Abstract: The present disclosure provides tobacco inbred plants Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 2.1 SRC, and CMS Burley 2.1 SRC. The present disclosure also provides parts of such plants and cured tobacco and tobacco products made from those parts. The present disclosure also includes progenies of the provided plants including hybrids.
TOBACCO INBRED AND HYBRID PLANTS AND TOBACCO PRODUCTS MADE THEREOF

Cross Reference to Related Applications


Incorporation of Sequence Listing

The Sequence Listing is hereby incorporated by reference in its entirety, including the file named P341 19US02.txt, which is 38,330 bytes in size and was generated on February 23, 2015, which is likewise herein incorporated by reference in its entirety.

Field

The present disclosure provides tobacco inbred plants Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC. The present disclosure also provides parts of such plants and cured tobacco and tobacco products made from those parts. The present disclosure also includes progenies of the provided plants including hybrids.

Background

Tobacco (*Nicotiana tabacum* L.) is an important commercial crop in the United States as well as in other countries. In tobacco plants, N-demethylation of nicotine results in nornicotine, a secondary alkaloid known to be a precursor for formation of N-Nitrosonornicotine ("NNN") in cured leaves. NNN is an undesired component of cured leaves.

The predominant alkaloid found in commercial tobacco varieties is nicotine, typically accounting for 90 - 95% of the total alkaloid pool. The remaining alkaloid fraction is comprised primarily of three additional pyridine alkaloids: nornicotine, anabasine, and anatabine. Nornicotine is generated directly from nicotine through the activity of the enzyme
nicotine N-demethylase. Nornicotine usually represents less than 5% of the total pyridine alkaloid pool, but through a process termed "conversion," tobacco plants that initially produce very low amounts of nornicotine give rise to progeny that metabolically "convert" a large percentage of leaf nicotine to nornicotine. In tobacco plants that have genetically converted (termed "converters"), the great majority of nornicotine production occurs during the senescence and curing of the mature leaf (Wernsman and Matzinger (1968), Tob. Sci., 72:226-228). Burley tobaccos are particularly prone to genetic conversion, with rates as high as 20% per generation observed in some cultivars.

During the curing and processing of the tobacco leaf, a portion of the nornicotine is metabolized to the compound NNN, a tobacco-specific nitrosamine (TSNA) that has been asserted to be carcinogenic in laboratory animals (Hecht and Hoffmann (1990), Cancer Surveys, 5:273-294; Hoffmann et al. (1994), J. Toxicol. Environ. Health, 41:1-52; Hecht (1998), Chem. Res. Toxicol., 77:559-603). In flue-cured tobaccos, TSNAs are found to be predominantly formed through the reaction of alkaloids with the minute amounts of nitrogen oxides present in combustion gases formed by the direct-fired heating systems found in traditional curing barns (Peele and Gentry (1999), "Formation of Tobacco-specific Nitrosamines in Flue-cured Tobacco," CORESTA Meeting, Agro-Phyto Groups, Suzhou, China). Retrofitting these curing barns with heat-exchangers virtually eliminated the mixing of combustion gases with the curing air and dramatically reduced the formation of TSNAs in tobaccos cured in this manner (Boyette and Hamm (2001), Rec. Adv. Tob. Sci., 27:17-22.). In contrast, in the air-cured Burley tobaccos, TSNA formation proceeds primarily through reaction of tobacco alkaloids with nitrite, a process catalyzed by leaf-borne microbes (Bush et al. (2001), Rec. Adv. Tob. Sci., 27:23-46). Thus far, attempts to reduce TSNAs through modification of curing conditions while maintaining acceptable quality standards have not proven to be successful for the air-cured tobaccos.

**SUMMARY**

In an aspect, the present disclosure includes a seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the American Type Culture Collection (ATCC) under ATCC Accession No. PTA-121043.

In another aspect, the present disclosure includes a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043.
In a further aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043.

In an aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a harvested leaf, or part thereof, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN), where the reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) is reduced in a smoke stream produced from the leaf.

In a further aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In another aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco, and where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).
In a further aspect, the present disclosure includes a second tobacco product prepared or produced from a first tobacco product prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where first product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof, and the second tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco. In some aspects, the first and second product comprises a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a part of a tobacco plant, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the part is selected from the group consisting of leaf, pollen, ovule, embryo, cotyledon, hypocotyl, meristematic cell, protoplast, root, root tip, pistil, anther, flower, shoot, stem, pod and petiole.

In another aspect, the present disclosure includes a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In an aspect, the present disclosure includes a tobacco plant regenerated from a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole where the regenerated plant has all, or essentially all of the morphological and physiological characteristics of cultivar Banket A1 SRC.
In an aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar Banket Al SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043.

In another aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar Banket Al SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the F₁ plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket Al SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket Al SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket Al SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the plant of tobacco cultivar Banket Al SRC is the male parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket Al SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where the plant of tobacco cultivar Banket Al SRC is the female parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket Al SRC, a representative sample seed of the cultivar having been deposited with the
ATCC under ATCC Accession No. PTA-121043, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a container of F₁ progeny seeds produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure includes an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, and where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure further includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) produced by growing a seed produced by a method comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) in a smoke stream produced from the leaf, where the plant is produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the
ATCC under ATCC Accession No. PTA-121043, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure includes a tobacco product prepared from an \( F_1 \) progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an \( F_i \) progeny seed produced by a method comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is produced by growing a seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where at least one tobacco plant is cytoplasmic male sterile, and where the tobacco product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco, and any combination thereof.

In an aspect, the present disclosure further includes a tobacco product prepared from an \( F_1 \) progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an \( F_i \) progeny seed produced by a method comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is produced by growing a seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, where at least one tobacco plant is cytoplasmic male sterile, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In another aspect, the present disclosure includes a seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure includes a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In another aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under
ATCC Accession No. PTA-121054, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In another aspect, the present disclosure includes a harvested leaf, or part thereof, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN), where the reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) is reduced in a smoke stream produced from the leaf.

In a further aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where the product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In another aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In a further aspect, the present disclosure includes a second tobacco product prepared or produced from a first tobacco product prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where first product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof, and the second tobacco product is selected from the
group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco. In some aspects, the first and/or the second product comprises a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a part of a tobacco plant, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where the part is selected from the group consisting of leaf, pollen, ovule, embryo, cotyledon, hypocotyl, meristematic cell, protoplast, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In another aspect, the present disclosure includes a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In an aspect, the present disclosure includes a tobacco plant regenerated from a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where the cell or protoplast of the tissue culture can be produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole where the regenerated plant has all, or essentially all of the morphological and physiological characteristics of cultivar CMS Banket A1 SRC.

In an aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In another aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where the F₁ plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one
tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, where the plant of tobacco cultivar CMS Banket A1 SRC is the female parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure also includes a container of F₁ progeny seeds produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure also includes an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting
the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In another aspect, the present disclosure further includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) in a smoke stream produced from the leaf, where the plant is produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, and where the tobacco product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure further includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of
tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In an aspect, the present disclosure further includes a tobacco product prepared from an F1 progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F1 progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco, and further where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile, where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure includes a method of vegetatively propagating a plant of a tobacco cultivar comprising the steps of (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054; (b) cultivating the tissue to obtain a proliferated shoot; and (c) rooting the proliferated shoots to obtain a rooted plantlet.

In an aspect, the present disclosure includes a method of vegetatively propagating a plant of a tobacco cultivar comprising the steps of (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054; (b) cultivating the tissue...
to obtain a proliferated shoot; (c) rooting the proliferated shoots to obtain a rooted plantlet; and (d) growing a plant from the rooted plantlet.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, with a second tobacco plant that comprises a desired trait to produce an F1 progeny seed; (b) growing the F1 progeny seed and selecting an Fi progeny plant that comprises the desired trait; (c) crossing the selected Fi progeny plant with a plant of said first tobacco cultivar to produce a backcross BC1Fi progeny seed; (d) growing the BC1Fi progeny seed and selecting a backcross BC1Fi progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of said first tobacco cultivar, Banket A1 SRC or CMS Banket A1 SRC; and (e) repeating steps (c) and (d) three or more times (e.g., 3, 4, 5, 6, 7, 8, 9, 10, and the like) in succession to produce selected fourth or higher backcross progeny that comprise the desired trait. In additional aspects, steps (c) and (d) can be repeated one or more times (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and the like) in succession to produce second or higher backcross progeny comprising the desired trait.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, with a second tobacco plant that comprises a desired trait to produce an F1 progeny seed; (b) growing the F1 progeny seed and selecting an Fi progeny plant that comprises the desired trait; (c) crossing the selected Fi progeny plant with a plant of the first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 to produce a backcross BC1Fi progeny seed; (d) growing the BQFi progeny seed and selecting a backcross BC1Fi progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, Banket A1 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS). In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS.
In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, with a second tobacco plant that comprises a desired trait to produce an F1 progeny seed; (b) growing the F1 progeny seed and selecting an F1 progeny plant that comprises the desired trait; (c) crossing the selected F1 progeny plant with a plant of the first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 to produce a backcross BC1 progeny seed; (d) growing the BC1,F1 progeny seed and selecting a backcross BC1F1 progeny plant comprising the desired trait and the physiological and essentially all of morphological characteristics of the first tobacco cultivar Banket A1 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS) and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens* or *Nicotiana glauca*. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens* or *Nicotiana glauca*.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 with a second tobacco plant that comprises a desired trait to produce an F1 progeny seed; (b) growing the F1 progeny seed and selecting an F1 progeny plant that comprises the desired trait; (c) crossing the selected F1 progeny plant with a plant of the first tobacco cultivar, Banket A1 SRC to produce a backcross BC1 progeny seed; (d) growing the BC1 progeny seed and selecting a backcross BC1F1 progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of tobacco cultivar Banket A1 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS) and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens*, and where the second tobacco plant is CMS Banket A1 SRC. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the
desired trait, where the trait is CMS and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens*.

In an aspect, the present disclosure includes a tobacco plant produced by a method comprising introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, with a second tobacco plant that comprises a desired trait to produce an F1 progeny seed; (b) growing the F1 progeny seed and selecting an F1 progeny plant that comprises the desired trait; (c) crossing the selected F1 progeny plant with a plant of the first tobacco cultivar Banket A1 SRC or CMS Banket A1 SRC to produce a backcross BC\(^{1}\) progeny seed; (d) growing the BCiF\(^{1}\) progeny seed and selecting a backcross BC\(^{i}\)F\(^{1}\) progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar Banket A1 SRC or CMS Banket A1 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny that comprise the desired trait.

In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054 with a plant of a second tobacco cultivar that comprises a desired trait to produce a progeny plant where the desired trait is selected from the group consisting of herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early maturing, early to medium maturing, medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an F1 progeny seed; (b) growing the F1 progeny seed into an Fj progeny plant and selecting the F1 progeny plant having the desired trait; (c) crossing the selected F1 progeny plant with a plant of the first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or CMS
Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054 to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, Banket A1 SRC or CMS Banket A1 SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a selected second, third, fourth or higher backcross progeny plant that comprises the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, Banket A1 SRC or CMS Banket A1 SRC.

In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, with a plant of a second tobacco cultivar that comprises a desired trait to produce a progeny plant where the desired trait is selected from the group consisting of herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early maturing, early to medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an F1 progeny seed; (b) growing the F1 progeny seed into an F1 progeny plant and selecting the F1 progeny plant having the desired trait; (c) crossing the selected F1 progeny plant with a plant of the first tobacco cultivar to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, Banket A1 SRC or CMS Banket A1 SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a selected second, third, fourth or higher backcross progeny plant that comprises the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, Banket A1 SRC or CMS Banket A1 SRC.

In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121043 or CMS Banket A1 SRC, a representative sample
seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-
121054, with a plant of a second tobacco cultivar that comprises a desired trait to produce a
progeny plant where the desired trait is selected from the group consisting of herbicide
resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing
quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early
maturing, early to medium maturing, medium maturing, medium to late maturing, late
maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant,
11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an F1
progeny seed; (b) growing the F1 progeny seed into an F1 progeny plant and selecting the F1
progeny plant having the desired trait; (c) crossing the selected F1 progeny plant with a plant
of the first tobacco cultivar to produce a backcross progeny plant seed; (d) growing the
backcross progeny plant seed into a backcross progeny plant and selecting the backcross
progeny plant comprising the desired trait and essentially all of the physiological and
morphological characteristics of the first tobacco cultivar, Banket A1 SRC or CMS Banket
A1 SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a
selected second, third, fourth or higher backcross progeny plant that comprises the desired
trait and essentially all of the physiological and morphological characteristics of the first
tobacco cultivar, Banket A1 SRC or CMS Banket A1 SRC, where the plant has a desired trait
of disease resistance.

In another aspect, the present disclosure includes a method for producing a tobacco
plant having decreased nicotine conversion comprising: identifying a first tobacco plant
comprising a nucleotide sequence selected from the group consisting of the nucleotide
sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof;
crossing the first tobacco plant with a second tobacco plant and collecting an F1 seed;
crossing a plant grown from the F1 seed to a third tobacco plant and collecting a second
tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed
that is homozygous for the nucleotide sequence selected from the group consisting of the
nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination
thereof.

In an aspect, the present disclosure includes a method for producing a tobacco plant
having decreased nicotine conversion comprising: identifying a first tobacco plant
comprising a nucleotide sequence selected from the group consisting of the nucleotide
sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof;
crossing the first tobacco plant with a second tobacco plant and collecting an F₁ seed; 
crossing a plant grown from the F₁ seed to a third tobacco plant and collecting a second tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed 
that is homozygous for the nucleotide sequence selected from the group consisting of the 
nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination 
thereof, where the second tobacco plant comprises a nucleotide sequence selected from the 
group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 
11, and any combination thereof.

In an aspect, the present disclosure includes a method for producing a tobacco plant 
having decreased nicotine conversion comprising: identifying a first tobacco plant 
comprising a nucleotide sequence selected from the group consisting of the nucleotide 
sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof; 
crossing the first tobacco plant with a second tobacco plant and collecting an F₁ seed; 
crossing a plant grown from the F₁ seed to a third tobacco plant and collecting a second 
tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed 
that is homozygous for the nucleotide sequence selected from the group consisting of the 
nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination 
thereof, where the second tobacco plant does not have the nucleotide sequence selected from 
the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID 
NO: 11, and any combination thereof, and the third tobacco plant is a tobacco plant 
comprising a nucleotide sequence selected from the group consisting of the nucleotide 
sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof.

In an aspect, the present disclosure includes a method for producing a tobacco plant 
having decreased nicotine conversion comprising: identifying a first tobacco plant 
comprising a nucleotide sequence selected from the group consisting of the nucleotide 
sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof; 
crossing the first tobacco plant with a second tobacco plant and collecting an F₁ seed; 
crossing a plant grown from the F₁ seed to a third tobacco plant and collecting a second 
tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed 
that is homozygous for the nucleotide sequence selected from the group consisting of the 
nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination 
thereof, where the first tobacco plant comprises the sequence set forth in SEQ ID NO: 1 or 
SEQ ID NO: 2.
In an aspect, the present disclosure includes a method for producing a tobacco plant having decreased nicotine conversion comprising: identifying a first tobacco plant comprising a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof; crossing the first tobacco plant with a second tobacco plant and collecting an F1 seed; crossing a plant grown from the F1 seed to a third tobacco plant and collecting a second tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed that is homozygous for the nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof, where the third tobacco plant is a tobacco plant comprising a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof.

In an aspect, the present disclosure includes a method for producing a tobacco plant having decreased nicotine conversion comprising: identifying a first tobacco plant comprising a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof; crossing the first tobacco plant with a second tobacco plant and collecting an F1 seed; crossing a plant grown from the F1 seed to a third tobacco plant and collecting a second tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed that is homozygous for the nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof, where the first tobacco plant is a plant of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, or tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure includes a method for producing a tobacco plant having decreased nicotine conversion comprising: identifying a first tobacco plant comprising a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof; crossing the first tobacco plant with a second tobacco plant and collecting an Fj seed; crossing a plant grown from the Fj seed to a third tobacco plant and collecting a second tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed that is homozygous for the nucleotide sequence selected from the group consisting of the
nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof, where the third tobacco plant is a plant of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043, or tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In another aspect, the present disclosure includes a method of producing a plant of a tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054 comprising at least one (e.g., 1, 2, 3, 4, 5, 6, 7, 8, and the like) additional desired trait comprising the steps of: (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054; and (b) introducing a at least one transgene (nucleic acid construct) conferring at least one desired trait into the tissue.

In another aspect, the present disclosure includes a method of producing an herbicide resistant tobacco plant comprising transforming a tobacco plant, or part thereof, produced by growing a seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054 with at least one transgene (nucleic acid construct), where the at least one transgene (nucleic acid construct) confers resistance to an herbicide selected from the group consisting of imidazolinone, cyclohexanedione, sulfonylurea, glyphosate, glufosinate, phenoxy proprionic acid, L-phosphinotricin, triazine, benzonitrile, and any combination thereof.

In another aspect, the present disclosure includes an herbicide resistant tobacco plant produced by a method comprising transforming a tobacco plant, or part thereof, produced by growing a seed of a tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054 with at least one transgene (nucleic
acid construct), where the at least one transgene (nucleic acid construct) confers resistance to an herbicide selected from the group consisting of imidazolinone, cyclohexanedione, sulfonylurea, glyphosate, glufosinate, phenoxy propionic acid, L-phosphinothricin, triazine, benzonitrile, and any combination thereof.

In another aspect, the present disclosure includes a method of producing a pest and/or insect resistant tobacco plant where the method comprises transforming a tobacco plant produced by growing a seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, with at least one transgene (nucleic acid construct) that confers pest and/or insect resistance.

In a further aspect, the present disclosure includes a pest and/or insect resistant tobacco plant produced by a method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, with at least one transgene (nucleic acid construct) that confers pest and/or insect resistance.

In a further aspect, the present disclosure includes a pest and/or insect resistant tobacco plant produced by a method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054, with at least one transgene (nucleic acid construct) that confers pest and/or insect resistance, where the transgene (nucleic acid construct) encodes a *Bacillus thuringiensis* (BT) endotoxin.

In another aspect, the present disclosure includes a method of producing a disease resistant tobacco plant, the method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054 with at least one transgene (nucleic acid construct) that confers disease resistance.
In a further aspect, the present disclosure includes a disease resistant tobacco plant produced by transforming a tobacco plant produced by growing a seed of tobacco cultivar Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043 or tobacco cultivar CMS Banket A1 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054 with at least one transgene (nucleic acid construct) that confers disease resistance.

In an aspect, the present disclosure includes a seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the American Type Culture Collection (ATCC) under ATCC Accession No. PTA-121053.

In another aspect, the present disclosure includes a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053.

In a further aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a harvested leaf, or part thereof, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN), where the reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) is reduced in a smoke stream produced from the leaf.

In a further aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the product is selected from the group
consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In another aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco, and where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In a further aspect, the present disclosure includes a second tobacco product prepared or produced from a first tobacco product prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where first product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof, and the second tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco. In some aspects, the first and second product comprises a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a part of a tobacco plant, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the part is selected from the group consisting of leaf, pollen, ovule, embryo, cotyledon, hypocotyl, meristematic cell, protoplast, root, root tip, pistil, anther, flower, shoot, stem, pod and petiole.

In another aspect, the present disclosure includes a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been
deposited with the ATCC under ATCC Accession No. PTA-121053, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristemetic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In an aspect, the present disclosure includes a tobacco plant regenerated from a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristemetic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole where the regenerated plant has all, or essentially all of the morphological and physiological characteristics of cultivar NC 2000 SRC.

In an aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053.

In another aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the F₁ plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar
NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the plant of tobacco cultivar NC 2000 SRC is the male parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where the plant of tobacco cultivar NC 2000 SRC is the female parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a container of F₁ progeny seeds produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure includes an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, and where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where at least one tobacco plant is cytoplasmic male sterile (CMS).
In another aspect, the present disclosure further includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) produced by growing a seed produced by a method of comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) in a smoke stream produced from the leaf, where the plant is produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by a method comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is produced by growing a seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where at least one tobacco plant is cytoplasmic male sterile, and where the tobacco product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco, and any combination thereof.

In an aspect, the present disclosure further includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by a method comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is produced by growing a seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, where at least one tobacco plant is cytoplasmic male sterile, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.
In another aspect, the present disclosure includes a seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In an aspect, the present disclosure includes a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In another aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In another aspect, the present disclosure includes a harvested leaf, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN), where the reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) is reduced in a smoke stream produced from the leaf.

In a further aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where the product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.
In another aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In a further aspect, the present disclosure includes a second tobacco product prepared or produced from a first tobacco product prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where first product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof, and the second tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco. In some aspects, the first and/or the second product comprises a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a part of a tobacco plant, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where the part is selected from the group consisting of leaf, pollen, ovule, embryo, cotyledon, hypocotyl, meristematic cell, protoplast, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In another aspect, the present disclosure includes a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In an aspect, the present disclosure includes a tobacco plant regenerated from a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045,
where the cell or protoplast of the tissue culture can be produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole where the regenerated plant has all, or essentially all of the morphological and physiological characteristics of cultivar CMS NC 2000 SRC.

In an aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In another aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where the F₁ plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, where the plant of tobacco cultivar CMS NC 2000 SRC is the female parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.
In an aspect, the present disclosure also includes a container of F₁ progeny seeds produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In an aspect, the present disclosure includes an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In another aspect, the present disclosure further includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) in a smoke stream produced from the leaf, where the plant is produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.
In an aspect, the present disclosure includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, and where the tobacco product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure further includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In an aspect, the present disclosure further includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco, and further where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile, where the cytoplasmic male sterile plant is
a plant of tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In an aspect, the present disclosure includes a method of vegetatively propagating a plant of a tobacco cultivar comprising the steps of (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045; (b) cultivating the tissue to obtain a proliferated shoot; and (c) rooting the proliferated shoots to obtain a rooted plantlet.

In an aspect, the present disclosure includes a method of vegetatively propagating a plant of a tobacco cultivar comprising the steps of (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045; (b) cultivating the tissue to obtain a proliferated shoot; (c) rooting the proliferated shoots to obtain a rooted plantlet; and (d) growing a plant from the rooted plantlet.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, with a second tobacco plant that comprises a desired trait to produce an F₁ progeny seed; (b) growing the F₁ progeny seed and selecting an F₁ progeny plant that comprises the desired trait; (c) crossing the selected F₁ progeny plant with a plant of said first tobacco cultivar to produce a backcross BC² progeny seed; (d) growing the BC²F₁ progeny seed and selecting a backcross BC²F₁ progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of said first tobacco cultivar, NC 2000 SRC or CMS NC 2000 SRC; and (e) repeating steps (c) and (d) three or more times (e.g., 3, 4, 5, 6, 7, 8, 9, 10, and the like) in succession to produce selected fourth or higher backcross progeny that comprise the desired trait. In additional aspects, steps (c) and (d) can be repeated one or more times (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and the like) in succession to produce second or higher backcross progeny comprising the desired trait.
In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, with a second tobacco plant that comprises a desired trait to produce an F1 progeny seed; (b) growing the F1 progeny seed and selecting an F1 progeny plant that comprises the desired trait; (c) crossing the selected F1 progeny plant with a plant of the first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 to produce a backcross BC1Fi progeny seed; (d) growing the BC1 progeny seed and selecting a backcross BC1Fi progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2000 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS). In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053, with a second tobacco plant that comprises a desired trait to produce an F1 progeny seed; (b) growing the F1 progeny seed and selecting an F1 progeny plant that comprises the desired trait; (c) crossing the selected F1 progeny plant with a plant of the first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 to produce a backcross BC1Fi progeny seed; (d) growing the BC1F1 progeny seed and selecting a backcross BC1F1 progeny plant comprising the desired trait and the physiological and essentially all of morphological characteristics of the first tobacco cultivar NC 2000 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS) and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens* or *Nicotiana glauca*. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens* or *Nicotiana glauca*. 
In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 with a second tobacco plant that comprises a desired trait to produce an F\(^1\) progeny seed; (b) growing the F\(^1\) progeny seed and selecting an F\(^1\) progeny plant that comprises the desired trait; (c) crossing the selected F\(^1\) progeny plant with a plant of the first tobacco cultivar, NC 2000 SRC to produce a backcross BC\(^2\)Fi progeny seed; (d) growing the BC\(^2\)Fi progeny seed and selecting a backcross BC\(^3\)Fi progeny plant comprising the desired trait; and (e) repeating steps (c) and (d) three or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is cytoplasmic male sterility (CMS) and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens*, and where the second tobacco plant is CMS NC 2000 SRC. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens*.

In an aspect, the present disclosure includes a method comprising introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, with a second tobacco plant that comprises a desired trait to produce an F\(^1\) progeny seed; (b) growing the F\(^1\) progeny seed and selecting an F\(^1\) progeny plant that comprises the desired trait; (c) crossing the selected F\(^1\) progeny plant with a plant of the first tobacco cultivar NC 2000 SRC or CMS NC 2000 SRC to produce a backcross BC\(^2\)^\(^\wedge\) progeny seed; (d) growing the BC\(^2\)^\(^\wedge\) Fi progeny seed and selecting a backcross BC\(^3\)^\(^\wedge\)Fi progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar NC 2000 SRC or CMS NC 2000 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny that comprise the desired trait.
In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045 with a plant of a second tobacco cultivar that comprises a desired trait to produce a progeny plant where the desired trait is selected from the group consisting of herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early maturing, early to medium maturing, medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an F1 progeny seed; (b) growing the F1 progeny seed into an F1 progeny plant and selecting the F1 progeny plant having the desired trait; (c) crossing the selected F1 progeny plant with a plant of the first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045 to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2000 SRC or CMS NC 2000 SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a selected second, third, fourth or higher backcross progeny plant that comprises the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2000 SRC or CMS NC 2000 SRC.

In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, with a plant of a second tobacco cultivar that comprises a desired trait to produce a progeny plant where the desired trait is selected from the group consisting of herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early
maturing, early to medium maturing, medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an \( F_j \) progeny seed; (b) growing the \( F_i \) progeny seed into an \( F_i \) progeny plant and selecting the \( F_j \) progeny plant having the desired trait; (c) crossing the selected \( F_1 \) progeny plant with a plant of the first tobacco cultivar to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2000 SRC or CMS NC 2000 SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a selected second, third, fourth or higher backcross progeny plant that comprises the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2000 SRC or CMS NC 2000 SRC.

In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, with a plant of a second tobacco cultivar that comprises a desired trait to produce a progeny plant where the desired trait is selected from the group consisting of herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early maturing, early to medium maturing, medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an \( F_i \) progeny seed; (b) growing the \( F_1 \) progeny seed into an \( F_1 \) progeny plant and selecting the \( F_i \) progeny plant having the desired trait; (c) crossing the selected \( F_1 \) progeny plant with a plant of the first tobacco cultivar to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2000 SRC or CMS NC 2000 SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a selected second, third, fourth or higher backcross progeny plant that comprises the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2000 SRC or CMS NC 2000 SRC.
tobacco cultivar, NC 2000 SRC or CMS NC 2000 SRC, where the plant has a desired trait of
disease resistance.

In an aspect, the present disclosure includes a method for producing a tobacco plant
having decreased nicotine conversion comprising: identifying a first tobacco plant
comprising a nucleotide sequence selected from the group consisting of the nucleotide
sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof;
crossing the first tobacco plant with a second tobacco plant and collecting an F1 seed;
crossing a plant grown from the F1 seed to a third tobacco plant and collecting a second
tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed
that is homozygous for the nucleotide sequence selected from the group consisting of the
nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination
thereof, where the first tobacco plant is a plant of tobacco cultivar NC 2000 SRC, a
representative sample seed of the cultivar having been deposited with the ATCC under
ATCC Accession No. PTA-121053, or tobacco cultivar CMS NC 2000 SRC, a representative
sample seed of the cultivar having been deposited with the ATCC under ATCC Accession
No. PTA-121045.

In an aspect, the present disclosure includes a method for producing a tobacco plant
having decreased nicotine conversion comprising: identifying a first tobacco plant
comprising a nucleotide sequence selected from the group consisting of the nucleotide
sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof;
crossing the first tobacco plant with a second tobacco plant and collecting an F1 seed;
crossing a plant grown from the F1 seed to a third tobacco plant and collecting a second
tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed
that is homozygous for the nucleotide sequence selected from the group consisting of the
nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination
thereof, where the third tobacco plant is a plant of tobacco cultivar NC 2000 SRC, a
representative sample seed of the cultivar having been deposited with the ATCC under
ATCC Accession No. PTA-121053, or tobacco cultivar CMS NC 2000 SRC, a representative
sample seed of the cultivar having been deposited with the ATCC under ATCC Accession
No. PTA-121045.

In another aspect, the present disclosure includes a method of producing a plant of a
tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been
deposited with the ATCC under ATCC Accession No. PTA-121053 or tobacco cultivar CMS
NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the
ATCC under ATCC Accession No. PTA-121045 comprising at least one (e.g., 1, 2, 3, 4, 5, 6, 7, 8, and the like) additional desired trait comprising the steps of: (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045; and (b) introducing a at least one transgene (nucleic acid construct) conferring at least one desired trait into the tissue.

In another aspect, the present disclosure includes a method of producing an herbicide resistant tobacco plant comprising transforming a tobacco plant, or part thereof, produced by growing a seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045 with at least one transgene (nucleic acid construct), where the at least one transgene (nucleic acid construct) confers resistance to an herbicide selected from the group consisting of imidazolinone, cyclohexanedione, sulfonylurea, glyphosate, glufosinate, phenoxy proprionic acid, L-phosphinothricin, triazine, benzonitrile, and any combination thereof.

In another aspect, the present disclosure includes an herbicide resistant tobacco plant produced by a method comprising transforming a tobacco plant, or part thereof, produced by growing a seed of a tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045 with at least one transgene (nucleic acid construct), where the at least one transgene (nucleic acid construct) confers resistance to an herbicide selected from the group consisting of imidazolinone, cyclohexanedione, sulfonylurea, glyphosate, glufosinate, phenoxy proprionic acid, L-phosphinothricin, triazine, benzonitrile, and any combination thereof.

In another aspect, the present disclosure includes a method of producing a pest and/or insect resistant tobacco plant where the method comprises transforming a tobacco plant produced by growing a seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar
having been deposited with the ATCC under ATCC Accession No. PTA-121045, with at least one transgene (nucleic acid construct) that confers pest and/or insect resistance.

In a further aspect, the present disclosure includes a pest and/or insect resistant tobacco plant produced by a method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, with at least one transgene (nucleic acid construct) that confers pest and/or insect resistance.

In a further aspect, the present disclosure includes a pest and/or insect resistant tobacco plant produced by a method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045, with at least one transgene (nucleic acid construct) that confers pest and/or insect resistance, where the transgene (nucleic acid construct) encodes a *Bacillus thuringiensis* (BT) endotoxin.

In another aspect, the present disclosure includes a method of producing a disease resistant tobacco plant, the method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045 with at least one transgene (nucleic acid construct) that confers disease resistance.

In a further aspect, the present disclosure includes a disease resistant tobacco plant produced by transforming a tobacco plant produced by growing a seed of tobacco cultivar NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053 or tobacco cultivar CMS NC 2000 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045 with at least one transgene (nucleic acid construct) that confers disease resistance.

In an aspect, the present disclosure includes a seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the American Type Culture Collection (ATCC) under ATCC Accession No. PTA-121058.
In another aspect, the present disclosure includes a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058.

In a further aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058.

In an aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a harvested leaf, or part thereof, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN), where the reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) is reduced in a smoke stream produced from the leaf.

In a further aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In another aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121058, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco, and where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In a further aspect, the present disclosure includes a second tobacco product prepared or produced from a first tobacco product prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where first product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof, and the second tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco. In some aspects, the first and second product comprises a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a part of a tobacco plant, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the part is selected from the group consisting of leaf, pollen, ovule, embryo, cotyledon, hypocotyl, meristematic cell, protoplast, root, root tip, pistil, anther, flower, shoot, stem, pod and petiole.

In another aspect, the present disclosure includes a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In an aspect, the present disclosure includes a tobacco plant regenerated from a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole where the regenerated plant has
all, or essentially all of the morphological and physiological characteristics of cultivar NC 2002 SRC.

In an aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058.

In another aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the F₁ plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the plant of tobacco cultivar NC 2002 SRC is the male parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where the plant of tobacco cultivar NC 2002 SRC is the female parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where
at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a container of \( F_1 \) progeny seeds produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure includes an \( F_1 \) progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, and where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a harvested leaf of an \( F_1 \) progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure further includes a harvested leaf of an \( F_1 \) progeny plant having a reduced amount of nornicotine and/or \( N' \)-nitroso-nornicotine (NNN) produced by growing a seed produced by a method of comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a harvested leaf of an \( Y_1 \) progeny plant having a reduced amount of nornicotine and/or \( N' \)-nitroso-nornicotine (NNN) in a smoke stream produced from the leaf, where the plant is produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar
NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by a method comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is produced by growing a seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where at least one tobacco plant is cytoplasmic male sterile, and where the tobacco product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco, and any combination thereof.

In an aspect, the present disclosure further includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by a method comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is produced by growing a seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, where at least one tobacco plant is cytoplasmic male sterile, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In another aspect, the present disclosure includes a seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In an aspect, the present disclosure includes a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In another aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In an aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under
ATCC Accession No. PTA-121041, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In another aspect, the present disclosure includes a harvested leaf, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN), where the reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) is reduced in a smoke stream produced from the leaf.

In a further aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, where the product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In another aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In a further aspect, the present disclosure includes a second tobacco product prepared or produced from a first tobacco product prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, where first product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof, and the second tobacco product is selected from the...
group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco. In some aspects, the first and/or the second product comprises a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a part of a tobacco plant, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, where the part is selected from the group consisting of leaf, pollen, ovule, embryo, cotyledon, hypocotyl, meristematic cell, protoplast, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In another aspect, the present disclosure includes a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In an aspect, the present disclosure includes a tobacco plant regenerated from a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, where the cell or protoplast of the tissue culture can be produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole where the regenerated plant has all, or essentially all of the morphological and physiological characteristics of cultivar CMS NC 2002 SRC.

In an aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In another aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, where the F₁ plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one
tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a
plant of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar
having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In another aspect, the present disclosure includes a method for producing a tobacco
seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where
at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar
CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with
the ATCC under ATCC Accession No. PTA-121041.

In another aspect, the present disclosure includes a method for producing a tobacco
seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where
at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar
CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with
the ATCC under ATCC Accession No. PTA-121041, where the plant of tobacco cultivar
CMS NC 2002 SRC is the female parent.

In another aspect, the present disclosure includes a method for producing a tobacco
seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where
at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In an aspect, the present disclosure also includes a container of F₁ progeny seeds
produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at
least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2002
SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121041.

In an aspect, the present disclosure includes an F₁ progeny plant produced by growing
a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed,
where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny
plant produced by growing a seed produced by crossing two tobacco plants and harvesting
the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In another aspect, the present disclosure further includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) in a smoke stream produced from the leaf, where the plant is produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In an aspect, the present disclosure includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, and where the tobacco product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure further includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of
tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In an aspect, the present disclosure further includes a tobacco product prepared from an F1 progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F1 progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco, and further where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile, where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In an aspect, the present disclosure includes a method of vegetatively propagating a plant of a tobacco cultivar comprising the steps of (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041; (b) cultivating the tissue to obtain a proliferated shoot; and (c) rooting the proliferated shoots to obtain a rooted plantlet.

In an aspect, the present disclosure includes a method of vegetatively propagating a plant of a tobacco cultivar comprising the steps of (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041; (b) cultivating the tissue to obtain
a proliferated shoot; (c) rooting the proliferated shoots to obtain a rooted plantlet; and (d) growing a plant from the rooted plantlet.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, with a second tobacco plant that comprises a desired trait to produce an F1 progeny seed; (b) growing the F1 progeny seed and selecting an F1 progeny plant that comprises the desired trait; (c) crossing the selected F1 progeny plant with a plant of said first tobacco cultivar to produce a backcross BCiFi progeny seed; (d) growing the BCiFi progeny seed and selecting a backcross BCiF1 progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of said first tobacco cultivar, NC 2002 SRC or CMS NC 2002 SRC; and (e) repeating steps (c) and (d) three or more times (e.g., 3, 4, 5, 6, 7, 8, 9, 10, and the like) in succession to produce selected fourth or higher backcross progeny that comprise the desired trait. In additional aspects, steps (c) and (d) can be repeated one or more times (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and the like) in succession to produce second or higher backcross progeny comprising the desired trait.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, with a second tobacco plant that comprises a desired trait to produce an F1 progeny seed; (b) growing the F1 progeny seed and selecting an F1 progeny plant that comprises the desired trait; (c) crossing the selected F1 progeny plant with a plant of the first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 to produce a backcross BC^n progeny seed; (d) growing the BCiFi progeny seed and selecting a backcross BCiF1 progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2002 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS). In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS.
In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, with a second tobacco plant that comprises a desired trait to produce an F<sub>1</sub> progeny seed; (b) growing the F<sub>1</sub> progeny seed and selecting an F<sub>i</sub> progeny plant that comprises the desired trait; (c) crossing the selected F<sub>i</sub> progeny plant with a plant of the first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 to produce a backcross BC<sup>1</sup> progeny seed; (d) growing the BC<sub>1</sub>F<sub>i</sub> progeny seed and selecting a backcross BC<sup>2</sup> progeny plant comprising the desired trait and the physiological and essentially all of morphological characteristics of the first tobacco cultivar NC 2002 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS) and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens* or *Nicotiana glauca*. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens* or *Nicotiana glauca*.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 with a second tobacco plant that comprises a desired trait to produce an F<sub>1</sub> progeny seed; (b) growing the F<sub>1</sub> progeny seed and selecting an F<sub>i</sub> progeny plant that comprises the desired trait; (c) crossing the selected F<sub>i</sub> progeny plant with a plant of the first tobacco cultivar, NC 2002 SRC to produce a backcross BC<sub>1</sub>F<sub>i</sub> progeny seed; (d) growing the BC<sub>1</sub>F<sub>i</sub> progeny seed and selecting a backcross BC<sup>2</sup> progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of tobacco cultivar NC 2002 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS) and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens*, and where the second tobacco plant is CMS NC 2002 SRC. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the
desired trait, where the trait is CMS and the CMS trait is obtained from the cytoplasm of *Nicotiana suaveolens*.

In an aspect, the present disclosure includes a tobacco plant produced by a method comprising introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, with a second tobacco plant that comprises a desired trait to produce an F₁ progeny seed; (b) growing the F₁ progeny seed and selecting an F₁ progeny plant that comprises the desired trait; (c) crossing the selected F₁ progeny plant with a plant of the first tobacco cultivar NC 2002 SRC or CMS NC 2002 SRC to produce a backcross BC₁F₁ progeny seed; (d) growing the BC₁ progeny seed and selecting a backcross BCjFi progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar NC 2002 SRC or CMS NC 2002 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny that comprise the desired trait.

In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041 with a plant of a second tobacco cultivar that comprises a desired trait to produce a progeny plant where the desired trait is selected from the group consisting of herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early maturing, early to medium maturing, medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an F₁ progeny seed; (b) growing the F₁ progeny seed into an F₁ progeny plant and selecting the F₁ progeny plant having the desired trait; (c) crossing the selected F₁ progeny plant with a plant of the first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or CMS NC 2002
SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041 to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2002 SRC or CMS NC 2002 SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a selected second, third, fourth or higher backcross progeny plant that comprises the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2002 SRC or CMS NC 2002 SRC.

In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, with a plant of a second tobacco cultivar that comprises a desired trait to produce a progeny plant where the desired trait is selected from the group consisting of herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early maturing, early to medium maturing, medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an F₁ progeny seed; (b) growing the F₁ progeny seed into an F₁ progeny plant and selecting the F₁ progeny plant having the desired trait; (c) crossing the selected F₁ progeny plant with a plant of the first tobacco cultivar to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2002 SRC or CMS NC 2002 SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a selected second, third, fourth or higher backcross progeny plant that comprises the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2002 SRC or CMS NC 2002 SRC.

In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121058 or CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041, with a plant of a second tobacco cultivar that comprises a desired trait to produce a progeny plant where the desired trait is selected from the group consisting of herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early maturing, early to medium maturing, medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an F₁ progeny seed; (b) growing the F₁ progeny seed into an F₁ progeny plant and selecting the F₁ progeny plant having the desired trait; (c) crossing the selected F₁ progeny plant with a plant of the first tobacco cultivar to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2002 SRC or CMS NC 2002 SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a selected second, third, fourth or higher backcross progeny plant that comprises the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, NC 2002 SRC or CMS NC 2002 SRC, where the plant has a desired trait of disease resistance.

In an aspect, the present disclosure includes a method for producing a tobacco plant having decreased nicotine conversion comprising: identifying a first tobacco plant comprising a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof; crossing the first tobacco plant with a second tobacco plant and collecting an F₁ seed; crossing a plant grown from the F₁ seed to a third tobacco plant and collecting a second tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed that is homozygous for the nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof, where the first tobacco plant is a plant of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, or tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.
In an aspect, the present disclosure includes a method for producing a tobacco plant having decreased nicotine conversion comprising: identifying a first tobacco plant
comprising a nucleotide sequence selected from the group consisting of the nucleotide
sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof;
crossing the first tobacco plant with a second tobacco plant and collecting an F1 seed;
crossing a plant grown from the F1 seed to a third tobacco plant and collecting a second tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed that is homozygous for the nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof, where the third tobacco plant is a plant of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058, or tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In another aspect, the present disclosure includes a method of producing a plant of a tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041 comprising at least one (e.g., 1, 2, 3, 4, 5, 6, 7, 8, and the like) additional desired trait comprising the steps of: (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041; and (b) introducing a at least one transgene (nucleic acid construct) conferring at least one desired trait into the tissue.

In another aspect, the present disclosure includes a method of producing an herbicide resistant tobacco plant comprising transforming a tobacco plant, or part thereof, produced by growing a seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041 with at least one transgene (nucleic acid construct), where the at least one transgene (nucleic acid construct) confers resistance to an herbicide selected from the group consisting of imidazolinone,
cyclohexanedione, sulfonylurea, glyphosate, glufosinate, phenoxy propionic acid, L-
phosphinothricin, triazine, benzonitrile, and any combination thereof.

In another aspect, the present disclosure includes an herbicide resistant tobacco plant
produced by a method comprising transforming a tobacco plant, or part thereof, produced by
growing a seed of a tobacco cultivar NC 2002 SRC, a representative sample seed of the
cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or
CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with
the ATCC under ATCC Accession No. PTA-121041 with at least one transgene (nucleic acid
construct), where the at least one transgene (nucleic acid construct) confers resistance to an
herbicide selected from the group consisting of imidazolinone, cyclohexanedione,
sulfonylurea, glyphosate, glufosinate, phenoxy propionic acid, L-phosphinothricin, triazine,
benzonitrile, and any combination thereof.

In another aspect, the present disclosure includes a method of producing a pest and/or
insect resistant tobacco plant where the method comprises transforming a tobacco plant
produced by growing a seed of tobacco cultivar NC 2002 SRC, a representative sample seed
of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-
121058 or tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar
having been deposited with the ATCC under ATCC Accession No. PTA-121041, with at
least one transgene (nucleic acid construct) that confers pest and/or insect resistance.

In a further aspect, the present disclosure includes a pest and/or insect resistant
tobacco plant produced by a method comprising transforming a tobacco plant produced by
growing a seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar
having been deposited with the ATCC under ATCC Accession No. PTA-121058 or tobacco
cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been
deposited with the ATCC under ATCC Accession No. PTA-121041, with at least one
transgene (nucleic acid construct) that confers pest and/or insect resistance.

In a further aspect, the present disclosure includes a pest and/or insect resistant
tobacco plant produced by a method comprising transforming a tobacco plant produced by
growing a seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar
having been deposited with the ATCC under ATCC Accession No. PTA-121058 or tobacco
cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been
deposited with the ATCC under ATCC Accession No. PTA-121041, with at least one
transgene (nucleic acid construct) that confers pest and/or insect resistance, where the
transgene (nucleic acid construct) encodes a *Bacillus thuringiensis* (BT) endotoxin.
In another aspect, the present disclosure includes a method of producing a disease resistant tobacco plant, the method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041 with at least one transgene (nucleic acid construct) that confers disease resistance.

In a further aspect, the present disclosure includes a disease resistant tobacco plant produced by transforming a tobacco plant produced by growing a seed of tobacco cultivar NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058 or tobacco cultivar CMS NC 2002 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041 with at least one transgene (nucleic acid construct) that confers disease resistance.

In an aspect, the present disclosure includes a seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the American Type Culture Collection (ATCC) under ATCC Accession No. PTA-121059.

In another aspect, the present disclosure includes a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059.

In a further aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059.

In an aspect, the present disclosure includes a harvested leaf, or part thereof, of a tobacco plant, produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a harvested leaf, or part thereof, produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where the leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN),
where the reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) is reduced in a
smoke stream produced from the leaf.

In a further aspect, the present disclosure includes a tobacco product, prepared from a
tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Burley 21
SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121059, where the product is selected from the group
consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco,
shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure includes a tobacco product, prepared from a
tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Burley 21
SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121059, where the product is selected from the group
consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter
cigarette, a cigar, snuff, and chewing tobacco.

In another aspect, the present disclosure includes a tobacco product, prepared from a
tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Burley 21
SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121059, where the product is selected from the group
consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter
cigarette, a cigar, snuff, and chewing tobacco, and where the product has a reduced amount
of nornicotine and/or N'-nitrosonornicotine (NNN).

In a further aspect, the present disclosure includes a second tobacco product prepared
or produced from a first tobacco product prepared from a tobacco plant, or part thereof,
produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample
seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-
121059, where first product is selected from the group consisting of pipe tobacco, cigar
tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and
any combination thereof, and the second tobacco product is selected from the group
consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter
cigarette, a cigar, snuff, and chewing tobacco. In some aspects, the first and second product
comprises a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a part of a tobacco plant, produced by
growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the
cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059,
where the part is selected from the group consisting of leaf, pollen, ovule, embryo, cotyledon, hypocotyl, meristematic cell, protoplast, root, root tip, pistil, anther, flower, shoot, stem, pod and petiole.

In another aspect, the present disclosure includes a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In an aspect, the present disclosure includes a tobacco plant regenerated from a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole where the regenerated plant has all, or essentially all of the morphological and physiological characteristics of cultivar Burley 21 SRC.

In an aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059.

In another aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where the F₁ plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where
at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where the plant of tobacco cultivar Burley 21 SRC is the female parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a container of F1 progeny seeds produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure includes an F1 progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, and where at least one tobacco plant is cytoplasmic male sterile (CMS).
In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure further includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) produced by growing a seed produced by a method of comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure also includes a harvested leaf of an Y₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) in a smoke stream produced from the leaf, where the plant is produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where at least one tobacco plant is cytoplasmic male sterile (CMS).

In an aspect, the present disclosure includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by a method comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is produced by growing a seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, where at least one tobacco plant is cytoplasmic male sterile, and where the tobacco product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco, and any combination thereof.

In an aspect, the present disclosure further includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by a method comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is produced by
growing a seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the
cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059,
where at least one tobacco plant is cytoplasmic male sterile, and where the tobacco product is
selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a
vented recess filter cigarette, a cigar, sniff, and chewing tobacco.

In another aspect, the present disclosure includes a seed of tobacco cultivar CMS
Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the
ATCC under ATCC Accession No. PTA-121044.

In an aspect, the present disclosure includes a tobacco plant, or part thereof, produced
by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of
the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In another aspect, the present disclosure includes a harvested leaf, or part thereof, of a
tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Burley
21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121044, where the leaf has a reduced amount of nornicotine
and/or N'-nitrosonornicotine (NNN).

In another aspect, the present disclosure includes a harvested leaf, or part thereof,
produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative
sample seed of the cultivar having been deposited with the ATCC under ATCC Accession
No. PTA-121044, where the leaf has a reduced amount of nornicotine and/or N'-
nitrosonornicotine (NNN), where the reduced amount of nornicotine and/or
N'-nitrosonornicotine (NNN) is reduced in a smoke stream produced from the leaf.

In a further aspect, the present disclosure includes a tobacco product, prepared from a
tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Burley
21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121044, where the product is selected from the group
consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco,
shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure includes a tobacco product, prepared from a
tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Burley
21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In another aspect, the present disclosure includes a tobacco product, prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, where the product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In a further aspect, the present disclosure includes a second tobacco product prepared or produced from a first tobacco product prepared from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, where first product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof, and the second tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco. In some aspects, the first and/or the second product comprises a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

In an aspect, the present disclosure includes a part of a tobacco plant, produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, where the part is selected from the group consisting of leaf, pollen, ovule, embryo, cotyledon, hypocotyl, meristematic cell, protoplast, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.

In another aspect, the present disclosure includes a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, where the cell or protoplast of the tissue culture is produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole.
In an aspect, the present disclosure includes a tobacco plant regenerated from a tissue culture produced from a protoplast or cell from a tobacco plant, or part thereof, produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, where the cell or protoplast of the tissue culture can be produced from a plant part selected from the group consisting of a leaf, pollen, embryo, cotyledon, hypocotyl, meristematic cell, root, root tip, pistil, anther, flower, shoot, stem, pod, and petiole where the regenerated plant has all, or essentially all of the morphological and physiological characteristics of cultivar CMS Burley 21 SRC.

In an aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In another aspect, the present disclosure includes an F₁ progeny plant of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, where the F₁ plant is cytoplasmic male sterile (CMS).

In another aspect, the present disclosure includes an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC is the female parent.

In another aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where
at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In an aspect, the present disclosure also includes a container of F₁ progeny seeds produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In an aspect, the present disclosure includes an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In another aspect, the present disclosure further includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In an aspect, the present disclosure also includes a harvested leaf of an F₁ progeny plant having a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) in a smoke stream produced from the leaf, where the plant is produced by growing a seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile
plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In an aspect, the present disclosure includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, and where the tobacco product is selected from the group consisting of pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, cut tobacco and any combination thereof.

In an aspect, the present disclosure further includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco.

In an aspect, the present disclosure further includes a tobacco product prepared from an F₁ progeny tobacco plant, or part thereof, where the plant or part thereof is produced by growing an F₁ progeny seed produced by crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile (CMS), where the cytoplasmic male sterile plant is a tobacco plant produced by growing the seed of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, and where the tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and chewing tobacco, and further where the product has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).
In an aspect, the present disclosure further includes a method of producing a tobacco product, comprising: (a) providing cured tobacco from a tobacco plant of a cultivar or a hybrid produced from said cultivar, wherein said cultivar is selected from the group consisting of Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC; and (b) preparing a tobacco product from said cured tobacco, wherein representative sample seeds of said Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC have been deposited at the ATCC with the following ATCC Accession Nos.: PTA-121043 for Banket A1 SRC, PTA-121054 for CMS Banket A1 SRC, PTA-121053 for NC 2000 SRC, PTA-121045 for CMS NC 2000 SRC, PTA-121058 for NC 2002 SRC, PTA-121041 for CMS NC 2002 SRC, PTA-121059 for Burley 21 SRC, and PTA-121044 for CMS Burley 21 SRC.

In an aspect, the present disclosure includes a method for producing a tobacco seed comprising crossing two tobacco plants and harvesting the resultant tobacco seed, where at least one tobacco plant is cytoplasmic male sterile, where the cytoplasmic male sterile plant is a plant of tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In an aspect, the present disclosure includes a method of vegetatively propagating a plant of a tobacco cultivar comprising the steps of (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044; (b) cultivating the tissue to obtain a proliferated shoot; and (c) rooting the proliferated shoots to obtain a rooted plantlet.

In an aspect, the present disclosure includes a method of vegetatively propagating a plant of a tobacco cultivar comprising the steps of (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044; (b) cultivating the tissue to obtain a proliferated shoot; (c) rooting the proliferated shoots to obtain a rooted plantlet; and (d) growing a plant from the rooted plantlet.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Burley 21

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SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, with a second tobacco plant that comprises a desired trait to produce an F₁ progeny seed; (b) growing the F₁ progeny seed and selecting an F₁ progeny plant that comprises the desired trait; (c) crossing the selected F₁ progeny plant with a plant of said first tobacco cultivar to produce a backcross BC₁F₁ progeny seed; (d) growing the BCiFi progeny seed and selecting a backcross BCiF₁ progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of said first tobacco cultivar, Burley 21 SRC or CMS Burley 21 SRC; and (e) repeating steps (c) and (d) three or more times (e.g., 3, 4, 5, 6, 7, 8, 9, 10, and the like) in succession to produce selected fourth or higher backcross progeny that comprise the desired trait. In additional aspects, steps (c) and (d) can be repeated one or more times (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and the like) in succession to produce second or higher backcross progeny comprising the desired trait.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, with a second tobacco plant that comprises a desired trait to produce an F₁ progeny seed; (b) growing the F₁ progeny seed and selecting an F₁ progeny plant that comprises the desired trait; (c) crossing the selected F₁ progeny plant with a plant of the first tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 to produce a backcross BC₁Fi progeny seed; (d) growing the BC₁Fi progeny seed and selecting a backcross BCtFi progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, Burley 21 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS). In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, with a second tobacco plant that comprises a
desired trait to produce an F₁ progeny seed; (b) growing the F₁ progeny seed and selecting an F₁ progeny plant that comprises the desired trait; (c) crossing the selected Fi progeny plant with a plant of the first tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 to produce a backcross BC₁F₁ progeny seed; (d) growing the BC₁F₁ progeny seed and selecting a backcross BCᵢF₁ progeny plant comprising the desired trait and the physiological and essentially all of morphological characteristics of the first tobacco cultivar Burley 21 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS) and the CMS trait is obtained from the cytoplasm of Nicotiana suaveolens or Nicotiana glauca. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS and the CMS trait is obtained from the cytoplasm of Nicotiana suaveolens or Nicotiana glauca.

In an aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 with a second tobacco plant that comprises a desired trait to produce an F₁ progeny seed; (b) growing the F₁ progeny seed and selecting an F₁ progeny plant that comprises the desired trait; (c) crossing the selected Fi progeny plant with a plant of the first tobacco cultivar, Burley 21 SRC to produce a backcross BCᵢFₜ progeny seed; (d) growing the BCᵢFₜ progeny seed and selecting a backcross BCᵢF₁ progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of tobacco cultivar Burley 21 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait, where the trait is cytoplasmic male sterility (CMS) and the CMS trait is obtained from the cytoplasm of Nicotiana suaveolens, and where the second tobacco plant is CMS Burley 21 SRC. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny comprising the desired trait, where the trait is CMS and the CMS trait is obtained from the cytoplasm of Nicotiana suaveolens.

In an aspect, the present disclosure includes a tobacco plant produced by a method comprising introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having
been deposited with the ATCC under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, with a second tobacco plant that comprises a desired trait to produce an \( F_1 \) progeny seed; (b) growing the \( F_1 \) progeny seed and selecting an \( F_1 \) progeny plant that comprises the desired trait; (c) crossing the selected \( F_1 \) progeny plant with a plant of the first tobacco cultivar Burley 21 SRC or CMS Burley 21 SRC to produce a backcross BC\(_i\)Fi progeny seed; (d) growing the BCiFi progeny seed and selecting a backcross BCiFi progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar Burley 21 SRC or CMS Burley 21 SRC; and (e) repeating steps (c) and (d) three or more times in succession to produce selected fourth or higher backcross progeny that comprise the desired trait. In additional aspects, steps (c) and (d) can be repeated one or more times in succession to produce second or higher backcross progeny that comprise the desired trait.

In another aspect, the present disclosure includes a method of introducing a desired trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044 with a plant of a second tobacco cultivar that comprises a desired trait to produce a progeny plant where the desired trait is selected from the group consisting of herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early maturing, early to medium maturing, medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an \( F_1 \) progeny seed; (b) growing the \( F_1 \) progeny seed into an \( F_1 \) progeny plant and selecting the \( F_1 \) progeny plant having the desired trait; (c) crossing the selected \( F_1 \) progeny plant with a plant of the first tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044 to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, Burley 21 SRC.
or CMS Burley 21 SRC; and (e) repeating steps (c) and (d) one or more times in succession
to produce a selected second, third, fourth or higher backcross progeny plant that comprises
the desired trait and essentially all of the physiological and morphological characteristics of
the first tobacco cultivar, Burley 21 SRC or CMS Burley 21 SRC.

In another aspect, the present disclosure includes a method of introducing a desired
trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Burley
21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample
seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-
121044, with a plant of a second tobacco cultivar that comprises a desired trait to produce a
progeny plant where the desired trait is selected from the group consisting of herbicide
resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing
quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early
maturing, medium to late maturing, late
maturing, small stalk, medium stalk, leaf number per plant, 5-10 leaves per plant,
11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof, to produce an F₁
progeny seed; (b) growing the F₁ progeny seed into an F₁ progeny plant and selecting the F₁
progeny plant having the desired trait; (c) crossing the selected F₁ progeny plant with a plant
of the first tobacco cultivar to produce a backcross progeny plant seed; (d) growing the
backcross progeny plant seed into a backcross progeny plant and selecting the backcross
progeny plant comprising the desired trait and essentially all of the physiological and
morphological characteristics of the first tobacco cultivar, Burley 21 SRC or CMS Burley 21
SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a
selected second, third, fourth or higher backcross progeny plant that comprises the desired
trait and essentially all of the physiological and morphological characteristics of the first
tobacco cultivar, Burley 21 SRC or CMS Burley 21 SRC.

In another aspect, the present disclosure includes a method of introducing a desired
trait into a tobacco cultivar comprising: (a) crossing a plant of a first tobacco cultivar Burley
21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC
under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample
seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-
121044, with a plant of a second tobacco cultivar that comprises a desired trait to produce a
progeny plant where the desired trait is selected from the group consisting of herbicide
resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing
quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation, early maturing, early to medium maturing, medium maturing, medium to late maturing, late maturing, small stalk, medium stalk, large stalk, leaf number per plant, 5-10 leaves per plant, 11-15 leaves per plant, 16-21 leaves per plant, and any combination thereof; to produce an F₁ progeny seed; (b) growing the F₁ progeny seed into an F₂ progeny plant and selecting the F₂ progeny plant having the desired trait; (c) crossing the selected F₂ progeny plant with a plant of the first tobacco cultivar to produce a backcross progeny plant seed; (d) growing the backcross progeny plant seed into a backcross progeny plant and selecting the backcross progeny plant comprising the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, Burley 2₁ SRC or CMS Burley 2₁ SRC; and (e) repeating steps (c) and (d) one or more times in succession to produce a selected second, third, fourth or higher backcross progeny plant that comprises the desired trait and essentially all of the physiological and morphological characteristics of the first tobacco cultivar, Burley 2₁ SRC or CMS Burley 2₁ SRC, where the plant has a desired trait of disease resistance.

In an aspect, the present disclosure includes a method for producing a tobacco plant having decreased nicotine conversion comprising: identifying a first tobacco plant comprising a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof; crossing the first tobacco plant with a second tobacco plant and collecting an F₁ seed; crossing a plant grown from the F₁ seed to a third tobacco plant and collecting a second tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed that is homozygous for the nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof, where the first tobacco plant is a plant of tobacco cultivar Burley 2₁ SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, or tobacco cultivar CMS Burley 2₁ SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In an aspect, the present disclosure includes a method for producing a tobacco plant having decreased nicotine conversion comprising: identifying a first tobacco plant comprising a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof; crossing the first tobacco plant with a second tobacco plant and collecting an F₁ seed;
crossing a plant grown from the F1 seed to a third tobacco plant and collecting a second tobacco seed; and identifying a second tobacco seed or a plant grown from the second seed that is homozygous for the nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 11, and any combination thereof, where the third tobacco plant is a plant of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059, or tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044.

In another aspect, the present disclosure includes a method of producing a plant of a tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044 comprising at least one (e.g., 1, 2, 3, 4, 5, 6, 7, 8, and the like) additional desired trait comprising the steps of: (a) collecting tissue capable of being propagated from a plant of a tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044; and (b) introducing a at least one transgene (nucleic acid construct) conferring at least one desired trait into the tissue.

In another aspect, the present disclosure includes a method of producing an herbicide resistant tobacco plant comprising transforming a tobacco plant, or part thereof, produced by growing a seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044 with at least one transgene (nucleic acid construct), where the at least one transgene (nucleic acid construct) confers resistance to an herbicide selected from the group consisting of imidazolinone, cyclohexanedione, sulfonylurea, glyphosate, glufosinate, phenoxy proprionic acid, L-phosphinothricin, triazine, benzonitrile, and any combination thereof.

In another aspect, the present disclosure includes an herbicide resistant tobacco plant produced by a method comprising transforming a tobacco plant, or part thereof, produced by growing a seed of a tobacco cultivar Burley 21 SRC, a representative sample seed of the
cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044 with at least one transgene (nucleic acid construct), where the at least one transgene (nucleic acid construct) confers resistance to an herbicide selected from the group consisting of imidazolinone, cyclohexanedione, sulfonyleurea, glyphosate, glufosinate, phenoxy propionic acid, L-phosphinothricin, triazine, benzonitrile, and any combination thereof.

In another aspect, the present disclosure includes a method of producing a pest and/or insect resistant tobacco plant where the method comprises transforming a tobacco plant produced by growing a seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, with at least one transgene (nucleic acid construct) that confers pest and/or insect resistance.

In a further aspect, the present disclosure includes a pest and/or insect resistant tobacco plant produced by a method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, with at least one transgene (nucleic acid construct) that confers pest and/or insect resistance.

In a further aspect, the present disclosure includes a pest and/or insect resistant tobacco plant produced by a method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, with at least one transgene (nucleic acid construct) that confers pest and/or insect resistance, where the transgene (nucleic acid construct) encodes a Bacillus thuringiensis (BT) endotoxin.

In another aspect, the present disclosure includes a method of producing a disease resistant tobacco plant, the method comprising transforming a tobacco plant produced by growing a seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044, with at least one transgene (nucleic acid construct) that confers disease resistance, where the transgene (nucleic acid construct) encodes a Bacillus thuringiensis (BT) endotoxin.
been deposited with the ATCC under ATCC Accession No. PTA-121044 with at least one transgene (nucleic acid construct) that confers disease resistance.

In a further aspect, the present disclosure includes a disease resistant tobacco plant produced by transforming a tobacco plant produced by growing a seed of tobacco cultivar Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059 or tobacco cultivar CMS Burley 21 SRC, a representative sample seed of the cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121044 with at least one transgene (nucleic acid construct) that confers disease resistance.

BRIEF DESCRIPTION OF THE SEQUENCES

SEQ ID NO: 1 sets forth a cyp82e4 W329Stop nucleotide sequence.
SEQ ID NO: 2 sets forth a cyp82e5v2 W422Stop nucleotide sequence.
SEQ ID NO: 3 sets forth a cyp82e-4 W329Stop amino acid sequence.
SEQ ID NO: 4 sets forth a cyp82e5v2 W422Stop amino acid sequence.
SEQ ID NO: 5 sets forth a CYP82E4 wild-type nucleotide sequence.
SEQ ID NO: 6 sets forth a CYP82E5v2 wild-type nucleotide sequence.
SEQ ID NO: 7 sets forth a CYP82E4 wild-type amino acid sequence.
SEQ ID NO: 8 sets forth a CYP82E5v2 wild-type amino acid sequence.
SEQ ID NO: 9 sets forth a CYP82E10 wild-type nucleotide sequence.
SEQ ID NO: 10 sets forth a CYP82E10 wild-type amino acid sequence.
SEQ ID NO: 11 sets forth a CYP82E10 P38 IS nucleotide sequence.
SEQ ID NO: 12 sets forth a CYP82E10 P381S amino acid sequence.

All three tobacco Nicotine Demethylase genes (CYP82E4, CYP82E5v2, CYP82E10) share a common structure: a 939 bp exon 1 and a 612 bp exon 2 separated by a large intron, whose length varies among the three genes. See Lewis et al, "Three nicotine demethylase genes mediate normicotine biosynthesis in Nicotiana tabacum L.: Functional characterization of the CYP82E10 gene," Phytochemistry, 71 (2010), 1988-1998. SEQ ID NOs: 1, 2, 5, 6, 9, and 11 set forth wild-type or mutant versions of coding sequences of CYP82E4, CYP82E5v2, or CYP82E10. It is understood that, used herein, a plant comprising, having, or homozygous for a sequence selected from SEQ ID NOs: 1, 2, 5, 6, 9, and 11 refers to a plant comprising at the CYP82E4, CYP82E5v2, or CYP82E10 endogenous locus a genomic sequence comprising the coding sequence of SEQ ID NO: 1, 2, 5, 6, 9, or 11.
DETAILED DESCRIPTION OF THE DISCLOSURE

This description is not intended to be a detailed catalog of all the different ways in which the disclosure may be implemented, or all the features that may be added to the instant disclosure. For example, features illustrated with respect to one embodiment may be incorporated into other embodiments, and features illustrated with respect to a particular embodiment may be deleted from that embodiment. Thus, the disclosure contemplates that in some embodiments of the disclosure, any feature or combination of features set forth herein can be excluded or omitted. In addition, numerous variations and additions to the various embodiments suggested herein will be apparent to those skilled in the art in light of the instant disclosure, which do not depart from the instant disclosure. Hence, the following descriptions are intended to illustrate some particular embodiments of the disclosure, and not to exhaustively specify all permutations, combinations and variations thereof.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs. The terminology used in the description of the disclosure herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure.

All publications, patent applications, patents and other references cited herein are incorporated by reference in their entireties for the teachings relevant to the sentence and/or paragraph in which the reference is presented. References to techniques employed herein are intended to refer to the techniques as commonly understood in the art, including variations on those techniques or substitutions of equivalent techniques that would be apparent to one of skill in the art.

Unless the context indicates otherwise, it is specifically intended that the various features of the disclosure described herein can be used in any combination. Moreover, the present disclosure also contemplates that in some embodiments of the disclosure, any feature or combination of features set forth herein can be excluded or omitted. To illustrate, if the specification states that a composition comprises components A, B and C, it is specifically intended that any of A, B or C, or a combination thereof, can be omitted and disclaimed singularly or in any combination.

As used in the description of the disclosure and the appended claims, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

As used herein, "and/or" refers to and encompasses any and all possible combinations of one or more of the associated listed items, as well as the lack of combinations when
interpreted in the alternative ("or").

The term "about," as used herein when referring to a measurable value such as a dosage or time period and the like, is meant to encompass variations of ± 20%, ± 10%, ± 5%, ± 1%, ± 0.5%, or even ± 0.1% of the specified amount.

As used herein, phrases such as "between X and Y" and "between about X and Y" should be interpreted to include X and Y. As used herein, phrases such as "between about X and Y" mean "between about X and about Y" and phrases such as "from about X to Y" mean "from about X to about Y."

The terms "comprise," "comprises" and "comprising" as used herein, specify the presence of the stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

As used herein, the transitional phrase "consisting essentially of" means that the scope of a claim is to be interpreted to encompass the specified materials or steps recited in the claim and those that do not materially affect the basic and novel characteristic(s) of the claimed disclosure. Thus, the term "consisting essentially of" when used in a claim of this disclosure is not intended to be interpreted to be equivalent to "comprising."

"Introducing," in the context of a polynucleotide sequence (e.g., a recombinant polynucleotide and/or expression cassette of the disclosure), means presenting a polynucleotide sequence to the plant, plant part, and/or plant cell in such a manner that the polynucleotide sequence gains access to the interior of a cell. Where more than one polynucleotide sequence is to be introduced these polynucleotide sequences can be assembled as part of a single polynucleotide or nucleic acid construct, or as separate polynucleotide or nucleic acid constructs, and can be located on the same or different transformation vectors.

Accordingly, these polynucleotides can be introduced into plant cells in a single transformation event, in separate transformation events, or, e.g., as part of a breeding protocol. Thus, the term "transformation" as used herein refers to the introduction of a heterologous nucleic acid into a cell. Transformation of a cell may be stable or transient. Thus, in some embodiments, a plant cell, plant part or plant of this disclosure can be stably transformed with a recombinant polynucleotide of the disclosure. In other embodiments, a plant cell, plant part or plant of this disclosure can be transiently transformed with a recombinant polynucleotide of the disclosure.
"Tobacco product" is defined as "any product made or derived from tobacco that is intended for human use or consumption, including any component, part, or accessory of a tobacco product (except for raw materials other than tobacco used in manufacturing a component, part, or accessory of a tobacco product)" (section 201 of the FD&C Act; 21 U.S.C. 321). The label and packaging is part of a tobacco product.

Terms "nicotine conversion rate," "percent nicotine conversion," and "percentage nicotine conversion" are used interchangeably. Percent nicotine demethylation in a sample is calculated by dividing the level of nornicotine by the combined level of nicotine and nornicotine as measured in the sample, and multiplying by 100.

**Banket Al SRC**

In some aspects, the present disclosure provides tobacco cultivars, and parts thereof, from Banket Al SRC, representative sample seeds of this cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043. In other aspects, the present disclosure provides a tobacco plant, or part thereof, produced by growing a seed of Banket Al SRC. In further aspects, a plant of the present disclosure can include a plant with all, or essentially all, of the morphological and physiological characteristics of cultivar Banket Al SRC.

While not being limited by process, Banket Al SRC is a result of the introduction of three mutated **CYP82E** genes in a burley tobacco cultivar Banket Al. The three genes are a mutated **CYP82E4** gene recited as 325-6 #775 in Lewis *et al.* ("Three nicotine demethylase genes mediate nornicotine biosynthesis in *Nicotiana tabacum* L.: Functional characterization of the CYP82E10 gene," *Phytochemistry*, 71 (2010), 1988-1998 (SEQ ID NO: 1, which sets forth a cyp82e4 W329Stop, hereby incorporated by reference in its entirety)), a mutated **CYP82E5v2** recited in Lewis *et al.* (*supra*) as 325-6 #1-13 (SEQ ID NO: 2, which sets forth a cyp82e5v2 W422Stop, hereby incorporated by reference in its entirety), and a mutated **CYP82E10** recited in Lewis *et al.* (*supra*) as 325-6 #1041 (SEQ ID NO: 1, which sets forth a cyp82e10 P381S, hereby incorporated by reference in its entirety). Mutations cyp82e4 W329Stop and cyp82e5v2 W422Stop result in truncated proteins while cyp82e10 P381S results in a nonfunctional protein. A cyp82e4 W329Stop ("e4"), a cyp82e5v2 W422Stop ("e5"), and a cyp82e10 P381S ("e10") mutation are introduced from a *e4e5e10* triple mutant from a strong converter burley background, line DH98-325-6, as listed in Table 4 of Lewis *et al.* (*supra*) into a burley tobacco cultivar Banket Al background.

Banket Al SRC is the result of seven backcrosses with burley cultivar Banket Al as the recurrent parent, followed by two rounds of selfing with selection for homozygosity for
the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutations to yield BC\textsubscript{3}F\textsubscript{3} plants (Banket A1 SRC) in which the wild-type CYP82E4, CYP82E5v2 and CYP82E10 alleles of Banket A1 are replaced by the mutant alleles (e.g., cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

Banket A1 SRC progeny plants have genetic backgrounds that are at least 95%, at least 97%, at least 98%, or at least 99% similar to Banket A1. Banket A1 SRC plants exhibit low nornicotine levels and produce leaves with reduced potential for accumulating derived NNN during curing, storage, and smoking.

**CMS Banket A1 SRC**

In some aspects, the present disclosure provides tobacco cultivars, and parts thereof, from CMS Banket A1 SRC, representative sample seeds of this cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054. In further aspects, the present disclosure also includes a tobacco plant, or part thereof, produced by growing a seed of CMS Banket A1 SRC. In still further aspects, a plant of the present disclosure can include a plant with all, or essentially all, of the morphological and physiological characteristics of cultivar CMS Banket A1 SRC. CMS Banket A1 SRC is a male-sterile (CMS) version of Banket A1 SRC (CMS Banket A1 SRC) produced by crossing a plant of CMS Banket A1 as a female with pollen of Banket A1 SRC BC\textsuperscript{1} to produce male-sterile plants heterozygous for all three mutations. The CMS progeny plants of the CMS Banket A1 x Banket A1 SRC BC\textsubscript{6}F\textsubscript{i} cross are male sterile. A plurality of CMS Banket A1 x Banket A1 SRC BC\textsuperscript{1} x CMS plants (e.g., CMS \( \frac{1}{1}\) progeny plants) are screened for the cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S mutations to identify plants heterozygous for all three mutations. A single male-sterile plant resulting from this cross is backcrossed as a female to Banket A1 SRC to prepare BC\textsubscript{7}F\textsubscript{i} CMS progeny. BC\textsubscript{7}F\textsubscript{i} CMS progeny homozygous for the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutations are identified by genotyping and designated as CMS Banket A1 SRC. Because the CMS Banket A1 SRC line is male sterile, it is maintained via pollination with Banket A1 SRC. Banket A1 SRC is crossed as the male parent to CMS Banket A1 SRC to prepare CMS Banket A1 SRC F\textsubscript{1} progeny plants.

CMS Banket A1 SRC and CMS Banket A1 SRC F\textsubscript{i} progeny plants have genetic backgrounds that are at least 95%, at least 97%, at least 98%, or at least 99% similar to Banket A1. CMS Banket A1 SRC and CMS Banket A1 SRC F\textsubscript{i} progeny plants exhibit low
nornicotine levels and produce leaves with reduced potential for accumulating derived NNN during curing, storage, and smoking.

**NC 2000 SRC**

In some aspects, the present disclosure provides tobacco cultivars, and parts thereof, from NC 2000 SRC, representative sample seeds of this cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053. In other aspects, the present disclosure provides a tobacco plant, or part thereof, produced by growing a seed of NC 2000 SRC. In further aspects, a plant of the present disclosure can include a plant with all, or essentially all, of the morphological and physiological characteristics of cultivar NC 2000 SRC.

While not being limited by process, NC 2000 SRC is a result of the introduction of three mutated *CYP82E* genes in a burley tobacco cultivar NC 2000. The three genes are a mutated *CYP82E4* gene recited as 325-6 #775 in Lewis et al. ("Three nicotine demethylase genes mediate nornicotine biosynthesis in *Nicotiana tabacum* L.: Functional characterization of the CYP82E10 gene," *Phytochemistry*, 71 (2010), 1988-1998 (SEQ ID NO: 1, which sets forth a *cyp82e4* W329Stop, hereby incorporated by reference in its entirety)), a mutated *CYP82E5v2* recited in Lewis *et al* (supra) as 325-6 #1-13 (SEQ ID NO: 2, which sets forth a *cyp82e5v2* W422Stop, hereby incorporated by reference in its entirety), and a mutated *CYP82E10* recited in Lewis *et al.* (supra) as 325-6 #1041 (SEQ ID NO:1 1, which sets forth a *cyp82el0* P381S, hereby incorporated by reference in its entirety). Mutations *cyp82e4 W329Stop* and *cyp82e5v2 W422Stop* result in truncated proteins while *cyp82E10 P381S* results in a nonfunctional protein. A *cyp82e4 W329Stop* ("e4"), a *cyp82e5v2 W422Stop* ("e5"), and a *cyp82el0* P381S ("el0") mutation are introduced from a *e4e4e4e5e5el0el0* triple mutant from a strong converter burley background, line DH98-325-6, as listed in Table 4 of Lewis *et al.* (supra) into a burley tobacco cultivar NC 2000 background.

NC 2000 SRC is the result of seven backcrosses with burley cultivar NC 2000 as the recurrent parent, followed by two rounds of selfing with selection for homozygosity for the *cyp82e4 W329Stop*, the *cyp82e5v2 W422Stop*, and *cyp82el0* P381S mutations to yield BC1F3 plants (NC 2000 SRC) in which the wild-type CYP82E4, CYP82E5v2 and CYP82E10 alleles of NC 2000 are replaced by the mutant alleles {*e.g.*, *cyp82e4 W329Stop*, *cyp82e5v2 W422Stop*, and *cyp82el0* P381S}.

NC 2000 SRC progeny plants have genetic backgrounds that are at least 95%, at least 97%, at least 98%, or at least 99% similar to NC 2000. NC 2000 SRC plants exhibit low
nornicotine levels and produce leaves with reduced potential for accumulating derived NNN
during curing, storage, and smoking.

**CMS NC 2000 SRC**

In some aspects, the present disclosure provides tobacco cultivars, and parts thereof,
from CMS NC 2000 SRC, representative sample seeds of this cultivar having been deposited
with the ATCC under ATCC Accession No. PTA-121045. In further aspects, the present
disclosure also includes a tobacco plant, or part thereof, produced by growing a seed of CMS
NC 2000 SRC. In still further aspects, a plant of the present disclosure can include a plant
with all, or essentially all, of the morphological and physiological characteristics of cultivar
CMS NC 2000 SRC. CMS NC 2000 SRC is a male-sterile (CMS) version of NC 2000 SRC
(CMS NC 2000 SRC) produced by crossing a plant of CMS NC 2000 as a female with pollen
of NC 2000 SRC BC₆F₁ to produce male-sterile plants heterozygous for all three mutations.
The CMS progeny plants of the CMS NC 2000 x NC 2000 SRC BC₆F₁ cross are male sterile.
A plurality of CMS NC 2000 x NC 2000 SRC BC₆F₁ x CMS plants (e.g., CMS F₁ progeny
plants) are screened for the *cyp82e4* W329Stop, *cyp82e5v2* W422Stop, and *cyp82e10* P381S
mutations to identify plants heterozygous for all three mutations. A single male-sterile plant
resulting from this cross is backcrossed as a female to NC 2000 SRC to prepare BC₇F₁ CMS
progeny. BC₇F₁ CMS progeny homozygous for the *cyp82e4* W329Stop, the *cyp82e5v2*
W422Stop, and *cyp82e10* P381S mutations are identified by genotyping and designated as
CMS NC 2000 SRC. Because the CMS NC 2000 SRC line is male sterile, it is maintained
via pollination with NC 2000 SRC. NC 2000 SRC is crossed as the male parent to CMS NC
2000 SRC to prepare CMS NC 2000 SRC F₃ progeny plants.

CMS NC 2000 SRC and CMS NC 2000 SRC F₃ progeny plants have genetic
backgrounds that are at least 95%, at least 97%, at least 98%, or at least 99% similar to NC
2000. CMS NC 2000 SRC and CMS NC 2000 SRC F₁ progeny plants exhibit low
nornicotine levels and produce leaves with reduced potential for accumulating derived NNN
during curing, storage, and smoking.

**NC 2002 SRC**

In some aspects, the present disclosure provides tobacco cultivars, and parts thereof,
from NC 2002 SRC, representative sample seeds of this cultivar having been deposited with
the ATCC under ATCC Accession No. PTA-121058. In other aspects, the present disclosure
provides a tobacco plant, or part thereof, produced by growing a seed of NC 2002 SRC. In
further aspects, a plant of the present disclosure can include a plant with all, or essentially all, of the morphological and physiological characteristics of cultivar NC 2002 SRC.

While not being limited by process, NC 2002 SRC is a result of the introduction of three mutated CYP82E genes in a burley tobacco cultivar NC 2002LC. The three genes are a mutated CYP82E4 gene recited as 325-6 #775 in Lewis et al. ("Three nicotine demethylase genes mediate nor nicotine biosynthesis in Nicotiana tabacum L.: Functional characterization of the CYP82E10 gene," Phytochemistry, 71 (2010), 1988-1998 (SEQ ID NO: 1, which sets forth a cyp82e4 W329Stop, hereby incorporated by reference in its entirety)), a mutated CYP82E5v2 recited in Lewis et al. (supra) as 325-6 #1-13 (SEQ ID NO: 2, which sets forth a cyp82e5v2 W422Stop, hereby incorporated by reference in its entirety), and a mutated CYP82E10 recited in Lewis et al (supra) as 325-6 #1041 (SEQ ID NO:1 1, which sets forth a cyp82el0 P381S, hereby incorporated by reference in its entirety). Mutations cyp82e4 W329Stop and cyp82e5v2 W422Stop result in truncated proteins while cyp82E10 P381S results in a nonfunctional protein. A cyp82e4 W329Stop ('W'), a cyp82e5v2 W422Stop ('e5'), and a cyp82el0 P381S ('el0') mutation are introduced from a c4e4e5e5e5e0el0 triple mutant from a strong converter burley background, line DH98-325-6, as listed in Table 4 of Lewis et al. (supra) into a burley tobacco cultivar NC 2002LC background.

NC 2002 SRC is the result of seven backcrosses with burley cultivar NC 2002LC as the recurrent parent, followed by two rounds of selfmg with selection for homozygosity for the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutations to yield BC2F3 plants (NC 2002 SRC) in which the wild-type CYP82E4, CYP82E5v2 and CYP82E10 alleles of NC 2002LC are replaced by the mutant alleles (e.g., cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

NC 2002 SRC progeny plants have genetic backgrounds that are at least 95%, at least 97%, at least 98%, or at least 99% similar to NC 2002LC. NC 2002 SRC plants exhibit low nor nicotine levels and produce leaves with reduced potential for accumulating derived NNN during curing, storage, and smoking.

CMS NC 2002 SRC

In some aspects, the present disclosure provides tobacco cultivars, and parts thereof, from CMS NC 2002 SRC, representative sample seeds of this cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041. In further aspects, the present disclosure also includes a tobacco plant, or part thereof, produced by growing a seed of CMS NC 2002 SRC. In still further aspects, a plant of the present disclosure can include a plant
with all, or essentially all, of the morphological and physiological characteristics of cultivar CMS NC 2002 SRC. CMS NC 2002 SRC is a male-sterile (CMS) version of NC 2002 SRC (CMS NC 2002 SRC) produced by crossing a plant of CMS NC 2002LC as a female with pollen of NC 2002 SRC BC$_2$Fi to produce male-sterile plants heterozygous for all three mutations. The CMS progeny plants of the CMS NC 2002LC x NC 2002 SRC BC$_2$F$_1$ cross are male sterile. A plurality of CMS NC 2002LC x NC 2002 SRC BC$_2$F$_1$ x CMS plants (e.g., CMS F$_1$ progeny plants) are screened for the cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S mutations to identify plants heterozygous for all three mutations. A single male-sterile plant resulting from this cross is backcrossed as a female to NC 2002 SRC to prepare BCyFi CMS progeny. BC$_2$F$_1$ CMS progeny homozygous for the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutations are identified by genotyping and designated as CMS NC 2002 SRC. Because the CMS NC 2002 SRC line is male sterile, it is maintained via pollination with NC 2002 SRC. NC 2002 SRC is crossed as the male parent to CMS NC 2002 SRC to prepare CMS NC 2002 SRC F$_1$ progeny plants.

CMS NC 2002 SRC and CMS NC 2002 SRC F$_1$ progeny plants have genetic backgrounds that are at least 95%, at least 97%, at least 98%, or at least 99% similar to NC 2002LC. CMS NC 2002 SRC and CMS NC 2002 SRC F$_1$ progeny plants exhibit low nornicotine levels and produce leaves with reduced potential for accumulating derived NNN during curing, storage, and smoking.

**Burley 21 SRC**

In some aspects, the present disclosure provides tobacco cultivars, and parts thereof, from Burley 21 SRC, representative sample seeds of this cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121059. In other aspects, the present disclosure provides a tobacco plant, or part thereof, produced by growing a seed of Burley 21 SRC. In further aspects, a plant of the present disclosure can include a plant with all, or essentially all, of the morphological and physiological characteristics of cultivar Burley 21 SRC.

While not being limited by process, Burley 21 SRC is a result of the introduction of three mutated *CYP82E* genes in a burley tobacco cultivar Burley 21 SRC. The three genes are a mutated *CYP82E4* gene recited as 325-6 #775 in Lewis *et al.* ("Three nicotine demethylase genes mediate nornicotine biosynthesis in *Nicotiana tabacum* L.: Functional characterization of the CYP82E10 gene," *Phytochemistry, 71* (2010), 1988-1998 (SEQ ID NO: 1, which sets forth a cyp82e4 W329Stop, hereby incorporated by reference in its entirety)), a mutated *CYP82E5v2* recited in Lewis *et al.* (supra) as 325-6 #1-13 (SEQ ID NO:
2, which sets forth a cyp82e5v2 W422Stop, hereby incorporated by reference in its entirety),
and a mutated CYP82E10 recited in Lewis et al. (supra) as 325-6 #1041 (SEQ ID NO:1 1,
which sets forth a cyp82el0 P381S, hereby incorporated by reference in its entirety).
Mutations cyp82e4 W329Stop and cyp82e5v2 W422Stop result in truncated proteins while

cyp82el0 P381S mutations to identify plants heterozygous for all three mutations. A single
Burley SRC is the result of seven backcrosses with burley cultivar Burley 21 SRC as the recurrent parent, followed by two rounds of selfmg with selection for homozygosity for
the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutations to yield
BC2F3 plants (Burley 21 SRC) in which the wild-type CYP82E4, CYP82E5v2 and
CYP82E10 alleles of Burley 21 SRC are replaced by the mutant alleles (e.g., cyp82e4
W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).
Burley 21 SRC progeny plants have genetic backgrounds that are at least 95%, at least
97%, at least 98%, or at least 99% similar to Burley 21 SRC. Burley 21 SRC plants exhibit
low nornicotine levels and produce leaves with reduced potential for accumulating derived
NNN during curing, storage, and smoking.

**CMS Burley 21 SRC**

In some aspects, the present disclosure provides tobacco cultivars, and parts thereof,
from CMS Burley 21 SRC, representative sample seeds of this cultivar having been deposited
with the ATCC under ATCC Accession No. PTA-121044. In further aspects, the present
disclosure also includes a tobacco plant, or part thereof, produced by growing a seed of CMS
Burley 21 SRC. In still further aspects, a plant of the present disclosure can include a plant
with all, or essentially all, of the morphological and physiological characteristics of cultivar
CMS Burley 21 SRC. CMS Burley 21 SRC is a male-sterile (CMS) version of Burley 21
SRC (CMS Burley 21 SRC) produced by crossing a plant of CMS Burley 21 as a female with
pollen of Burley 21 SRC BC6F1 to produce male-sterile plants heterozygous for all three
mutations. The CMS progeny plants of the CMS Burley 21 x Burley 21 SRC BC6F1 cross are
male sterile. A plurality of CMS Burley 21 x Burley 21 SRC BC6F1 x CMS plants (e.g.,
CMS F1 progeny plants) are screened for the cyp82e4 W329Stop, cyp82e5v2 W422Stop, and
cyp82el0 P381S mutations to identify plants heterozygous for all three mutations. A single
male-sterile plant resulting from this cross is backcrossed as a female to Burley 21 SRC to prepare BC$_2$F$_1$ CMS progeny. BC$_3$Fi CMS progeny homozygous for the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutations are identified by genotyping and designated as CMS Burley 21 SRC. Because the CMS Burley 21 SRC line is male sterile, it is maintained via pollination with Burley 21 SRC. Burley 21 SRC is crossed as the male parent to CMS Burley 21 SRC to prepare CMS Burley 21 SRC F$_1$ progeny plants.

CMS Burley 21 SRC and CMS Burley 21 SRC F$_1$ progeny plants have genetic backgrounds that are at least 95%, at least 97%, at least 98%», or at least 99% similar to Burley 21 SRC. CMS Burley 21 SRC and CMS Burley 21 SRC F$_1$ progeny plants exhibit low nornicotine levels and produce leaves with reduced potential for accumulating derived NNN during curing, storage, and smoking.

Other plants

The present disclosure includes a tobacco seed produced by crossing two parent tobacco plants and harvesting the resultant tobacco seed, where at least one parent tobacco plant is Banket A1 SRC. In one aspect, the Banket A1 SRC is the male parent plant. In another aspect, the CMS Banket A1 SRC is the female parent plant. One aspect of the present disclosure provides tobacco plants that are homozygous at the cyp82e4, cyp82e5v2, and cyp82E10 loci for SEQ ID NO: 1, SEQ ID NO: 2, and SEQ ID NO: 11, respectively, and which share a genetic background that is greater than about 75%, 80%, 85%, 90%», 95%, 98%, or 99% similar to Banket A1 or CMS Banket A1. In one aspect, approximately or greater than about 50%, 75%, or 100% of a progeny's genetics is provided by a plant of the present disclosure that is homozygous at the cyp82e4, cyp82e5v2, and cyp82E10 loci for SEQ ID NO: 1, SEQ ID NO: 2, and SEQ ID NO: 11, respectively. In one aspect, a plant of the present disclosure has a genetic background that is at least 95%, at least 97%, at least 98%, or at least 99% similar to Banket A1 or CMS Banket A1. In another aspect, a plant of the present disclosure exhibits low nornicotine and is not subject to conversion to high nornicotine. In one aspect, a plant of the present disclosure is the progeny plant of a female or male parent plant that is *Fusarium* wilt resistant. In another aspect, a plant of Banket A1 SRC has low resistance to black shank and moderate resistance to bacterial wilt.

The present disclosure includes a tobacco seed produced by crossing two parent tobacco plants and harvesting the resultant tobacco seed, where at least one parent tobacco plant is NC 2000 SRC. In one aspect, the NC 2000 SRC is the male parent plant. In another aspect, the CMS NC 2000 SRC is the female parent plant. One aspect of the present
disclosure provides tobacco plants that are homozygous at the cyp82e4, cyp82e5v2, and cyp82E10 loci for SEQ ID NO: 1, SEQ ID NO: 2, and SEQ ID NO: 11, respectively, and which share a genetic background that is greater than about 75%, 80%, 85%, 90%, 95%, 98%, or 99% similar to NC 2000 or CMS NC 2000. In one aspect, approximately or greater than about 50%, 75%, or 100% of a progeny's genetics is provided by a plant of the present disclosure that is homozygous at the cyp82e4, cyp82e5v2, and cyp82E10 loci for SEQ ID NO: 1, SEQ ID NO: 2, and SEQ ID NO: 11, respectively. In one aspect, a plant of the present disclosure has a genetic background that is at least 95%, at least 97%, at least 98%, or at least 99% similar to NC 2000 or CMS NC 2000. In another aspect, a plant of the present disclosure exhibits low nornicotine and is not subject to conversion to high nornicotine. In one aspect, a plant of the present disclosure is the progeny plant of a female or male parent plant that is Fusarium wilt resistant. In another aspect, a plant of NC 2000 SRC has low resistance to black shank and moderate resistance to bacterial wilt.

The present disclosure includes a tobacco seed produced by crossing two parent tobacco plants and harvesting the resultant tobacco seed, where at least one parent tobacco plant is NC 2002 SRC. In one aspect, the NC 2002 SRC is the male parent plant. In another aspect, the CMS NC 2002 SRC is the female parent plant. One aspect of the present disclosure provides tobacco plants that are homozygous at the cyp82e4, cyp82e5v2, and cyp82E10 loci for SEQ ID NO: 1, SEQ ID NO: 2, and SEQ ID NO: 11, respectively, and which share a genetic background that is greater than about 75%, 80%, 85%, 90%, 95%, 98%, or 99% similar to NC 2002LC or CMS NC 2002LC. In one aspect, approximately or greater than about 50%, 75%, or 100% of a progeny's genetics is provided by a plant of the present disclosure that is homozygous at the cyp82e4, cyp82e5v2, and cyp82E10 loci for SEQ ID NO: 1, SEQ ID NO: 2, and SEQ ID NO: 11, respectively. In one aspect, a plant of the present disclosure has a genetic background that is at least 95%, at least 97%, at least 98%, or at least 99% similar to NC 2002LC or CMS NC 2002LC. In another aspect, a plant of the present disclosure exhibits low nornicotine and is not subject to conversion to high nornicotine. In one aspect, a plant of the present disclosure is the progeny plant of a female or male parent plant that is Fusarium wilt resistant. In another aspect, a plant of NC 2002 SRC has low resistance to black shank and moderate resistance to bacterial wilt.

The present disclosure includes a tobacco seed produced by crossing two parent tobacco plants and harvesting the resultant tobacco seed, where at least one parent tobacco plant is Burley 21 SRC. In one aspect, the Burley 21 SRC is the male parent plant. In another aspect, the CMS Burley 21 SRC is the female parent plant. One aspect of the present
disclosure provides tobacco plants that are homozygous at the cyp82e4, cyp82e5v2, and cyp82E10 loci for SEQ ID NO: 1, SEQ ID NO: 2, and SEQ ID NO: 11, respectively, and which share a genetic background that is greater than about 75%, 80%, 85%, 90%, 95%, 98%, or 99% similar to Burley 21 SRC or CMS Burley 21. In one aspect, approximately or greater than about 50%, 75%, or 100% of a progeny's genetics is provided by a plant of the present disclosure that is homozygous at the cyp82e4, cyp82e5v2, and cyp82E10 loci for SEQ ID NO: 1, SEQ ID NO: 2, and SEQ ID NO: 11, respectively. In one aspect, a plant of the present disclosure has a genetic background that is at least 95%, at least 97%, at least 98%, or at least 99% similar to Burley 21 SRC or CMS Burley 21. In another aspect, a plant of the present disclosure exhibits low nornicotine and is not subject to conversion to high nornicotine. In one aspect, a plant of the present disclosure is the progeny plant of a female or male parent plant that is Fusarium wilt resistant. In another aspect, a plant of Burley 21 SRC has low resistance to black shank and moderate resistance to bacterial wilt.

In one aspect, a plant of the present disclosure is a medium-late maturing variety with moderately high yield potential. In another aspect, a plant of the present disclosure offers a broad range of important agronomic characteristics. In a further aspect, a plant of the present disclosure has one, two, three, four or more of the traits including moderate resistance to black shank, some tolerance to blue mold, black root rot resistance, and resistance to common virus diseases. In another aspect, a plant of the present disclosure has blue mold tolerance and level 4 resistance to both races of black shank and high root rot resistance. In one aspect, a plant of the present disclosure, such as Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC, lacks Fusarium wilt resistance. In another aspect, a plant of the present disclosure is Fusarium wilt resistant. In another aspect, a plant of the present disclosure has low resistance to black shank and moderate resistance to bacterial wilt.

In an aspect, the plants of the present disclosure have reduced or eliminated ability to convert nicotine to nornicotine. In an aspect, the percentage nicotine conversion can be less than about 75%, 70%, 60%, 50%, or 25% of that found in Banket A1. In other aspects, the nicotine conversion in plants of the present disclosure, including, e.g., Banket A1 SRC or CMS Banket A1 SRC, can be less than about 4%, about 3.5%, about 3%, about 2.5%, about 2%, about 1.5%, about 1%, or any range therein. In still other aspects, the nicotine conversion in plants of the present disclosure, including, e.g., Banket A1 SRC or CMS Banket A1 SRC, can be in a range from about 3% to about 1%, about 3% to about 0.5%, or about 2% to about 0.5%. In a preferred aspect, the percentage nicotine conversion is less
than about 25%, 10%, 5%, or 2% of that found in Banket A1 without the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutations.

In an aspect, the plants of the present disclosure have reduced or eliminated ability to convert nicotine to nornicotine. In an aspect, the percentage nicotine conversion can be less than about 25%, 10%, 5%, or 2% of that found in NC 2000. In other aspects, the nicotine conversion in plants of the present disclosure, including, e.g., NC 2000 SRC or CMS NC 2000 SRC, can be less than about 4%, about 3.5%, about 3%, about 2.5%, about 2%, about 1.5%, about 1%, or any range therein. In still other aspects, the nicotine conversion in plants of the present disclosure, including, e.g., NC 2000 SRC or CMS NC 2000 SRC, can be in a range from about 3% to about 1%, about 3% to about 0.5%, or about 2% to about 0.5%.

In a preferred aspect, the percentage nicotine conversion is less than about 25%, 10%, 5%, or 2% of that found in NC 2000 without the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutations.

In an aspect, the plants of the present disclosure have reduced or eliminated ability to convert nicotine to nornicotine. In an aspect, the percentage nicotine conversion can be less than about 75%, 70%, 60%, 50%, or 25% of that found in NC 2002. In other aspects, the nicotine conversion in plants of the present disclosure, including, e.g., NC 2002 SRC or CMS NC 2002 SRC, can be less than about 4%, about 3.5%, about 3%, about 2.5%, about 2%, about 1.5%, about 1%, or any range therein. In still other aspects, the nicotine conversion in plants of the present disclosure, including, e.g., NC 2002 SRC or CMS NC 2002 SRC, can be in a range from about 3% to about 1%, about 3% to about 0.5%, or about 2% to about 0.5%.

In a preferred aspect, the percentage nicotine conversion is less than about 25%, 10%, 5%, or 2% of that found in NC 2002LC without the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutations. In an aspect, the tobacco plants of the present disclosure can have a nicotine conversion rate of about 3.5, 3.25, 3.0 or 2.75% or less.

In an aspect, the plants of the present disclosure have reduced or eliminated ability to convert nicotine to nornicotine. In an aspect, the percentage nicotine conversion can be less than about 75%, 70%, 60%, 50%, or 25% of that found in Burley 21 SRC. In other aspects, the nicotine conversion in plants of the present disclosure, including, e.g., Burley 21 SRC or CMS Burley 21 SRC, can be less than about 4%, about 3.5%, about 3%, about 2.5%, about 2%, about 1.5%, about 1%, or any range therein. In still other aspects, the nicotine conversion in plants of the present disclosure, including, e.g., Burley 21 SRC or CMS Burley 21 SRC, can be in a range from about 3% to about 1%, about 3% to about 0.5%, or about 2% to about 0.5%. In a preferred aspect, the percentage nicotine conversion is less than about
25%, 10%, 5%, or 2% of that found in Burley 21 SRC without the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82e10 P381S mutations.

In an aspect, the tobacco plants of the present disclosure can have a nicotine conversion rate of about 3.5, 3.25, 3.0 or 2.75% or less. In another aspect, the nicotine conversion rate of tobacco plants of the present disclosure can be about 4.0, 3.9, 3.8, 3.7, 3.6, 3.5, 3.4, 3.3, 3.2, 3.1, 3.0, 2.9, 2.8, 2.7, 2.6, 2.5, 2.4, 2.3, 2.2, 2.1, 2.0, 1.9, 1.8, 1.7, 1.6, 1.5, 1.4, 1.3, 1.2, 1.1, 1.0, 0.9, 0.8, 0.7, 0.6 % or less or any range therein. In another aspect, the nicotine conversion rate of tobacco plants of the present disclosure can be about 2.9, 2.8, 2.7, 2.6, 2.5, 2.4, 2.3, 2.2, 2.1, 2.0, 1.9, 1.8, 1.7, 1.6, 1.5, 1.4, 1.3, 1.2, 1.1, 1.0, 0.9, 0.8, 0.7, 0.6 % or less or any range therein. In another aspect, the nicotine conversion rates can be in a range from about 0.5% to about 0.9%, about 0.5% to about 1.5%, about 0.5% to about 2.0%, about 0.5% to about 2.5%, about 0.5% to about 2.75%, and about 0.5% to about 3.0%.

In another aspect, the nicotine conversion rates can be in a range from about 1.0% to about 1.5%, about 1.0% to about 1.75%, about 1.0% to about 2.0%, about 1.0% to about 2.5%, about 1.0% to about 2.75%, or about 1.0% to about 3.0%. In another aspect, the nicotine conversion rate in a plant of the present disclosure can be less than about 2.9, 2.75, 2.5, 2.25, 2.0, 1.9, 1.8, 1.7, 1.6, 1.5, 1.4, 1.3, 1.2, 1.1 or 1.0% or any range therein.

In another aspect, the nicotine content in such plants can be about 1.2, 1.0, 0.7, 0.5, 0.4, 0.2, 0.1, 0.09, 0.085, 0.08, 0.075, 0.07, 0.065, 0.06, 0.055, 0.05, 0.045, 0.04, 0.035, 0.025, 0.01, 0.009, 0.0075, 0.005, 0.0025, 0.001, 0.0009, 0.00075, 0.0005, 0.00025, or 0.0001 % dry weight, or undetectable, or any range therein. In another aspect, the nicotine content can be less than about 1.2, 1.0, 0.9, 0.8, 0.7, 0.5, 0.4, 0.2, 0.1, 0.075, 0.05, 0.025, 0.01, 0.009, 0.0075, 0.005, 0.0025, 0.001, 0.0009, 0.00075, 0.0005, 0.00025, or 0.0001 % dry weight, or any range therein. In another aspect, the nicotine content in such plants can be in a range from about 1.2% to about 1.0%, about 0.7% to about 0.5%, about 0.4% to about 0.2%, about 0.1% to about 0.075%, about 0.05% to about 0.025%, about 0.01% to about 0.0075%, about 0.005% to about 0.0025%, about 0.001% to about 0.00075%, about 0.0005% to about 0.00025%, or about 0.0005% to about 0.0001 % dry weight. In some aspects, in a plant of the present disclosure, the nicotine is a relatively small percentage of total alkaloids in the plant compared to a commercial seedlot of Banket AI, NC 2000, NC 2002, or Burley 21. In some aspects, the nicotine in a plant of the present disclosure can be about 2% to about 1%, less than 3%, about 2%, about 1.5%, about 1%, or 0.75% of total alkaloids. Tobacco products having a
reduced amount of nitrosamine content can be manufactured using tobacco plant material from plants and plant parts of the present disclosure. Thus, in some embodiments, a tobacco product manufactured using tobacco plant material from plants and plant parts of the present disclosure can comprise a reduced amount of nornicotine of less than about 3 mg/g. For example, the nornicotine content in such a product can be 3.0 mg/g, 2.5 mg/g, 2.0 mg/g, 1.5 mg/g, 1.0 mg/g, 0.75 mg/g, 0.5 mg/g, 0.25 mg/g, 0.1 mg/g, 0.075 mg/g, 0.05 mg/g, 0.025 mg/g, 0.01 mg/g, and the like, or undetectable, or any range therein. The tobacco product typically has a reduced amount of NNN of less than about 10 pg/g. For example, the NNN content in such a product can be about 10 pg/g, 7.0 pg/g, 5.0 pg/g, 4.0 pg/g, 2.0 pg/g, 1.0 pg/g, 0.5 pg/g, 0.4 pg/g, 0.2 pg/g, 0.1 pg/g, 0.05 pg/g, 0.01 pg/g, and the like, or undetectable, or any range therein. The percentage of secondary alkaloids relative to total alkaloid content contained in a plant of the present disclosure may not be statistically different than from a commercial seedlot of Banket Al, NC 2000, NC 2002, or Burley 21.

Differences between two inbred tobacco varieties or two hybrid tobacco varieties can be evaluated using statistical approaches. Statistical analysis includes the calculation of mean values, determination of the statistical significance of the sources of variation, and the calculation of the appropriate variance components. Methods for determining statistical significance are known in the art. Statistical software is available, for example, the PROC GLM function of SAS. Significance is generally presented as a "p-value." A statistically significant p-value is less than 0.10. In a preferred aspect, the p-value is less than or equal to 0.05. In another aspect, the p-value is 0.04 or less, 0.03 or less, or 0.02 or less. In yet another aspect, a statistically significant value is less than 0.01. In yet another aspect, it can be less than 0.009, less than 0.008, less than 0.007, less than 0.006, less than 0.005, less than 0.004, less than 0.003, less than 0.002, or less than 0.001.

Tobacco plants of the present disclosure that are homozygous for the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82e10 P381S alleles have a reversion rate that is statistically significantly lower than corresponding control low-converter plants having wild type nicotine demethylase CYP82E4, E5, and E10 genes. In addition, homozygous CYP82E4, CYP82E5, and CYP82E10 triple mutant tobacco plants have a percent conversion to nornicotine of less than about 2.0%, e.g., undetectable to about 2.0%, 1.9%, 1.8%, 1.7%, 1.6%, 1.5%, 1.4%, 1.3%, 1.2%, 1.1%, 1.0%, 0.9%, 0.8%, or any range therein. In some
aspects, the triple mutant tobacco plants have a percent conversion to nornicotine in a range from, for example, about 1.0% to 2.0%, 0.8% to 1.8%, 0.8% to 2.0%, or 1.0% to 2.0%.

Nicotine and nornicotine can be measured in ethylene-treated leaves using methods known in the art (e.g., gas chromatography). Percent nicotine demethylation in a sample is calculated by dividing the level of nornicotine by the combined level of nicotine and nornicotine as measured in the sample, and multiplying by 100. Percent nicotine demethylation in a sample from a plant of the present disclosure is about 50, 40, 30, 20, or 10 percent of a sample from an individual plant grown from a commercial seedlot of Banket A1, NC 2000, NC 2002, or Burley 21.

In an aspect, the tobacco plants of the present disclosure have a USDA quality index of about 73, about 72, about 71, about 70, about 69, about 68, about 67 or about 66 or any range therein. In an aspect, the tobacco plants of the present disclosure have a USDA quality index of about 65. In another aspect, the quality index may be at least about 55, 60, 62.5 or greater, or any range therein. In another aspect, tobacco plants of the present disclosure can have a quality index in the range of about 60 to about 65, about 60 to about 70, about 62.5 to about 65, about 62.5 to about 70, or about 65 to about 70.

A plant of the present disclosure, including, but not limited to, Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC, can have any yield potential, including high (e.g., over 3000 lbs/A), moderately high (e.g., 2200-3000 lbs/A), and moderate (e.g., less than 2000 lbs/A) yield potential.

In another aspect, the present disclosure also provides for a plant grown from the seed of a Banket A1 SRC or CMS Banket A1 SRC plant in which alkaloids obtained from tobacco plants grown for the seed have decreased nornicotine, as well as plant parts and tissue cultures from such plants, representative sample seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121043 for Banket A1 SRC and ATCC Accession No. PTA-121054 for CMS Banket A1 SRC.

An aspect of the present disclosure provides for parts of the cultivars Banket A1 SRC and CMS Banket A1 SRC. A part of a cultivar can comprise any plant part and includes, but is not limited to, leaves, pollen, embryos, cotyledons, hypocotyls, roots, root tips, anthers, flowers, ovules, shoots, stems, stalks, pith and capsules, tissue culture comprising tissue, callus, cells or protoplasts of the cultivars Banket A1 SRC and CMS Banket A1 SRC. In another aspect, the present disclosure provides for parts from hybrids of cultivars Banket A1 SRC and CMS Banket A1 SRC derived tobacco plants. In yet another aspect, the present
disclosure provides for parts from genetically modified (e.g., by conventional breeding or genetic engineering techniques) forms of the foregoing plants and tissue culture.

In another aspect, the present disclosure also provides for a plant grown from the seed of aNC 2000 SRC or CMS NC 2000 SRC plant in which alkaloids obtained from tobacco plants grown for the seed have decreased normicotine, as well as plant parts and tissue cultures from such plants, representative sample seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121053 for NC 2000 SRC and ATCC Accession No. PTA-121045 for CMS NC 2000 SRC.

An aspect of the present disclosure provides for parts of the cultivars NC 2000 SRC and CMS NC 2000 SRC. A part of a cultivar can comprise any plant part and includes, but is not limited to, leaves, pollen, embryos, cotyledons, hypocotyls, roots, root tips, anthers, flowers, ovules, shoots, stems, stalks, pith and capsules, tissue culture comprising tissue, callus, cells or protoplasts of the cultivars NC 2000 SRC and CMS NC 2000 SRC. In another aspect, the present disclosure provides for parts from hybrids of cultivars NC 2000 SRC and CMS NC 2000 SRC derived tobacco plants. In yet another aspect, the present disclosure provides for parts from genetically modified (e.g., by conventional breeding or genetic engineering techniques) forms of the foregoing plants and tissue culture.

In another aspect, the present disclosure also provides for a plant grown from the seed of aNC 2002 SRC or CMS NC 2002 SRC plant in which alkaloids obtained from tobacco plants grown for the seed have decreased normicotine, as well as plant parts and tissue cultures from such plants, representative sample seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121058 for NC 2002 SRC and ATCC Accession No. PTA-121041 for CMS NC 2002 SRC.

An aspect of the present disclosure provides for parts of the cultivars NC 2002 SRC and CMS NC 2002 SRC. A part of a cultivar can comprise any plant part and includes, but is not limited to, leaves, pollen, embryos, cotyledons, hypocotyls, roots, root tips, anthers, flowers, ovules, shoots, stems, stalks, pith and capsules, tissue culture comprising tissue, callus, cells or protoplasts of the cultivars NC 2002 SRC and CMS NC 2002 SRC. In another aspect, the present disclosure provides for parts from hybrids of cultivars NC 2002 SRC and CMS NC 2002 SRC derived tobacco plants. In yet another aspect, the present disclosure provides for parts from genetically modified (e.g., by conventional breeding or genetic engineering techniques) forms of the foregoing plants and tissue culture.

In another aspect, the present disclosure also provides for a plant grown from the seed of a Burley 21 SRC or CMS Burley 21 SRC plant in which alkaloids obtained from tobacco
plants grown for the seed have decreased nornicotine, as well as plant parts and tissue cultures from such plants, representative sample seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121059 for Burley 21 SRC and ATCC Accession No. PTA-121044 for CMS Burley 21 SRC. An aspect of the present disclosure provides for parts of the cultivars Burley 21 SRC and CMS Burley 21 SRC. A part of a cultivar can comprise any plant part and includes, but is not limited to, leaves, pollen, embryos, cotyledons, hypocotyls, roots, root tips, anthers, flowers, ovules, shoots, stems, stalks, pith and capsules, tissue culture comprising tissue, callus, cells or protoplasts of the cultivars Burley 21 SRC and CMS Burley 21 SRC. In another aspect, the present disclosure provides for parts from hybrids of cultivars Burley 21 SRC and CMS Burley 21 SRC derived tobacco plants. In yet another aspect, the present disclosure provides for parts from genetically modified (e.g., by conventional breeding or genetic engineering techniques) forms of the foregoing plants and tissue culture.

Additional aspects of the present disclosure provide products comprising tobacco from the plants of the present disclosure, and parts thereof. Other aspects of the disclosure provide cured plant parts, which include, but are not limited to, a leaf, pollen, ovule, embryo, cotyledon, hypocotyl, meristematic cell, protoplast, root, root tip, pistil, anther, flower, shoot, stem, pod, petiole, and the like, and combinations thereof.

Thus, in some aspects, the present disclosure provides a cured tobacco comprising the leaves of the tobacco plant designated Banket A1 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043. In another aspect, the present disclosure provides a cured tobacco comprising the leaves of the tobacco plant designated CMS Banket A1 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure provides a cured tobacco comprising the stems of the tobacco plant designated Banket A1 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043. In another aspect, the present disclosure provides a cured tobacco comprising the stems of the tobacco plant designated CMS Banket A1 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In an aspect, the present disclosure provides a cured tobacco comprising the leaves and stems of the tobacco plants designated Banket A1 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121043. In another aspect, the present disclosure provides a cured tobacco comprising...
the leaves and stems of the tobacco plants designated CMS Banket A1 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121054.

In some aspects, the present disclosure provides a cured tobacco comprising the leaves of the tobacco plant designated NC 2000 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053. In another aspect, the present disclosure provides a cured tobacco comprising the leaves of the tobacco plant designated CMS NC 2000 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In an aspect, the present disclosure provides a cured tobacco comprising the stems of the tobacco plant designated NC 2000 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121053. In another aspect, the present disclosure provides a cured tobacco comprising the leaves and stems of the tobacco plants designated CMS NC 2000 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121045.

In some aspects, the present disclosure provides a cured tobacco comprising the leaves of the tobacco plant designated NC 2002 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058. In another aspect, the present disclosure provides a cured tobacco comprising the leaves of the tobacco plant designated CMS NC 2002 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

In an aspect, the present disclosure provides a cured tobacco comprising the stems of the tobacco plant designated NC 2002 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058. In another aspect, the present disclosure provides a cured tobacco comprising the stems of the tobacco plant designated CMS NC 2002 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.
In an aspect, the present disclosure provides a cured tobacco comprising the leaves and stems of the tobacco plants designated NC 2002 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121058. In another aspect, the present disclosure provides a cured tobacco comprising the leaves and stems of the tobacco plants designated CMS NC 2002 SRC, a representative sample seed of said cultivar having been deposited with the ATCC under ATCC Accession No. PTA-121041.

The present disclosure also provides a container of Banket A1 SRC or CMS Banket A1 SRC seeds or other seeds of the present disclosure in which alkaloids obtained from tobacco plants grown from greater than about 50% of the seeds have decreased nornicotine. In another aspect, alkaloids obtained from Banket A1 SRC or CMS Banket A1 SRC plants or other plants of the present disclosure grown from greater than about 55%, 60%, 65%, 70%, 75%, 80%, 85%+, 90%, or 95% of the seeds in the container have decreased nornicotine, representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121043 for Banket A1 SRC and/or ATCC Accession No. PTA-121054 for CMS Banket A1 SRC.

The container of Banket A1 SRC or CMS Banket A1 SRC seeds or other seeds of the present disclosure may contain any number, weight or volume of seeds. For example, a container can contain at least, or greater than, about 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1500, 2000, 2500, 3000, 3500, 4000 or more seeds. Alternatively, the container can contain at least, or greater than, about 1 ounce, 5 ounces, 10 ounces, 1 pound, 2 pounds, 3 pounds, 4 pounds, 5 pounds or more seeds. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121043 for Banket A1 SRC and/or ATCC Accession No. PTA-121054 for CMS Banket A1 SRC.

Containers of Banket A1 SRC or CMS Banket A1 SRC seeds or other seeds of the present disclosure may be any container available in the art. By way of a non-limiting example, a container may be a box, a bag, a packet, a pouch, a tape roll, a pail, a foil, or a tube. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121043 for Banket A1 SRC and/or ATCC Accession No. PTA-121054 for CMS Banket A1 SRC.

In another aspect, the present disclosure also provides a container of Banket A1 SRC or CMS Banket A1 SRC in which greater than about 50% of Banket A1 SRC or CMS Banket A1 SRC seeds or other seeds of the present disclosure have decreased nornicotine.
Representative samples of seeds of these cultivars having been deposited with the ATCC, for example under ATCC Accession No. PTA-121043 for Banket A1 SRC and/or ATCC Accession No. PTA-121054 for CMS Banket A1 SRC.

In one aspect, the present disclosure provides a seed of a Banket A1 SRC or CMS Banket A1 SRC plant or other plant of the present disclosure in which a plant grown from said seed is male sterile. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121043 for Banket A1 SRC and/or ATCC Accession No. PTA-121054 for CMS Banket A1 SRC.

The present disclosure also provides a container of NC 2000 SRC or CMS NC 2000 SRC seeds or other seeds of the present disclosure in which alkaloids obtained from tobacco plants grown from greater than about 50% of the seeds have decreased nornicotine. In another aspect, alkaloids obtained from NC 2000 SRC or CMS NC 2000 SRC plants or other plants of the present disclosure grown from greater than about 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, or 95% of the seeds in the container have decreased nornicotine, representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121053 for NC 2000 SRC and/or ATCC Accession No. PTA-121045 for CMS NC 2000 SRC.

The container of NC 2000 SRC or CMS NC 2000 SRC seeds or other seeds of the present disclosure may contain any number, weight or volume of seeds. For example, a container can contain at least, or greater than, about 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1500, 2000, 2500, 3000, 3500, 4000 or more seeds. Alternatively, the container can contain at least, or greater than, about 1 ounce, 5 ounces, 10 ounces, 1 pound, 2 pounds, 3 pounds, 4 pounds, 5 pounds or more seeds. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121053 for NC 2000 SRC and/or ATCC Accession No. PTA-121045 for CMS NC 2000 SRC.

Containers of NC 2000 SRC or CMS NC 2000 SRC seeds or other seeds of the present disclosure may be any container available in the art. By way of a non-limiting example, a container may be a box, a bag, a packet, a pouch, a tape roll, a pail, a foil, or a tube. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121053 for NC 2000 SRC and/or ATCC Accession No. PTA-121045 for CMS NC 2000 SRC.

In another aspect, the present disclosure also provides a container of NC 2000 SRC or CMS NC 2000 SRC in which greater than about 50% of NC 2000 SRC or CMS NC 2000
SRC seeds or other seeds of the present disclosure have decreased nornicotine. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example under ATCC Accession No. PTA-121053 for NC 2000 SRC and/or ATCC Accession No. PTA-121045 for CMS NC 2000 SRC.

In one aspect, the present disclosure provides a seed of a NC 2000 SRC or CMS NC 2000 SRC plant or other plant of the present disclosure in which a plant grown from said seed is male sterile. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121053 for NC 2000 SRC and/or ATCC Accession No. PTA-121045 for CMS NC 2000 SRC.

The present disclosure also provides a container of NC 2002 SRC or CMS NC 2002 SRC seeds or other seeds of the present disclosure in which alkaloids obtained from tobacco plants grown from greater than about 50% of the seeds have decreased nornicotine. In another aspect, alkaloids obtained from NC 2002 SRC or CMS NC 2002 SRC plants or other plants of the present disclosure grown from greater than about 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, or 95% of the seeds in the container have decreased nornicotine, representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121058 for NC 2002 SRC and/or ATCC Accession No. PTA-121041 for CMS NC 2002 SRC.

The container of NC 2002 SRC or CMS NC 2002 SRC seeds or other seeds of the present disclosure may contain any number, weight or volume of seeds. For example, a container can contain at least, or greater than, about 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1500, 2000, 2500, 3000, 3500, 4000 or more seeds. Alternatively, the container can contain at least, or greater than, about 1 ounce, 5 ounces, 10 ounces, 1 pound, 2 pounds, 3 pounds, 4 pounds, 5 pounds or more seeds. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121058 for NC 2002 SRC and/or ATCC Accession No. PTA-121041 for CMS NC 2002 SRC.

Containers of NC 2002 SRC or CMS NC 2002 SRC seeds or other seeds of the present disclosure may be any container available in the art. By way of a non-limiting example, a container may be a box, a bag, a packet, a pouch, a tape roll, a pail, a foil, or a tube. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121058 for NC 2002 SRC and/or ATCC Accession No. PTA-121041 for CMS NC 2002 SRC.
In another aspect, the present disclosure also provides a container of NC 2002 SRC or CMS NC 2002 SRC in which greater than about 50% of NC 2002 SRC or CMS NC 2002 SRC seeds or other seeds of the present disclosure have decreased nornicotine. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example under ATCC Accession No. PTA-121058 for NC 2002 SRC and/or ATCC Accession No. PTA-121041 for CMS NC 2002 SRC.

In one aspect, the present disclosure provides a seed of a NC 2002 SRC or CMS NC 2002 SRC plant or other plant of the present disclosure in which a plant grown from said seed is male sterile. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121058 for NC 2002 SRC and/or ATCC Accession No. PTA-121041 for CMS NC 2002 SRC.

The present disclosure also provides a container of Burley 21 SRC or CMS Burley 21 SRC seeds or other seeds of the present disclosure in which alkaloids obtained from tobacco plants grown from greater than about 50% of the seeds have decreased nornicotine. In another aspect, alkaloids obtained from Burley 21 SRC or CMS Burley 21 SRC plants or other plants of the present disclosure grown from greater than about 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, or 95% of the seeds in the container have decreased nornicotine, representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121059 for Burley 21 SRC and/or ATCC Accession No. PTA-121044 for CMS Burley 21 SRC.

The container of Burley 21 SRC or CMS Burley 21 SRC seeds or other seeds of the present disclosure may contain any number, weight or volume of seeds. For example, a container can contain at least, or greater than, about 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1500, 2000, 2500, 3000, 3500, 4000 or more seeds. Alternatively, the container can contain at least, or greater than, about 1 ounce, 5 ounces, 10 ounces, 1 pound, 2 pounds, 3 pounds, 4 pounds, 5 pounds or more seeds. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121059 for Burley 21 SRC and/or ATCC Accession No. PTA-121044 for CMS Burley 21 SRC.

Containers of Burley 21 SRC or CMS Burley 21 SRC seeds or other seeds of the present disclosure may be any container available in the art. By way of a non-limiting example, a container may be a box, a bag, a packet, a pouch, a tape roll, a pail, a foil, or a tube. Representative samples of seeds of these cultivars having been deposited with the
ATCC, for example, under ATCC Accession No. PTA-121059 for Burley 21 SRC and/or ATCC Accession No. PTA-121044 for CMS Burley 21 SRC.

In another aspect, the present disclosure also provides a container of Burley 21 SRC or CMS Burley 21 SRC in which greater than about 50% of Burley 21 SRC or CMS Burley 21 SRC seeds or other seeds of the present disclosure have decreased normoncotine. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example under ATCC Accession No. PTA-121059 for Burley 21 SRC and/or ATCC Accession No. PTA-121044 for CMS Burley 21 SRC.

In one aspect, the present disclosure provides a seed of a Burley 21 SRC or CMS Burley 21 SRC plant or other plant of the present disclosure in which a plant grown from said seed is male sterile. Representative samples of seeds of these cultivars having been deposited with the ATCC, for example, under ATCC Accession No. PTA-121059 for Burley 21 SRC and/or ATCC Accession No. PTA-121044 for CMS Burley 21 SRC.

Tobacco material obtained from the tobacco lines, varieties or hybrids of the present disclosure can be used to make tobacco products including, without limitation, cigarette products (e.g., cigarettes and bidi cigarettes), cigar products (e.g., cigar wrapping tobacco and cigarillos), pipe tobacco products, smokeless cigarette products, smokeless tobacco products (e.g., moist snuff, dry snuff, and chewing tobacco), films, chewables, tabs, shaped parts, gels, consumable units, insoluble matrices, hollow shapes and the like. See, e.g., U.S. Patent Publication No. US 2006/0191548, which is herein incorporated by reference in its entirety.

Tobacco products derived from plants of the present disclosure also include cigarettes and other smoking articles, particularly those smoking articles including filter elements, wherein the rod of smokeable material includes cured tobacco within a tobacco blend. In an aspect, a tobacco product can include but is not limited to pipe tobacco, cigar tobacco, cigarette tobacco, chewing tobacco, leaf tobacco, shredded tobacco, and/or cut tobacco or any combination thereof.

In an aspect, the tobacco product of the present disclosure can be a blended tobacco product. In other aspects of the disclosure, the tobacco product of the present disclosure can be a reduced nicotine tobacco product. In still other aspects, the tobacco product of the present disclosure can be a blended tobacco product with reduced nicotine content. Thus, the tobacco product of the present disclosure can be a blended reduced nicotine tobacco product. Tobacco product material comprises a blend of tobacco materials from the present disclosure, wherein the blend comprises at least about 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, or 95 percent by weight of a cured tobacco, or any range therein, based on the dry weight of the tobacco...
material. US 2008/0245377 is herein incorporated by reference for blend mixtures in its entirety.

In an aspect, tobacco products having a reduced amount of nitrosamine content can be manufactured using tobacco plant material from plants and plant parts of the present disclosure. Thus, in some aspects, a tobacco product manufactured using tobacco plant material from plants and plant parts of the present disclosure can comprise a reduced amount of nornicotine of less than about 3 mg/g. For example, the nornicotine content in such a product can be 3.0 mg/g, 2.5 mg/g, 2.0 mg/g, 1.5 mg/g, 1.0 mg/g, 750 µg/g, 500 µg/g, 250 µg/g, 100 µg/g, 75 µg/g, 50 µg/g, 25 µg/g, 10 µg/g, 5 µg/g, 1 µg/g, 750 ng/g, 500 ng/g, 250 ng/g, 100 ng/g, 75 ng/g, 50 ng/g, 25 ng/g, 10 ng/g, 5 ng/g, 1 ng/g, 750 pg/g, 500 pg/g, 250 pg/g, 100 pg/g, 75 pg/g, 50 pg/g, 25 pg/g, 10 pg/g, 7.0 pg/g, 5.0 pg/g, 4.0 pg/g, 2.0 pg/g, 1.0 pg/g, 0.5 pg/g, 0.4 pg/g, 0.2 pg/g, 0.1 pg/g, 0.05 pg/g, 0.01 pg/g, or undetectable, or any range therein. The tobacco product typically has a reduced amount of NNN of less than about 10 pg/g. For example, the NNN content in such a product can be about 10 pg/g, 7.0 pg/g, 5.0 pg/g, 4.0 pg/g, 2.0 pg/g, 1.0 pg/g, 0.5 pg/g, 0.4 pg/g, 0.2 pg/g, 0.1 pg/g, 0.05 pg/g, 0.01 pg/g, or undetectable, or any range therein. The percentage of secondary alkaloids relative to total alkaloid content contained in a plant of the present disclosure may not be statistically different than from a commercial seedlot of Banket Al, NC 2000, NC 2002, or Burley 21.

A tobacco plant of the present disclosure designated Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC carrying the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82e10 P381 S alleles can be used in a plant breeding program to create useful lines, cultivars, varieties, progeny, inbreds, and hybrids. Thus, in some aspects, an F₁, F₂, F₃, or later generation tobacco plant containing the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82e10 P381S alleles is crossed with a second *Nicotiana* plant, and progeny of the cross are identified in which the cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82e10 P381S alleles are present. It will be appreciated that the second *Nicotiana* plant can be Banket Al, NC 2000, NC 2002, Burley 21 or any other *Nicotiana* species or line, optionally with an additional desirable trait, such as herbicide resistance.

In still other aspects, methods of the present disclosure further include self-pollinating or pollinating a male sterile pollen acceptor with a pollen donor capable of being used in production of a progeny plant of the present disclosure, such as a male sterile hybrid of the present disclosure. Either the male sterile pollen acceptor plant or the pollen donor plant has at least one mutant allele, two, or even three mutant alleles at a nicotine demethylase locus,
such as the cyp82e4 W329Stop allele, the cyp82e5v2 W422Stop allele, and/or the cyp82el0 P381S allele. In an aspect, all three alleles at each nicotine demethylase locus are mutant alleles, making the plant homozygous for cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S.

Breeding can be carried out via any known procedures. DNA fingerprinting, SNP or similar technologies may be used in a marker-assisted selection (MAS) breeding program to transfer or breed mutant alleles of a nicotine demethylase gene into other tobaccos. For example, a breeder can create segregating populations from hybridizations of a genotype containing cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S alleles with an agronomically desirable genotype. Plants in the F2 or backcross generations can be screened using a marker developed from cyp82e4 W329Stop, cyp82e5v2 W422Stop, or cyp82el0 P381S alleles or a fragment thereof, using one of the techniques known in the art or disclosed herein. Plants identified as possessing one or more cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S alleles can be backcrossed or self-pollinated to create a second population to be screened. Depending on the expected inheritance pattern or the MAS technology used, it may be necessary to self-pollinate the selected plants before each cycle of backcrossing to aid identification of the desired individual plants. Backcrossing or other breeding procedure can be repeated until the desired phenotype of the recurrent parent is recovered. A recurrent parent in the present disclosure can be Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC. Other breeding techniques can be found, for example, in Wernsman, E.A., and Rufty, R.C., 1987. Chapter Seventeen. Tobacco. pages 669-698 In: Cultivar Development. Crop Species. W.H. Fehr (ed.), MacMillan Publishing Go., Inc., New York, N.Y., incorporated herein by reference in their entireties.

Nicotiana species which exhibit breeding compatibility with Nicotiana tabacum include Nicotiana amplexicaulis, PI 271989; Nicotiana benthamiana PI 555478; Nicotiana bigelovii PI 555485; Nicotiana debneyi; Nicotiana excelsior PI 224063; Nicotiana glutinosa PI 555507; Nicotiana goodspeedii PI 241012; Nicotiana gossei PI 230953; Nicotiana hesperis PI 271991; Nicotiana knightiana PI 555527; Nicotiana maritima PI 555535; Nicotiana megalosiphon PI 555536; Nicotiana nudicaulis PI 555540; Nicotianapaniculata PI 555545; Nicotiana plumbaginifolia PI 555548; Nicotiana repanda PI 555552; Nicotiana rustica; Nicotiana suaveolens PI 230960; Nicotiana sylvestris PI 555569; Nicotiana tomentosa PI 266379; Nicotiana tomentosiformis; and Nicotiana trigonophylla PI 555572. See also, Compendium of Tobacco Diseases published by American Phytopathology Society.
or The Genus *Nicotiana* Illustrated, published by Japan Tobacco Inc, hereby incorporated by reference in their entireties.

The result of a plant breeding program using the mutant tobacco plants described herein includes useful lines, cultivars, varieties, progeny, inbreds, and hybrids. As used herein, the term "cultivar" or "variety" refers to a population of plants that share constant characteristics which separate them from other plants of the same species. A cultivar or variety is often, although not always, sold commercially. While possessing one or more distinctive traits, a cultivar or variety is further characterized by a very small overall variation between individuals within that cultivar or variety. A "pure line" variety may be created by several generations of self-pollination and selection, or vegetative propagation from a single parent using tissue or cell culture techniques. A cultivar or variety can be essentially derived from another cultivar, line, or variety. As defined by the International Convention for the Protection of New Varieties of Plants (Dec. 2, 1961, as revised at Geneva on Nov. 10, 1972, on Oct. 23, 1978, and on Mar. 19, 1991), a cultivar or variety is "essentially derived" from an initial cultivar or variety if: a) it is predominantly derived from the initial cultivar or variety, or from a cultivar or variety that is predominantly derived from the initial cultivar or variety, while retaining the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial cultivar or variety; b) it is clearly distinguishable from the initial cultivar or variety; and c) except for the differences which result from the act of derivation, it conforms to the initial cultivar or variety in the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial cultivar or variety. Essentially derived varieties can be obtained, for example, by the selection of a natural or induced mutant, a somaclonal variant, a variant individual from plants of the initial cultivar or variety, backcrossing, or transformation. A "line" as distinguished from a cultivar or variety most often denotes a group of plants used non-commercially, for example in plant research. A line typically displays little overall variation between individuals for one or more traits of interest, although there may be some variation between individuals for other traits.

Hybrid tobacco varieties can be produced by preventing self-pollination of female parent plants (i.e., seed parents) of a first variety, permitting pollen from male parent plants of a second variety to fertilize the female parent plants, and allowing F₁ hybrid seeds to form on the female plants. Self-pollination of female plants can be prevented by emasculating the flowers at an early stage of flower development. Alternatively, pollen formation can be prevented on the female parent plants using a form of male sterility. For example, male
sterility can be produced by cytoplasmic male sterility (CMS), or transgenic male sterility in which a transgene inhibits microsporogenesis and/or pollen formation, or self-incompatibility. Female parent plants containing CMS are particularly useful. In aspects in which the female parent plants are CMS, pollen may be harvested from male fertile plants and applied manually to the stigmas of CMS female parent plants, and the resulting F1 seed is harvested.

Plants can be used to form single-cross tobacco F1 hybrids. In such an aspect, the plants of the parent varieties can be grown as substantially homogeneous adjoining populations to facilitate natural cross-pollination from the male parent plants to the female parent plants. The F1 seed formed on the female parent plants is selectively harvested by conventional means. One also can grow the two parent plant varieties in bulk and harvest a blend of F1 hybrid seed formed on the female parent and seed formed upon the male parent as the result of self-pollination. Alternatively, three-way crosses can be carried out wherein a single-cross F1 hybrid is used as a female parent and is crossed with a different male parent.

As another alternative, double-cross hybrids can be created wherein the F1 progeny of two different single-crosses are themselves crossed. Self-incompatibility can be used to particular advantage to prevent self-pollination of female parents when forming a double-cross hybrid.

Successful crosses yield F1 plants that are fertile, have cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82e10 P381S alleles, and can be backcrossed with one of the parents, such as Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC, if desired. In some aspects, a plant population in the F2 generation is screened for cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82e10 P381S alleles. Selected plants can be crossed with one of the parents and the first backcross (BC1) generation plants are self-pollinated to produce a BC1 F2 population that is again screened for variant nicotine demethylase gene expression (e.g., the null version of the nicotine demethylase gene). The process of backcrossing, self-pollination, and screening is repeated, for example, at least four times, until the final screening produces a plant that is fertile and reasonably similar to the recurrent parent. This plant, if desired, is self-pollinated and the progeny are subsequently screened again to confirm that the plant exhibits the same low nicotine conversion phenotype as Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC. Breeder's seed of the selected plant is produced using standard methods including, for example, field testing, confirmation of the null condition for nicotine demethylase, chemical analyses of cured leaf to determine the
level of alkaloids and/or chemical analyses of cured leaf to determine the ratio of nornicotine to nicotine+nornicotine.


The present disclosure further provides methods of producing a tobacco plant by crossing one of cultivars Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC with itself or a different tobacco line. The disclosure further relates to methods for producing other tobacco cultivars or breeding lines derived from cultivars Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC by crossing a plant of cultivars Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC with a second tobacco plant and growing the progeny seed to yield a Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC - derived tobacco plant. An additional aspect of the present disclosure provides a method for producing a tobacco plant that contains in its genetic material one or more transgenes, comprising crossing cultivars of the present disclosure with a second cultivar containing one or more transgenes wherein progeny are produced, so that the genetic material of the progeny that result from the cross comprise the transgene(s) optionally operably linked to one or more regulatory elements. In one aspect, the second cultivar may be a plant derived from cultivars Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC transformed with one or more transgenes.

The disclosure further provides for the vegetative propagation of a plant of cultivars Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC and progeny thereof. In one aspect, the disclosure provides for a method of vegetatively propagating a plant of a tobacco
cultivar comprising collecting tissue capable of being propagated from a plant of cultivars
Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC, cultivating the tissue to obtain a proliferated shoot and rooting the proliferated shoots to obtain a rooted plantlet. In another aspect, the plant tissue may be collected from an F1 hybrid of a plant of cultivars Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC. In an aspect, the plant tissue may be collected from an F2, F3, F4 or later progeny plant obtained by breeding a plant of cultivars Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC.

A plant comprising a mutation in a nicotine demethylase gene can be identified by selecting or screening the mutagenized plant material, or progeny thereof. Such screening and selection methodologies are known to those having ordinary skill in the art. Examples of screening and selection methodologies include, but are not limited to, Southern analysis, PCR amplification for detection of a polynucleotide, Northern blots, RNase protection, primer-extension, RT-PCR amplification for detecting RNA transcripts, enzymatic assays for detecting enzyme or ribozyme activity of polypeptides and polynucleotides, and protein gel electrophoresis, Western blots, immunoprecipitation, and enzyme-linked immunoassays to detect polypeptides. Other techniques such as in situ hybridization, enzyme staining, and immunostaining also can be used to detect the presence or expression of polypeptides and/or polynucleotides. Methods for performing all of the referenced techniques are known.

It is understood that a tobacco plant of the present disclosure, including, but not limited to, Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC, can be transformed by a genetic construct (nucleic acid construct) or transgene using any technique known in the art. Without limitation, an example of a desired trait can include herbicide resistance, pest resistance, disease resistance, high yield, high grade index, curability, curing quality, mechanical harvestability, holding ability, leaf quality, height, plant maturation (e.g., early maturing, early to medium maturing, medium maturing, medium to late maturing, or late maturing), stalk size (e.g., small, medium, or large stalk), or leaf number per plant (e.g., small (e.g., 5-10 leaves), medium (e.g., 11-15 leaves), or large (e.g., 16-21) number of leaves), or any combination. Any plant of the present disclosure can be used as a basis for tissue culture, regeneration, transformed, or a combination of any of these. In an aspect, a plant of the present disclosure derived by tissue culture, transformation, or both has all, or
essentially all, of the morphological and physiological characteristics of cultivar Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, or CMS Burley 21 SRC.

Having now generally described the disclosure, the same will be more readily understood through reference to the following examples that are provided by way of illustration, and are not intended to be limiting of the present disclosure, unless specified.

EXAMPLES

Example 1: Breeding of homozygous cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82e10 P381S mutant plants into the Banket A1 Burley Tobacco Cultivar

Banket A1 SRC is a backcross-derived version of burley tobacco cultivar Banket A1 carrying introduced mutations in three genes (CYP82E4 (SEQ ID NO: 5), CYP82E5 (SEQ ID NO: 8), and CYP82E10 (SEQ ID NO: 9)) previously documented to encode for nicotine demethylase enzymes (Lewis et al, Phytochemistry, 71 (2010), 1988-1998). The introduced mutations in CYP82E4 (cyp82e4 W329Stop (SEQ ID NO: 1)) and CYP82E5 (cyp82e5v2 W422Stop (SEQ ID NO: 2)) encode for premature stop codons which render the genes non-functional. The introduced mutation in CYP82E10 (cyp82e10 P381S (SEQ ID NO: 11)) does not encode for a premature stop codon, but does render the gene product non-functional for converting nicotine to nornicotine (Id). When in homozygous condition, the three mutations result in tobacco plants with (1) reduced genetic capacity to demethylate nicotine to form nornicotine, and (2) a corresponding diminished potential to accumulate N-nitrosornicotine (NNN), a potent carcinogen found in many tobacco products. The mutation in CYP82E4 (cyp82e4 W329Stop (SEQ ID NO: 1)) also provides phenotypic stability for the "nicotine conversion" trait and eliminates the requirement to utilize the cumbersome "LC" method for reducing levels of nornicotine in tobacco cultivars (see e.g., Jack et al. 2007. Implications of reducing nornicotine accumulation in burley tobacco: appendix A - the LC protocol. Rec. Adv. Tob. Set. 33: 58-79).

The original tobacco cultivar Banket A1 is a fertile inbred line. CMS Banket A1 is a cytoplasmic male-sterile version of Banket A1. To develop Banket A1 SRC, an individual plant of Banket A1 is pollinated with a plant of the genetic background DH98-325-6 carrying mutations in each of the three nicotine demethylase genes. Fi individuals originating from this cross and heterozygous for each mutation are backcrossed to the recurrent parent, Banket A1, to produce BC\(^1\) progeny. BC\(^1\) progeny are screened using genotyping
methodologies to identify individuals heterozygous for all three mutations. A single triple heterozygous BC1F1 plant is backcrossed to Banket A1 to produce BC2Fi progeny. The process of backcrossing and identification of individuals heterozygous for all three mutations is repeated through the BC3F1, BC4F1, BC5F1, BC6F1, and BC7 stages. At the BC7 stage, individuals heterozygous for all three mutations from each pedigree are self-pollinated to produce BC7F2 seed. A large number of BC7F2 progeny from each pedigree are genotyped to identify individuals homozygous for all three mutations. A single BC7F2 plant homozygous for all three mutations is self-pollinated to produce a BC7F3 family (Banket A1 SRC) in which the wild-type CYP82E4, CYP82E5v2, and CYP82E10 alleles of Banket A1 were replaced by the mutant alleles (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82e10 P381S).

The male-sterile (CMS) version of Banket A1 SRC (CMS Banket A1 SRC) is produced by crossing a plant of CMS Banket A1 as a female with pollen of Banket A1 SRC to produce male-sterile plants heterozygous for all three mutations. A single male-sterile plant resulting from this cross is then subsequently backcrossed as a female to Banket A1 SRC to produce progeny that are segregating for individuals homozygous for all three mutations. Triple homozygous individuals are identified by DNA genotyping to produce the CMS Banket A1 SRC line. Because the line is male-sterile, it is maintained via pollination with Banket A1 SRC.

Commercial Banket A1 SRC is produced by pollinating plants of CMS Banket A1 SRC with pollen of Banket A1 SRC.

**Example 2: Testing of Banket A1 SRC**

Banket A1 SRC is evaluated for cured leaf chemistry, yield, and physical quality at three North Carolina field research locations during 2013 (Reidsville and Waynesville). Banket A1 is included for comparison. The experimental design at each location is a randomized complete block design with four replications. Experimental units are single 20-plant plots. Plots are harvested and air-cured. Plot weights are used to determine per acre yields. Cured leaf is evaluated by a former USDA tobacco grader. Fifty gram composite leaf samples are collected from each plot and analyzed for percent nicotine, nornicotine, anatabine, anabasine, and percent nicotine conversion using gas chromatography equipment.

Comparisons using the least significant difference (LSD) test indicates that Banket A1 SRC has significantly ($P < 0.05$) lower levels of nornicotine and percent nicotine conversion relative to Banket A1 (Table 1). Banket A1 and Banket A1 SRC are not significantly
different from each other for percent nicotine, yield, percent anabasine, percent anatabine, or percent total alkaloids.

Example 3: Breeding of homozygous cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82el0 P381S mutant plants into the NC 2000 Burley Tobacco Cultivar

NC 2000 SRC is a backcross-derived version of burley tobacco cultivar NC 2000 carrying introduced mutations in three genes (CYP82E4 (SEQ ID NO: 5), CYP82E5 (SEQ ID NO: 8), and CYP82E10 (SEQ ID NO: 9)) previously documented to encode for nicotine demethylase enzymes (Lewis et al., Phytchemistry, 71 (2010), 1988-1998). The introduced mutations in CYP82E4 (cyp82e4 W329Stop (SEQ ID NO: 1)) and CYP82E5 (cyp82e5v2 W422Stop (SEQ ID NO: 2)) encode for premature stop codons which render the genes non-functional. The introduced mutation in CYP82E10 (cyp82el0 P381S (SEQ ID NO: 11)) does not encode for a premature stop codon, but does render the gene product non-functional for converting nicotine to nornicotine (Id.). When in homozygous condition, the three mutations result in tobacco plants with (1) reduced genetic capacity to demethylate nicotine to form nornicotine, and (2) a corresponding diminished potential to accumulate N-nitrosonornicotine (NNN), a potent carcinogen found in many tobacco products. The mutation in CYP82E4 (cyp82e4 W329Stop (SEQ ID NO: 1)) also provides phenotypic stability for the "nicotine conversion" trait and eliminates the requirement to utilize the cumbersome "LC" method for reducing levels of nornicotine in tobacco cultivars (see e.g., Jack et al. 2007. Implications of reducing nornicotine accumulation in burley tobacco: appendix A - the LC protocol. Rec. Adv. Tob. Sci. 33: 58-79).

The original tobacco cultivar NC 2000 is a fertile inbred line. CMS NC 2000 is a cytoplasmic male-sterile version of NC 2000. To develop NC 2000 SRC, an individual plant of NC 2000 is pollinated with a plant of the genetic background DH98-325-6 carrying mutations in each of the three nicotine demethylase genes. F1 individuals originating from this cross and heterozygous for each mutation are backcrossed to the recurrent parent, NC 2000, to produce BC\(^1\) progeny. BC\(^1\) progeny are screened using genotyping methodologies to identify individuals heterozygous for all three mutations. A single triple heterozygous BC\(^1\)F1 plant is backcrossed to NC 2000 to produce BC\(^1\) progeny. The process of backcrossing and identification of individuals heterozygous for all three mutations is repeated through the BC\(^3\)F\(_{1}\), BC\(^4\)F\(_{1}\), BC\(^5\)F\(_{1}\), BC\(_{1}\)Fi, and BC\(_{1}\)Fi stages. At the BC\(_{1}\)Fi stage, individuals heterozygous for all three mutations from each pedigree are self-pollinated to produce BC\(_{7}\)F\(_{2}\) seed. A large number of BC\(_{7}\)F\(_{2}\) progeny from each pedigree are genotyped to
identify individuals homozygous for all three mutations. A single BC,F2 plant homozygous for all three mutations is self-pollinated to produce a BC,F3 family (NC 2000 SRC) in which the wild-type CYP82E4, CYP82E5v2, and CYP82E10 alleles of NC 2000 were replaced by the mutant alleles (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82e10 P381S).

The male-sterile (CMS) version of NC 2000 SRC (CMS NC 2000 SRC) is produced by crossing a plant of CMS NC 2000 as a female with pollen of NC 2000 SRC to produce male-sterile plants heterozygous for all three mutations. A single male-sterile plant resulting from this cross is then subsequently backcrossed as a female to NC 2000 SRC to produce progeny that are segregating for individuals homozygous for all three mutations. Triple homozygous individuals are identified by DNA genotyping to produce the CMS NC 2000 SRC line. Because the line is male-sterile, it is maintained via pollination with NC 2000 SRC.

Commercial NC 2000 SRC is produced by pollinating plants of CMS NC 2000 SRC with pollen of NC 2000 SRC.

Example 4: Testing of NC 2000 SRC

NC 2000 SRC is evaluated for cured leaf chemistry, yield, and physical quality at two North Carolina field research locations during 2013 (Reidsville and Waynesville). NC 2000 is included for comparison. The experimental design at each location is a randomized complete block design with four replications. Experimental units are single 20-plant plots. Plots are harvested and air-cured. Plot weights are used to determine per acre yields. Cured leaf is evaluated by a former USDA tobacco grader. Fifty gram composite leaf samples are collected from each plot and analyzed for percent nicotine, nornicotine, anatabine, anabasine, and percent nicotine conversion using gas chromatography equipment.

Comparisons using the least significant difference (LSD) test indicates that NC 2000 SRC has significantly \( P < 0.05 \) lower levels of nornicotine and percent nicotine conversion relative to NC 2000 (Table 2). NC 2000 and NC 2000 SRC are not significantly different from each other for percent nicotine, yield, percent anabasine, percent anatabine, or percent total alkaloids.

Example 5: Breeding of homozygous cyp82e4 W329Stop, the cyp82e5v2 W422Stop, and cyp82e10 P381S mutant plants into the NC 2002LC Burley Tobacco Cultivar

NC 2002 SRC is a backcross-derived version of burley tobacco cultivar NC 2002LC carrying introduced mutations in three genes (CYP82E4 (SEQ ID NO: 5), CYP82E5 (SEQ ID NO: 8), and CYP82E10 (SEQ ID NO: 9)) previously documented to encode for nicotine.
demethylase enzymes (Lewis et al., Phytochemistry, 71 (2010), 1988–1998). The introduced mutations in CYP82E4 (cyp82e4 W329Stop (SEQ ID NO: 1)) and CYP82E5 (cyp82e5v2 W422Stop (SEQ ID NO: 2)) encode for premature stop codons which render the genes non-functional. The introduced mutation in CYP82E10 (cyp82e10 P381S (SEQ ID NO: 11)) does not encode for a premature stop codon, but does render the gene product non-functional for converting nicotine to nornicotine (Id.). When in homozygous condition, the three mutations result in tobacco plants with (1) reduced genetic capacity to demethylate nicotine to form nornicotine, and (2) a corresponding diminished potential to accumulate N-nitrosonornicotine (NNN), a potent carcinogen found in many tobacco products. The mutation in CYP82E4 (cyp82e4 W329Stop (SEQ ID NO: 1)) also provides phenotypic stability for the "nicotine conversion" trait and eliminates the requirement to utilize the cumbersome "LC" method for reducing levels of nornicotine in tobacco cultivars (see e.g., Jack et al. 2007. Implications of reducing nornicotine accumulation in burley tobacco: appendix A - the LC protocol. Rec. Adv. Tob. Sci. 33: 58–79).

The original tobacco cultivar NC 2002LC is a fertile inbred line. CMS NC 2002LC is a cytoplasmic male-sterile version of NC 2002LC. To develop NC 2002 SRC, an individual plant of NC 2002LC is pollinated with a plant of the genetic background DH98-325-6 carrying mutations in each of the three nicotine demethylase genes. F1 individuals originating from this cross and heterozygous for each mutation are backcrossed to the recurrent parent, NC 2002LC, to produce BC^\^ progeny. BC\_F1 progeny are screened using genotyping methodologies to identify individuals heterozygous for all three mutations. A single triple heterozygous BC\_Fi plant is backcrossed to NC 2002LC to produce BC\_F1 progeny. The process of backcrossing and identification of individuals heterozygous for all three mutations is repeated through the BC\_F1, BC\_Fi, BC\_F1, BC\_Fi, and BC^\^ stages. At the BC\_Fi stage, individuals heterozygous for all three mutations from each pedigree are self-pollinated to produce BC\_F2 seed. A large number of BC\_F2 progeny from each pedigree are genotyped to identify individuals homozygous for all three mutations. A single BC\_F2 plant homozygous for all three mutations is self-pollinated to produce a BC\_F3 family (NC 2002 SRC) in which the wild-type CYP82E4, CYP82E5v2, and CYP82E10 alleles of NC 2002LC were replaced by the mutant alleles (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82e10 P381S).

The male-sterile (CMS) version of NC 2002 SRC (CMS NC 2002 SRC) is produced by crossing a plant of CMS NC 2002LC as a female with pollen of NC 2002 SRC to produce male-sterile plants heterozygous for all three mutations. A single male-sterile plant resulting
from this cross is then subsequently backcrossed as a female to NC 2002 SRC to produce progeny that are segregating for individuals homozygous for all three mutations. Triple homozygous individuals are identified by DNA genotyping to produce the CMS NC 2002 SRC line. Because the line is male-sterile, it is maintained via pollination with NC 2002 SRC.

Commercial NC 2002 SRC is produced by pollinating plants of CMS NC 2002 SRC with pollen of NC 2002 SRC.

Example 6: Testing of NC 2002 SRC

NC 2002 SRC is evaluated for cured leaf chemistry, yield, and physical quality at two North Carolina field research locations during 2013 (Reidsville and Waynesville). NC 2002LC is included for comparison. The experimental design at each location is a randomized complete block design with four replications. Experimental units are single 20-plant plots. Plots are harvested and air-cured. Plot weights are used to determine per acre yields. Cured leaf is evaluated by a former USDA tobacco grader. Fifty gram composite leaf samples are collected from each plot and analyzed for percent nicotine, nornicotine, anatabine, anabasine, and percent nicotine conversion using gas chromatography equipment.

Comparisons using the least significant difference (LSD) test indicates that NC 2002 SRC has significantly \( P < 0.05 \) lower levels of nornicotine and percent nicotine conversion relative to NC 2002LC (Table 2). NC 2002LC and NC 2002 SRC are not significantly different from each other for percent nicotine, yield, percent anabasine, percent anatabine, or percent total alkaloids.

Example 7: Breeding of homozygous \textit{cyp82e4 W329Stop}, the \textit{cyp82e5v2 W422Stop}, and \textit{cyp82e10 P381S} mutant plants into the Burley 21 SRC Burley Tobacco Cultivar

Burley 21 SRC is a back-cross-derived version of burley tobacco cultivar Burley 21 SRC carrying introduced mutations in three genes (\textit{CYP82E4} (SEQ ID NO: 5), \textit{CYP82E5} (SEQ ID NO: 8), and \textit{CYP82E10} (SEQ ID NO: 9)) previously documented to encode for nicotine demethylase enzymes (Lewis et al, Phytochemistry, 71 (2010), 1988-1998). The introduced mutations in \textit{CYP82E4} (\textit{cyp82e4 W329Stop} (SEQ ID NO: 1)) and \textit{CYP82E5} (\textit{cyp82e5v2 W422Stop} (SEQ ID NO: 2)) encode for premature stop codons which render the genes non-functional. The introduced mutation in \textit{CYP82E10} (\textit{cyp82e10 P381S} (SEQ ID NO: 11)) does not encode for a premature stop codon, but does render the gene product non-functional for converting nicotine to nornicotine \( (ld) \). When in homozygous condition, the three mutations result in tobacco plants with (1) reduced genetic capacity to demethylate nicotine, (2) reduced yield, and (3) reduced alkaloid percent.
nicotine to form nornicotine, and (2) a corresponding diminished potential to accumulate N-nitrosonornicotine (NNN), a potent carcinogen found in many tobacco products. The mutation in CYP82E4 (cyp82e4 W329Stop (SEQ ID NO: 1)) also provides phenotypic stability for the "nicotine conversion" trait and eliminates the requirement to utilize the cumbersome "LC" method for reducing levels of nornicotine in tobacco cultivars [see e.g., Jack et al. 2007. Implications of reducing nornicotine accumulation in burley tobacco: appendix A - the LC protocol. Rec. Adv. Tob. Sci. 33: 58-79).

The original tobacco cultivar Burley 21 SRC is a fertile inbred line. CMS Burley 21 is a cytoplasmic male-sterile version of Burley 21 SRC. To develop Burley 21 SRC, an individual plant of Burley 21 SRC is pollinated with a plant of the genetic background DH98-325-6 carrying mutations in each of the three nicotine demethylase genes. F1 individuals originating from this cross and heterozygous for each mutation are backcrossed to the recurrent parent, Burley 21 SRC, to produce BC1 progeny. BC1F1 progeny are screened using genotyping methodologies to identify individuals heterozygous for all three mutations. A single triple heterozygous BCiFi plant is backcrossed to Burley 21 SRC to produce BC2Fi progeny. The process of backcrossing and identification of individuals heterozygous for all three mutations is repeated through the BC3F1, BC4F1, BC5F1, BC6F1, and BC7F1 stages. At the BC7F1 stage, individuals heterozygous for all three mutations from each pedigree are self-pollinated to produce BC7F2 seed. A large number of BC7F2 progeny from each pedigree are genotyped to identify individuals homozygous for all three mutations. A single BC7F2 plant homozygous for all three mutations is self-pollinated to produce a BC7F3 family (Burley 21 SRC) in which the wild-type CYP82E4, CYP82E5v2, and CYP82E10 alleles of Burley 21 SRC were replaced by the mutant alleles (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82e10 P38\S).

The male-sterile (CMS) version of Burley 21 SRC (CMS Burley 21 SRC) is produced by crossing a plant of CMS Burley 21 as a female with pollen of Burley 21 SRC to produce male-sterile plants heterozygous for all three mutations. A single male-sterile plant resulting from this cross is then subsequently backcrossed as a female to Burley 21 SRC to produce progeny that are segregating for individuals homozygous for all three mutations. Triple homozygous individuals are identified by DNA genotyping to produce the CMS Burley 21 SRC line. Because the line is male-sterile, it is maintained via pollination with Burley 21 SRC.

Commercial Burley 21 SRC is produced by pollinating plants of CMS Burley 21 SRC with pollen of Burley 21 SRC.
Example 8: Testing of Burley 21 SRC

Burley 21 SRC is evaluated for cured leaf chemistry, yield, and physical quality at two North Carolina field research locations during 2013 (Reidsville and Waynesville). Burley 21 SRC is included for comparison. The experimental design at each location is a randomized complete block design with four replications. Experimental units are single 20-plant plots. Plots are harvested and air-cured. Plot weights are used to determine per acre yields. Cured leaf is evaluated by a former USDA tobacco grader. Fifty gram composite leaf samples are collected from each plot and analyzed for percent nicotine, nornicotine, anatabine, anabasine, and percent nicotine conversion using gas chromatography equipment.

Comparisons using the least significant difference (LSD) test indicates that Burley 21 SRC has significantly ($P < 0.05$) lower levels of nornicotine and percent nicotine conversion relative to Burley 21 SRC (Table 1). Burley 21 SRC and Burley 21 SRC are not significantly different from each other for percent nicotine, yield, percent anabasine, percent anatabine, or percent total alkaloids.
Table 1. Entry means for experiment EX1 4-157 entries evaluated in two 2013 North Carolina environments (Reidsville and Waynesville).

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield (lbs/A)</th>
<th>Grade Index</th>
<th>Nicotine (%)</th>
<th>Nornicotine (%)</th>
<th>Anabasine (%)</th>
<th>Anatabine (%)</th>
<th>Total Alkaloids (%)</th>
<th>Nicotine Conversion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banket A1</td>
<td>2071</td>
<td>72.4</td>
<td>2.757</td>
<td>0.049</td>
<td>0.017</td>
<td>0.258</td>
<td>3.081</td>
<td>1.796</td>
</tr>
<tr>
<td>Banket A1 SRC</td>
<td>1948</td>
<td>72.2</td>
<td>3.214</td>
<td>0.018*</td>
<td>0.019</td>
<td>0.284</td>
<td>3.535</td>
<td>0.594*</td>
</tr>
<tr>
<td>Burley 21</td>
<td>1985</td>
<td>72.7</td>
<td>2.250</td>
<td>0.060</td>
<td>0.012</td>
<td>0.174</td>
<td>2.495</td>
<td>2.649</td>
</tr>
<tr>
<td>Burley 21 SRC</td>
<td>1897</td>
<td>74.7</td>
<td>2.881</td>
<td>0.018*</td>
<td>0.014</td>
<td>0.218</td>
<td>3.130</td>
<td>0.631*</td>
</tr>
<tr>
<td>NC 3 LC</td>
<td>2168</td>
<td>73.9</td>
<td>1.921</td>
<td>0.117</td>
<td>0.012</td>
<td>0.180</td>
<td>2.230</td>
<td>5.523</td>
</tr>
<tr>
<td>NC 3 SRC</td>
<td>2097</td>
<td>75.9</td>
<td>2.154</td>
<td>0.011*</td>
<td>0.011</td>
<td>0.175</td>
<td>2.351</td>
<td>0.504*</td>
</tr>
<tr>
<td>NC 4 SRC</td>
<td>2143</td>
<td>74.6</td>
<td>2.395</td>
<td>0.013*</td>
<td>0.012</td>
<td>0.217</td>
<td>2.637</td>
<td>0.554*</td>
</tr>
<tr>
<td>NC 6 LC</td>
<td>2275</td>
<td>75.7</td>
<td>2.093</td>
<td>0.221</td>
<td>0.012</td>
<td>0.204</td>
<td>2.530</td>
<td>8.965</td>
</tr>
<tr>
<td>NC 6 SRC</td>
<td>2245</td>
<td>72.1</td>
<td>2.380</td>
<td>0.010*</td>
<td>0.012</td>
<td>0.199</td>
<td>2.601</td>
<td>0.431*</td>
</tr>
<tr>
<td>DH98-325-5</td>
<td>2187</td>
<td>72.1</td>
<td>2.066</td>
<td>0.045</td>
<td>0.012</td>
<td>0.200</td>
<td>2.323</td>
<td>2.205</td>
</tr>
<tr>
<td>DH98-325-5 SRC</td>
<td>2086</td>
<td>72.5</td>
<td>2.332</td>
<td>0.013*</td>
<td>0.012</td>
<td>0.205</td>
<td>2.562</td>
<td>0.533*</td>
</tr>
<tr>
<td>DH19</td>
<td>1898</td>
<td>70.7</td>
<td>1.854</td>
<td>0.044</td>
<td>0.011</td>
<td>0.158</td>
<td>2.066</td>
<td>2.257</td>
</tr>
<tr>
<td>DH19 SRC</td>
<td>2242</td>
<td>72.5</td>
<td>1.870</td>
<td>0.018*</td>
<td>0.012</td>
<td>0.159</td>
<td>2.058</td>
<td>0.998*</td>
</tr>
<tr>
<td>NC1426-17</td>
<td>1924</td>
<td>71.8</td>
<td>1.802</td>
<td>0.047</td>
<td>0.012</td>
<td>0.211</td>
<td>2.072</td>
<td>2.565</td>
</tr>
<tr>
<td>NC1426-17 SRC</td>
<td>2056</td>
<td>75.2</td>
<td>2.030</td>
<td>0.012*</td>
<td>0.012</td>
<td>0.214</td>
<td>2.269</td>
<td>0.614*</td>
</tr>
<tr>
<td>NC1426-11</td>
<td>2415</td>
<td>71.2</td>
<td>2.228</td>
<td>0.078</td>
<td>0.013</td>
<td>0.232</td>
<td>2.551</td>
<td>3.513</td>
</tr>
<tr>
<td>NC1426-11 SRC</td>
<td>2056*</td>
<td>75.4*</td>
<td>2.121</td>
<td>0.011*</td>
<td>0.011</td>
<td>0.181*</td>
<td>2.324</td>
<td>0.524*</td>
</tr>
<tr>
<td>VA 509 LC</td>
<td>1975</td>
<td>72.9</td>
<td>2.197</td>
<td>0.169</td>
<td>0.013</td>
<td>0.187</td>
<td>2.567</td>
<td>7.107</td>
</tr>
<tr>
<td>Ky 14 LC</td>
<td>2237</td>
<td>74.2</td>
<td>2.151</td>
<td>0.072</td>
<td>0.012</td>
<td>0.209</td>
<td>2.444</td>
<td>3.407</td>
</tr>
</tbody>
</table>
Banket A1 is a fertile burley inbred variety. Banket A1 SRC is a backcross-derived version of Banket A1 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

Burley 21 is a fertile burley inbred variety. Burley 21 SRC is a backcross-derived version of Burley 21 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

Tobacco cultivar NC 3LC is a hybrid generated by pollinating plants of a male-sterile breeding line CMS NC1209-23 with pollen produced by fertile breeding line DH19. Tobacco cultivar NC 3 SRC is a hybrid generated by pollinating plants of a male-sterile breeding line CMS NC1209-23 SRC with pollen produced by fertile breeding line DH19 SRC.

Tobacco cultivar NC 4 SRC is a hybrid generated by pollinating plants of a male-sterile breeding line CMS NC1 426-1 1 SRC with pollen produced by fertile breeding line NCI 426-17 SRC. Tobacco cultivar NC 6LC is a hybrid generated by pollinating plants of a male-sterile breeding line CMS NC1209-23 with pollen produced by fertile breeding line DH98-325-5.

Tobacco cultivar NC 6 SRC is a hybrid generated by pollinating plants of a male-sterile breeding line CMS NC1209-23 SRC with pollen produced by fertile breeding line DH98-325-5 SRC.

DH98-325-5 is a fertile burley inbred variety. DH98-325-5 SRC is a backcross-derived version of DH98-325-5 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

DH 19 is a fertile burley inbred variety. DH 19 SRC is a backcross-derived version of DH 19 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

NCI 426-17 is a fertile burley inbred variety. NCI 426-17 SRC is a backcross-derived version of NCI 426-17 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

NC1426-1 1 is a fertile burley inbred variety. NC1426-1 1 SRC is a backcross-derived version of NC1426-1 1 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

KY 14 LC and VA 509 LC are LC-selected burley tobacco varieties KY 14 and VA 509.

*Indicates significantly different (P < 0.05) from the nearly isogenic LC variety or regular breeding line. Significance tests were based upon log transformed valued for % nicotine, % nomicotine, % anabasine, % anatabine, and % nicotine conversion. Significance tests were based upon non-transformed values for the remainder of the measured characteristics.
Table 2. Entry means for experiment EX13-158 entries evaluated in two 2013 North Carolina environments (Reidsville and Waynesville).

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield (lbs/A)</th>
<th>Grade Index</th>
<th>Nicotine (%)</th>
<th>Nornicotine (%)</th>
<th>Anabasine (%)</th>
<th>Anatabine (%)</th>
<th>Total Alkaloids (%)</th>
<th>Nicotine Conversion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC 174</td>
<td>1769</td>
<td>65.2</td>
<td>2.180</td>
<td>0.061</td>
<td>0.012</td>
<td>0.167</td>
<td>2.420</td>
<td>2.689</td>
</tr>
<tr>
<td>NC 174 SRC</td>
<td>1489</td>
<td>67.7</td>
<td>1.606*</td>
<td>0.013*</td>
<td>0.010</td>
<td>0.117*</td>
<td>1.746</td>
<td>0.826*</td>
</tr>
<tr>
<td>NC821-11</td>
<td>1671</td>
<td>66.6</td>
<td>1.708</td>
<td>0.045</td>
<td>0.012</td>
<td>0.241</td>
<td>2.005</td>
<td>2.658</td>
</tr>
<tr>
<td>NC821-11 SRC</td>
<td>1588</td>
<td>66.5</td>
<td>1.535</td>
<td>0.013*</td>
<td>0.010</td>
<td>0.170*</td>
<td>1.728</td>
<td>0.803*</td>
</tr>
<tr>
<td>NC 2000LC</td>
<td>1750</td>
<td>71.5</td>
<td>2.651</td>
<td>0.076</td>
<td>0.015</td>
<td>0.230</td>
<td>2.973</td>
<td>2.834</td>
</tr>
<tr>
<td>NC 2000 SRC</td>
<td>1652</td>
<td>68.9</td>
<td>2.914</td>
<td>0.021*</td>
<td>0.017</td>
<td>0.238</td>
<td>3.191</td>
<td>0.705*</td>
</tr>
<tr>
<td>NC 2002LC</td>
<td>1722</td>
<td>71.9</td>
<td>2.143</td>
<td>0.091</td>
<td>0.014</td>
<td>0.191</td>
<td>2.439</td>
<td>4.280</td>
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<tr>
<td>NC 2002 SRC</td>
<td>1596</td>
<td>69.0</td>
<td>1.856</td>
<td>0.015*</td>
<td>0.009*</td>
<td>0.127*</td>
<td>2.007</td>
<td>0.788*</td>
</tr>
<tr>
<td>NC 5LC</td>
<td>1769</td>
<td>65.7</td>
<td>1.575</td>
<td>0.123</td>
<td>0.011</td>
<td>0.170</td>
<td>1.879</td>
<td>7.363</td>
</tr>
<tr>
<td>NC 5 SRC</td>
<td>1897</td>
<td>66.5</td>
<td>1.701</td>
<td>0.014*</td>
<td>0.010</td>
<td>0.155</td>
<td>1.880</td>
<td>0.781*</td>
</tr>
<tr>
<td>NC 645</td>
<td>1919</td>
<td>72.9</td>
<td>2.134</td>
<td>0.078</td>
<td>0.012</td>
<td>0.177</td>
<td>2.402</td>
<td>3.226</td>
</tr>
<tr>
<td>NC645 BmrBmr SRC</td>
<td>1748</td>
<td>72.1</td>
<td>2.717</td>
<td>0.024*</td>
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NC 174 is a fertile burley inbred variety. NC 174 SRC is a backcross-derived version of NC 174 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

NC821-1 is a fertile burley inbred variety. NC821-1 SRC is a backcross-derived version of NC821-1 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

NC 2000LC is a LC-selected fertile burley inbred variety NC 2000. NC 2000 SRC is a backcross-derived version of NC 2000 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

NC 2002LC is a LC-selected fertile burley inbred variety NC 2002. NC 2002 SRC is a backcross-derived version of NC 2002 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S).

Tobacco cultivar NC 5LC is a hybrid generated by pollinating plants of a male-sterile breeding line CMS NCI 74 with pollen produced by fertile breeding line NC821-1 LC. Tobacco cultivar NC 5 SRC is a hybrid generated by pollinating plants of a male-sterile breeding line CMS NCI 74 SRC with pollen produced by fertile breeding line NC821-1 LC SRC.

NC 645 is a fertile burley inbred variety. NC645 BmrBmr SRC is a backcross-derived version of NC645 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S) and homozygous for an introduced major blue mold resistance gene designated as Bmr.

NC 775 is a fertile burley inbred variety. NC775 BmrBmr SRC is a backcross-derived version of NC775 carrying introduced mutations in three genes (cyp82e4 W329Stop, cyp82e5v2 W422Stop, and cyp82el0 P381S) and homozygous for an introduced major blue mold resistance gene designated as Bmr.

Hybrid cultivar NC 8 SRC is produced by pollinating plants of CMS NC775 Bmr/Bmr SRC with pollen of NC645 Bmr/Bmr SRC.

KY 14LC and VA 509LC are LC-selected burley tobacco varieties KY 14 and VA 509, respectively.

* Indicates significantly different (P < 0.05) from the nearly isogenic LC variety or regular breeding line. Significance tests are based upon log transformed values for % nicotine, % nomicotine, % anabasine, % anatabme, and % nicotine conversion. Significance tests are based upon non-transformed values for the remainder of the measured characteristics.
DEPOSIT INFORMATION

A deposit of the proprietary inbred plant lines disclosed above and recited in the appended claims have been made with American Type Culture Collection (ATCC), 10801 University Boulevard, Manassas, VA 20110. The date of deposit for Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC was February 26, 2014. The deposits of 2500 seeds for each variety was taken from the same deposits maintained since prior to the filing date of this application. Upon issuance of a patent, all restrictions upon the deposits will be removed, and the deposits are intended to meet all of the requirements of 37 C.F.R. § 1.801-1.809. The ATCC has issued the following accession numbers: PTA-121043 for Banket A1 SRC, PTA-121054 for CMS Banket A1 SRC, PTA-121053 for NC 2000 SRC, PTA-121045 for CMS NC 2000 SRC, PTA-121058 for NC 2002 SRC, PTA-121041 for CMS NC 2002 SRC, PTA-121059 for Burley 21 SRC, and PTA-121044 for CMS Burley 21 SRC. These deposits will be maintained in the depository for a period of 30 years, or 5 years after the last request, or for the effective life of the patent, whichever is longer, and will be replaced as necessary during that period. Applicants do not waive any infringement of their rights granted under this patent or under the Plant Variety Protection Act (7 U.S.C. 2321 et seq.).
What is claimed is:

1. Cured tobacco or a tobacco product prepared therefrom,

   wherein said cured tobacco is from a tobacco plant of a cultivar or a hybrid produced from said cultivar,

   wherein said cultivar is selected from the group consisting of Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC;

   and wherein representative sample seeds of said Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC have been deposited at the ATCC with the following ATCC Accession Nos.: PTA-121043 for Banket A1 SRC, PTA-121054 for CMS Banket A1 SRC, PTA-121053 for NC 2000 SRC, PTA-121045 for CMS NC 2000 SRC, PTA-121058 for NC 2002 SRC, PTA-121041 for CMS NC 2002 SRC, PTA-121059 for Burley 21 SRC, and PTA-121044 for CMS Burley 21 SRC.

2. The tobacco product of claim 1, wherein said tobacco product is selected from the group consisting of a tobacco blend, a pipe tobacco, a cigar tobacco, a cigarette tobacco, a chewing tobacco, a leaf tobacco, a shredded tobacco, and a cut tobacco.

3. The tobacco product of claim 1, wherein said tobacco product is selected from the group consisting of a cigarillo, a non-ventilated recess filter cigarette, a vented recess filter cigarette, a cigar, snuff, and a chewing tobacco.

4. The tobacco product of claim 3, wherein said tobacco product has an amount of nornicotine of less than about 3 mg/g.

5. The tobacco product of claim 4, wherein said amount of nicotine is selected from the group consisting of 3.0 mg/g, 2.5 mg/g, 2.0 mg/g, 1.5 mg/g, 1.0 mg/g, 750 µg/g, 500 pg/g, 250 pg/g, 100 pg/g, 75 pg/g, 50 pg/g, 25 pg/g, 10 pg/g, 7.0 pg/g, 5.0 pg/g, 4.0 pg/g, 2.0 pg/g, 1.0 pg/g, 0.5 pg/g, 0.4 pg/g, 0.2 pg/g, 0.1 pg/g, 0.05 pg/g, 0.01 pg/g, and undetectable.

6. The tobacco product of claim 3, wherein said tobacco product has an amount of N'-nitrosonornicotine (NNN) of less than about 10 pg/g.
7. The tobacco product of claim 6, wherein said amount of NNN is selected from the group consisting of 10 pg/g, 7.0 pg/g, 5.0 pg/g, 4.0 pg/g, 2.0 pg/g, 1.0 pg/g, 0.5 pg/g, 0.4 pg/g, 0.2 pg/g, 0.1 pg/g, 0.05 pg/g, 0.01 pg/g, and undetectable.

8. The tobacco product of claim 1, wherein said cured tobacco is at least about 5% by dry weight of the total tobacco in said tobacco product.

9. The tobacco product of claim 8, wherein said cured tobacco has a dry weight percentage of said total cured tobacco selected from the group consisting of at least about 10%, at least about 20%, at least about 30%, at least about 40%, at least about 50%, at least about 60%, at least about 70%, at least about 80%, at least about 90%, and at least about 95%.

10. A method of producing a tobacco product, comprising:

   a. providing cured tobacco from a tobacco plant of a cultivar or a hybrid produced from said cultivar, wherein said cultivar is selected from the group consisting of Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC; and

   b. preparing a tobacco product from said cured tobacco, wherein representative sample seeds of said Banket A1 SRC, CMS Banket A1 SRC, NC 2000 SRC, CMS NC 2000 SRC, NC 2002 SRC, CMS NC 2002 SRC, Burley 21 SRC, and CMS Burley 21 SRC have been deposited at the ATCC with the following ATCC Accession Nos.: PTA-121043 for Banket A1 SRC, PTA-121054 for CMS Banket A1 SRC, PTA-121053 for NC 2000 SRC, PTA-121045 for CMS NC 2000 SRC, PTA-121058 for NC 2002 SRC, PTA-121041 for CMS NC 2002 SRC, PTA-121059 for Burley 21 SRC, and PTA-121044 for CMS Burley 21 SRC.

CMS NC 2002 SRC, PTA-121059 for Burley 21 SRC, and PTA-121044 for CMS Burley 21 SRC.

12. A tobacco plant, or part thereof, produced from said seed of claim 11.

13. The part of the plant of claim 12, wherein said part is selected from the group consisting of a harvested leaf, a pollen, an ovule, an embryo, a cotyledon, a hypocotyl, a meristematic cell, a proplast, a root, a root tip, a pistil, an anther, a flower, a shoot, a stem, a pod, a petiole, and combinations thereof.


15. The harvested leaf of claim 14, wherein said leaf has a reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN).

16. The harvested leaf of claim 15, wherein said reduced amount of nornicotine and/or N'-nitrosonornicotine (NNN) is reduced in a smoke stream produced from said leaf.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A01H5/12 A24B13/00 A24B13/02 C12N9/10 C12N15/82

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

A01H A24B C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal , BIOSIS, Sequence Search , EMBASE, PAJ, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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[X] Further documents are listed in the continuation of Box C.  
[X] See patent family annex.

* Special categories of cited documents:
  * "A" document defining the general state of the art which is not considered to be of particular relevance
  * "E" earlier application or patent but published on or after the international filing date
  * "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  * "O" document referring to an oral disclosure, use, exhibition or other means
  * "P" document published prior to the international filing date but later than the priority date claimed

Date of the actual completion of the international search  
6 May 2015

Date of mailing of the international search report  
21/08/2015

Name and mailing address of the ISA/  
European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040,  
Fax: (+31-70) 340-3016

Authorized officer  
Kel l er, Yves

Form PCT/ISA/210 (second sheet) (April 2005)

page 1 of 2
This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

   - [Reasons]

2. □ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

   - [Reasons]

3. □ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

This International Searching Authority found multiple inventions in this international application, as follows:

- see additional sheet

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. □ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☑ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

   - [Invention Description]

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.
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This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: l-16(partly)
   A tobacco plant cultivar Banket Al SRC and directly related subject matter

2. claims: l-16(partly)
   A tobacco plant cultivar CMS Banket Al SRC and directly related subject matter

3. claims: l-16(partly)
   A tobacco plant cultivar NC 2000 SRC and directly related subject matter

4. claims: l-16(partly)
   A tobacco plant cultivar CMS NC 2000 SRC and directly related subject matter

5. claims: l-16(partly)
   A tobacco plant cultivar NC 2002 SRC and directly related subject matter

6. claims: l-16(partly)
   A tobacco plant cultivar CMC NC 2000 SRC and directly related subject matter

7. claims: l-16(partly)
   A tobacco plant cultivar Burley 21 SRC and directly related subject matter

8. claims: l-16(partly)
   A tobacco plant cultivar CMS CMS Burley 21 SRC and directly related subject matter