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TOBACCO

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This invention relates to the treatment of living tobacco for the purpose of improving the smoking quality of the leaf therefrom. More particularly, this invention relates to addition of flavorants and flavorant precursors to tobacco for the purpose of imparting desirable flavor and aroma to smoke from the tobacco leaf.

Smoking tobacco as now prepared for use in cigarettes comprises essentially a blended mixture of various types of tobaccos which are desirable to produce a characteristic flavor and aroma when the tobacco is smoked. Present day cigarette tobaccos normally comprise blends of (1) heat-cured tobaccos, which are sometimes known as flue-cured, bright leaf, or Virginia tobaccos, (2) air-cured tobaccos, which are sometimes known as burley, Kentucky, or Maryland tobaccos, and (3) sun-cured tobaccos, which are sometimes known as Turkish or Oriental tobaccos. The relative proportions of these various types blended to produce a desired cigarette tobacco mixture depend in a large measure upon the characteristic flavor and aroma that is desired to be achieved when the tobacco is smoked.

In the several copending applications of Jones, Rowland, Ashburn and Teague, Serial Nos. 445,891 through 445,896, all filed July 26, 1954, now Patents Nos. 2,766,145 through 2,766,150, all issued October 9, 1956, there have been disclosed smoking tobacco compositions which contain as additives small amounts of various substances which, when the tobacco is smoked, will release flavoring acids, particularly those carboxylic acids having from 3 to 8 carbon atoms and more particularly from 4 to 6 carbon atoms. Examples of such additives are esters of the flavoring acids, alkylated or arylated derivatives of malonic acid, and certain aliphatic 1,3-diketones and their derivatives. As disclosed in those applications the additives are usually incorporated into the tobacco after the curing and aging steps.

An object of this invention is the provision of a method for treating tobacco plants with an additive in order to improve the smoking qualities of the tobacco leaf.

A further object of this invention is the provision of a process of treating living tobacco with an additive in such a manner as to insure its distribution throughout the tobacco leaf.

An additional object of this invention is the provision of tobacco having improved flavor and aroma characteristics which become apparent during smoking.

A further object of this invention is to provide a method for producing tobacco which when smoked will have improved or enhanced flavor and odor characteristics which will be pleasing to the smoker.

A further object of this invention is the provision of a method for producing tobacco which when smoked will liberate organic flavoring acids thus imparting a selected and desired flavor and aroma to the smoke.

A still further object of this invention is the provision of a method for producing tobacco having incorporated therein one or more flavoring substances which in themselves do not substantially change the aroma of the leaf

but which, when the leaf is burned or smoked release to the smoke certain desired flavors and aromas.

A still further object of this invention is the provision of a biochemical or biophysical process for incorporating an additive into tobacco in such a manner that the additive becomes fixed therein and does not volatilize or decompose until such time as the tobacco is smoked.

A still further object of this invention is the provision of a method for producing tobacco having incorporated therein organic compounds which, when the tobacco is smoked or burned, will release several types of organic flavoring acids to the smoke, whereby a desired improvement or enhancement in the flavor and aroma of the smoke may be achieved.

A still further object of this invention is the provision of a process for the addition of flavorants or flavorant precursors to living tobacco plants or leaves for the purpose of imparting selected and desired smoking flavor and aroma characteristics to the leaf therefrom.

A still further object of this invention is the provision of a process for the incorporation of certain additives into tobacco leaves, thereby imparting desirable smoking qualities to the leaf.

Further and additional objects will appear from the following description and the appended claims.

In accordance with one embodiment of this invention, a process has been provided which comprises treating a living tobacco plant or the leaves thereof with a substance which will impart a desired flavor and aroma to the tobacco when smoked. The substance, which may be called an additive, may be applied directly to the plant in pure form or in aqueous suspension or solution before harvesting the additive may be applied to the plant by dusting or spraying, or may be applied to the root system of the growing tobacco plant, or may be injected directly into the tobacco plant by a hypodermic needle or other device inserted into the roots, stalk or leaf of the plant. It is preferred that the additives employed be of a character such that when the treated tobacco is smoked organic flavoring acids of the type disclosed in the several Jones, Rowland, Ashburn and Teague copending applications above referred to will appear in the smoke. Thus the compounds that are useful as additives in accordance with this invention are those specifically disclosed in said copending applications to which reference is here made for further details. Thus such compounds include esters of the flavoring acids, the precursors of such acids such as arylated or alkylated derivatives of malonic acids (i. e. isopropyl malonic acid or its salts), certain aliphatic, 1,3-diketones, or the like. Also the ammonium or metallic salts of the flavoring acids or the amides thereof may be employed.

Thus, in accordance with this invention, a process is provided for making a tobacco product having incorporated therein as an integral part of the leaf a small amount of substance which in itself does not substantially change the aroma of the leaf but which when the leaf is burned liberates to the smoke one or more organic flavoring acids preferably having from 3 to 8 carbon atoms, sometimes together with other flavor-producing compounds. These flavoring acids, when present in the smoke in suitable concentrations, will impart characteristic and desirable flavor and aroma to the tobacco smoke, thus contributing to the enjoyment of the smoker.

In accordance with this invention the flavor-producing acids which are liberated by the treated leaf upon smoking are preferably those flavoring acids which will volatilize and will be carried by the smoke, such acids preferably being the organic carboxylic acids having 3, 4, 5, 6, 7 or 8 carbon atoms, herein collectively referred to as those having from 3 to 8 carbon atoms. Representative acids are the saturated aliphatic fatty acids, such as propionic,

n-butyric, isobutyric, n-valeric, isovaleric, 2-methylbutyric, n-caproic, 4-methylvaleric, 3-methylvaleric, 2,2-dimethylbutyric, 2-methylisovaleric, straight or branched chain heptanoic, or straight or branched chain caprylic acids; the unsaturated aliphatic fatty acids, such as acrylic, crotonic, vinylacetic, 4-methyl-4-hexenoic, and 5-methylsorbic acids; the cycloalkane or cycloalkene alicyclic acids, such as cyclopentanecarboxylic, cyclohexanecarboxylic, cyclopentaneacetic or cyclohexaneacetic acids, or the corresponding unsaturated cyclic acids; and the aromatic carboxylic acids, such as benzoic, toluic, and phenylacetic acids. Also the volatile derivatives of such acids as the hydroxy acids or keto acids may be the acid compounds liberated to impart the desired odor and flavor to the smoke. It is preferred that the flavoring acid be an aliphatic or alicyclic saturated monocarboxylic acid having 4, 5, or 6 carbon atoms.

As previously indicated, the additive incorporated into the living tobacco in accordance with this invention is one which, when the tobacco is burned, will provide release of one or more of the foregoing types of flavoring acids into the smoke. However by incorporating the additive into the living tobacco plant or leaf as herein contemplated, the additive becomes fixed by some biochemical or biophysical process, not presently fully understood, whereby no undesired acid liberation will occur until such time as the tobacco is smoked. Also the additive is itself preferably of a non-volatile nature and is a derivative or precursor of the flavoring acid so that substantially no flavor or aroma from the additive becomes apparent in the tobacco until the tobacco treated therewith is smoked. The additive may be selected in such a manner that any one of the types of the foregoing acids will be released upon smoking. If desired a mixture of additives may be applied to the living tobacco so that a plurality of desired flavoring acids may be simultaneously liberated, thus effecting a blend of the various types of flavors and aromas which has the characteristics of the several flavoring acids. Under certain conditions the additive may induce the development of desirable properties in the leaf other than the release or organic flavoring acids. For example depending on the additive selected aging rates may be improved or a milder tobacco may result. Thus a further feature of this invention is the provision of a tobacco which will not only liberate the desired acid upon smoking but which may have other desirable properties.

The physiological process by which the additive is incorporated or assimilated into the living tobacco is unknown and probably varies with the form of additive used, method and time of application, soil conditions, plant variety, cultivation and subsequent treatment, and other factors not clearly understood. Whatever the exact process of assimilation, it is probable that in certain instances, at least, the additive is taken up by plant substances and converted biophysically or biochemically into a new substance which becomes an integral part of the leaf. This new substance is preferably non-volatile in nature but breaks down upon burning of the leaf to release the organic flavoring acids into the smoke.

As will be apparent from the disclosure herein, the basic process of this invention, namely the treatment of living tobacco with the specified organic additives for the purpose of improving its smoking quality, is simple and economical, compatible with present tobacco cultivation methods, and applicable to all types of tobacco. The process is sufficiently flexible to permit wide variation, at will, of induced properties in tobaccos so treated. The preferred additive in a given case of course depends upon the acid and other flavorants whose release is desired, as well as the method and time of application, type of plant, amount of additive used, qualities other than acid release desired, and other factors. The additive should of course be compatible with the tobacco plant in order to prevent growth inhibition.

As previously indicated the additives may be applied pure or in solution or suspension. Addition may be indirect, as where a root system is fed with the additive. Direct external application of the additive by processes such as painting, spraying or dusting part or all of the plant surfaces may be used. Direct internal application of the additive may be made by processes such as injection or implantation. Other methods of application will be apparent to those skilled in the art. Application may be single, multiple, or continuous, depending upon the desired effect and the amounts applied may vary widely, depending again upon desired effect. More than one method may be used with a given plant where desired and other methods of application will be apparent to those skilled in the art.

The additives may be applied at any time or times during the living cycle of the plant prior to harvesting while the plant or the leaves are still living. For example, the additive may be applied from one to two weeks before harvesting is begun, and application may be continued throughout the growing period until harvesting.

For a more complete understanding of the invention reference is now made to several specific examples. However, it will be apparent that the invention is not to be limited to the details of procedure given in the examples.

Example I

Burley tobacco is planted, fertilized, cultivated, and grown by normal, well-known methods. Two weeks before harvesting is begun the growing plants are sprayed with a water solution of an additive. This solution is prepared by dissolving one part isopropylmalonic acid in 20 parts of water and adding sufficient aqueous 10 percent potassium hydroxide to adjust the pH of the resulting solution to a value lying between 6 and 6.5. This solution is sprayed onto the growing plants with a conventional type spraying device, normally used for applying an insecticide to such plants. The amount of isopropylmalonic acid added to each plant is approximately 0.1 percent of the estimated total plant weight and during spraying an effort is to be made to apply most of the spray upon the upper leaf surfaces, attempting to cover all leaves on the plants evenly. After this treatment the tobacco is allowed to ripen, and is harvested, cured and aged by normal, well-known methods. The resulting tobacco has an enhanced aroma and flavor when smoked due to the small amount of isovaleric acid released upon the decarboxylation of the isopropylmalonic acid or derivative thereof, by the heat of smoking.

Example II

Tobacco which is to be flue-cured is planted, fertilized, cultivated, and grown by normal, well-known methods. One week before initial harvesting of the leaf, each plant is injected with an aqueous solution of ammonium 3-methylvalerate. This solution is prepared by adding 3-methylvaleric acid to 5 percent aqueous ammonium hydroxide until the pH of the resulting solution is between 6 and 6.5. This solution is injected into the stalks of the growing tobacco plants, using a syringe fitted with a 16 gauge hypodermic needle. The amount of 3-methylvaleric acid as the ammonium salt added to each plant in this manner may amount to approximately 0.05 percent of the estimated total plant weight. The solution is injected into the stalk of the plants at a point approximately half way between the ground and the point of attachment of the lowest leaf. The injection treatment, exactly as above, is repeated at three-day intervals during the remainder of the growing and harvesting period. The tobacco is allowed to ripen, and is harvested and cured by normal, well-known methods. The resulting tobacco has an improved aroma and flavor when smoked due to

the small amount of 3-methylvaleric acid that is released during the smoking thereof.

Example III

Burley tobacco is planted, fertilized, cultivated, and grown by normal, well-known methods. Two days before harvesting is begun the growing plants are dusted with finely-powdered α-glucose penta-cyclopentanecarboxylate. A standard crop-dusting procedure is used for applying the ester to the plants. The amount of ester added to each plant amounts to approximately 0.1 percent of the estimated total plant weight. After this treatment the tobacco is allowed to ripen, and is harvested and cured by normal, well-known methods. The resulting tobacco has an improved aroma and flavor when smoked due to the small amount of cyclopentanecarboxylic acid released during the smoking thereof.

Example IV

Tobacco to be flue-cured is planted, fertilized, cultivated, and grown by normal, well-known methods. Four weeks before harvesting is begun the soil around the roots of the growing plants is treated with dry, powdered isovaleramide. The amount of isovaleramide added around the base of each plant amounts to approximately 2 percent of the estimated total plant weight. The isovaleramide is applied by the same process used in applying dry fertilizers to such plants. After this treatment the plants are cultivated and grown as usual. When ripe the leaf is harvested and cured by normal, well-known methods. The resulting tobacco has an improved aroma and flavor when smoked due to the small amount of isovaleric acid released during smoking.

As will be apparent from the foregoing the additive treatment is entirely compatible with normal tobacco cultivation, fertilization, harvesting and curing practices. It is often possible to apply the additive mixed with fertilizers and other agricultural chemicals. The treated tobacco is aged by the processes normally used for untreated tobacco of the same variety.

The amount of additive actually applied to the living tobacco in accordance with this invention will vary widely depending upon the mode of treatment of the plant, the nature of the specific additive used, the time and frequency of application of the additive to the tobacco, the variety of plant treated, the amount of flavoring acid desired in the smoke and whether the treated tobacco is to be used alone in the manufacture of a cigarette or is to be blended with other tobaccos.

Various tobaccos may be treated according to the processes of this invention. The tobaccos thus treated are aged, and made into cigarettes, cigars or other smoking articles by regular, well-known methods. It will be understood that tobaccos may be prepared in accordance with this invention which have improved or enhanced flavor and aroma to give increased pleasure during smoking. Infinite variations with respect to the kinds and amounts of the flavor-producing compounds liberated by the treated tobaccos upon burning are possible and may be readily controlled. This invention is particularly useful with tobacco varieties which are ordinarily low in the types of flavor imparted by the acids or other flavorants. Tobaccos prepared by the process of this invention are particularly suitable for use in blends with other tobaccos, acting to improve or enhance the flavor and aroma of the smoke from such blends. While this invention is particularly useful in the preparation of cigarette tobaccos, it will be apparent that it has application to other smoking tobaccos, such as used for pipes and cigars.

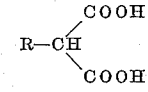
While several particular embodiments of this invention are described above, it will be understood, of course, that the invention is not limited thereto, since many modifications may be made, and it is contemplated therefore, by the appended claims, to cover any such modifications as fall within the true spirit and scope of this invention.

I claim:

1. A process for improving tobacco for smoking purposes which comprises treating a living tobacco plant prior to harvesting with an essentially nonvolatile additive whereby said additive is incorporated into the living tobacco and becomes an integral, essentially nonvolatile part thereof, said additive in its incorporated form being capable upon burning of the tobacco of liberating a monocarboxylic organic flavoring acid having from 3 to 8 carbon atoms selected from the group consisting of aliphatic acids and alicyclic acids.

2. A process for improving tobacco which comprises treating a living tobacco plant prior to harvesting with a compound which upon subsequent burning of the tobacco is capable of liberating a monocarboxylic organic flavoring acid having from 3 to 8 carbon atoms selected from the group consisting of aliphatic acids and alicyclic acids.

3. The process recited in claim 2 wherein said compound is selected from the group consisting of a derivative of malonic acid and the salts thereof, said derivative having the formula



wherein R is a hydrocarbon radical having from 1 to 6 (inclusive) carbon atoms.

4. The process recited in claim 2 wherein said compound is a nonvolatile ester of said flavoring acid.

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