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[54] **AIR-CURING PROCESS OF TOBACCO LEAF**

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[52] **U.S. Cl.** ..... **131/140 R**

[51] **Int. Cl.²** **A24B 03/12**

[58] **Field of Search** 131/140–144

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[57] **ABSTRACT**

Tobacco leaf of burley tobacco, domestic (i.e., Japanese) tobacco or cigar tobacco, which leaf has been yellowed in the course of the conventional air-cure of said tobacco leaf, is bruised mechanically to such an extent that the whole of the leaf tissue contains moisture uniformly and appears as water having soaked therein, and thereby the enzymatic oxidation of the constituents of the leaf is promoted and the browning and formation of aroma and taste of the leaf are attained within a shorter period. The blended tobacco product which is made by mixing the tobacco material prepared by the process of the invention with another tobacco material prepared by the routine flue-cure, has an excellent aroma and taste.

4 Claims, No Drawings

AIR-CURING PROCESS OF TOBACCO LEAF

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to a curing process for tobacco leaf, in particular, for the air-curing process of air-curing tobacco leaf, which comprises, bruising mechanically the leaf of burley tobacco, domestic (i.e., Japanese) tobacco or cigar tobacco, which leaf has been yellowed in the course of the conventional air-cure of such tobacco leaf, and thereby promoting thereby the enzymatic oxidation of the constituents of the leaf so as to accomplish the browning and formation of aroma and taste of the leaf within a shorter period.

The curing process of curing the tobacco leaf is essentially a complex operation in which the constituents of green leaf are caused to change gradually either by the action of the enzyme in the leaf or by oxygen in the open air so as to adapt them to smoking (this change is called "curing"); the moisture in the green leaf is caused to decrease gradually or step by step (such reduction of the moisture is called "drying"). The courses of the curing process of the tobacco leaf consist concretely of several stages of so called pre-drying, pre-yellowing, yellowing, (browning,) color-fixing and midrib-drying.

Tobacco leaf may be classified generally into two types, 1 Nicotiana tabacum var. bright yellow or the like which contains a larger amount of carbohydrate but a smaller amount of nitrogen compound, and 2 N. tabacum var. burley 21, or the like, which contains a smaller amount of carbohydrate but a larger amount of nitrogen compound. As for the former type of tobacco leaf, there is applied the so-called flue-cure in which the product is finished in a state of containing a comparatively larger amount of sugar, while as for the latter type of tobacco leaf, there is applied the so-called air-cure in which the product is finished in a state of a large part of the nitrogen compound contained in the green leaf having been decomposed. The reason for such specialization of the curing process of tobacco leaf is that, the said nitrogen compound contained in the leaf largely affects the aroma and taste of the tobacco product so that the decomposition of said compound has been regarded as the most essential matter in the cure of tobacco leaf, and further that, in order to improve the aroma and taste, the bulkiness and the burning quality of the cigarette, the form of which is adopted most widely as a convenient form of smoking tobacco at present, it is regarded as most suitable that the blending of said flue-cured leaf and air-cured leaf, both have been so made since they exhibit their respective characters so significantly.

In the air-cure which is applied to burley tobacco leaf, domestic tobacco leaf, cigar tobacco leaf and others, however, it is necessary to carry out the cure spending a longer period at lower temperatures in comparison with those in the case of the flue-cure. In particular, the period required for the stages of browning and midrib-drying in the air-curing process, which stages succeed the yellowing stage, amounts to 7–15 days, and thus the total period of the same process takes 10–20 days. Further, there is another disadvantage in that the yellowing stage of the air-cure is apt to grow the so-called partly greenish leaf, or over-cured leaf each of which affects the subsequent stages, and

thus result in lack of uniformity of the quality of the finished product.

We have studied the air-cure of tobacco leaf as above-mentioned, and found that, the decomposition of the nitrogen compound contained in the green leaf, which decomposition is most essential in the air-cure, is remarkably promoted when the tobacco leaf having been yellowed in the course of the conventional air-cure is bruised mechanically so as to accelerate the death of the leaf cells, and thereby the browning and formation of aroma and taste of the leaf are attained in a shorter period.

OBJECTS OF THE INVENTION

An object of the invention is accordingly to provide a process of air-curing tobacco leaf wherein the browning and formation of smoking aroma and taste thereof are attained within a remarkably shorter period in comparison with that in the conventional process.

Another object of the invention is to provide a process of air-curving tobacco leaf as a result of which the tobacco product has excellent aroma and taste in comparison with that generated from the conventional process.

Still another object of the invention is to provide a process of air-curing tobacco leaf wherein an uniform browning and formation of aroma and taste of the tobacco leaf may be attained finally even in the case of non uniform yellowing which has been caused in the preceding stage.

Still further objects of the invention will be understood from the detailed explanation of the invention disclosed hereinafter.

DESCRIPTION OF THE INVENTION

In the process of the invention, firstly, the harvested leaf of burley tobacco, domestic tobacco or cigar tobacco (these tobaccos being called for short "tobacco" hereinafter) is caused to yellow by being treated with the routine manner. That is, for example, tobacco leaf with or without the stalk is subjected to the successive operations of pre-drying, pre-yellowing and yellowing in order, and the moisture content of the leaf is reduced thereby to about 40–70 percent by wet basis. The moisture content in the above tobacco leaf is far lower in comparison with that in the leaf at the same stage of the conventional air-curing process, and such lower moisture content is developed only in relation to the subsequent stage, in which the yellowed leaf is bruised mechanically. In such a yellowing-dehydrating stage, the carbohydrate material such as starch in the tobacco leaf is hydrolyzed into soluble sugar by amylase and the like, the protein is decomposed into soluble amino acid by protease and the like; and the decomposition of fatty acid and of chlorophyl are promoted. Furthermore, the activity of oxidizing enzymes such as polyphenol oxidase and peroxidase is enchanced in this stage.

Secondly, the tobacco leaf which has been yellowed and the constituents of which have been converted as described above, is subjected to bruising mechanically so as to cause the sap of the leaf cells to transude and to come in contact with the open air, and thereby the browning reaction of the tobacco leaf is uniformly promoted as a whole. The said mechanical bruising of the tobacco leaf may be accomplished either by crushing of the yellowed leaf in a kneader or the like or by several times passing the leaf several times through pairs of pressing rollers. Such bruising operation is

carried out at least to such an extent that the whole of the leaf tissue contains moisture uniformly and appears as if water has soaked therein (in other words to such an extent that either the volume of the gas contained in the leaf is reduced to about half of its initial volume or until the leaf turns translucent). The specific time required for the bruising operation on the tobacco leaf is from a few minutes to 2 hours, varying with the character of the leaf to be treated, apparatus used, temperature and other factors.

In the course of this operation of bruising the tobacco leaf, the constituents of the leaf are exposed to the open air, so that decomposition thereof by the action of various oxidizing enzymes is promoted; for example, polyphenols (i.e., chlorogenic acid, lutin and the like) are decomposed by polyphenol oxidase. Simultaneously with said decomposition the tissue of the tobacco leaf turns brown or light-brown uniformly and formation of aroma and taste therof is promoted. However the time required for such browning or light-browning of the leaf is slightly longer that that required for the bruising operation itself of the leaf, that is, from 30 minutes to 2 hours.

The tobacco leaf having been bruised as described above is allowed, if necessary, to stand under the condition of from room temperature to 45°C and relative humidity of 70–90 percent in the state of being put one upon another in a thin layer for 24 hours at most, and is kept at a temperature of 90°–130°C for a short time (e.g., 30 minutes) so as to cause the enzymatic reaction in the leaf to stop, followed by drying at 50°–60°C while aeration is carried out. After completion of the aeration-drying, the leaf is moisture-conditioned if necessary, and is either shredded or pulverized to make it into raw material for sheet tobacco.

The raw material for tobacco produced by the process of the invention has a concentrated aroma and taste and exhibits a brilliant brown, and the blended tobacco product which is made by mixing a small amount of said material with another tobacco material produced by the flue-cure, is recognized, through sensory test, to be such as to be capable of giving a smoking aroma and taste peculiar to the kind (species) of tobacco leaf which has been employed in the process of the invention.

Tobacco plants belonging to Nicotiana tabacum to which the air-curing process of the present invention may be applied are as follows:

burley tobacco cv. such as N.t. var. burley 21, N.t. var. burley mito 3, N.t. var. burley ky 10 and the like; domestic (Japanese) tobacco cv. such as N.t. var. suifu, N.t. var. matsukawa, N.t. var. daruma, N.t. var. ibusuki, N.t. var. maru, N.t. var. bitchu, N.t. var hatano, N.t. var. kirigasaku, N.t. var. enshu, N.t. var. awa, N.t. var. nambu, N.t. var. shiroenshu and the like; and cigar tobacco cv. such as N.t. var. florida, N.t. var. dixie shade, N.t. var. havana and the like.

The following examples serve to illustrate the invention without, however, limiting it in any way,

Example 1

Smoking leaf of Nicotiana tabacum var. burley 21 is harvested and pre-dried, followed by hanging the tobacco in a barn having a temperature of 30°C and a relative humidity (RH) of 60 percent for about 3 days so as to cause yellowing together with dehydration. Upon the moisture content being reduced to about 50 percent (w.b.), the leaf is placed in a kneader equipped with a double paddle and crushed thereby for an hour. The crushed leaf is then placed in a dryer at a temperature of 100°C for 30 minutes, and thereafter dried at 60°C for 4 hours while carrying out aeration. The product having been dried in this way is moisture-conditioned, and then, without having been shredded, it is made into a cigarette.

The amount of chlorogenic acid in the leaf at each stage of the present Example 1 is compared with that of the same acid in the leaf at the corresponding stage of the conventional air-curing process, said amount of chlorogenic acid being regarded generally as an indicator of the degree of progress in the browning of tobacco leaf. The results of the test are shown in Table 1 below, from which it is seen that in the process of the invention the browning of the leaf is accompanied with the conversion of the constitutents of the leaf.

Table 1

	Process of the invention	Conventional process
	Amount of chlorogenic acid in Leaf	
Green leaf	2.45 %	2.45 %
Yellowed leaf	2.33	2.01
Crushed leaf	0.12	—
Browned dried leaf	0.06	0.38

The cigarette made of the tobacco leaf prepared in this Example 1 of the invention is compared with that made of shredded tobacco which has been prepared by the conventional process using the same kind of tobacco leaf, through a sensory test (paired preference test). The results of the test are shown in Table 2, in which each figure shows the number of persons in the panel consisting of 10 professional persons who preferred the indicated product.

Table 2

	Aroma	Taste	Mildness
	Number of Persons Preferring		
Product of the invention	8	6	3
Product of the conventional process	2	4	7

From the data of Table 2, it is observed that the product of the invention is superior to that of the conventional air-curing process in aroma, which aroma is regarded as being essentially important in the appraisal of the smoking product of burley tobacco.

Further, a sensory test is carried out, wherein a comparison is made between (a) the cigarette made of the blended product which is composed of 10 percent of the burley tobacco prepared by this Example 1 of the present invention and of 90 percent of the shredded tobacco prepared by the flue-curing process, and (b) the cigarette made of the blended product which is composed of 20 percent of the shredded burley tobacco prepared by the conventional air-curing process using the same kind of tobacco leaf and of 80 percent of the said shredded tobacco prepared by the flue-curing process. The results of the test are shown in Table 3, wherein this numbers have the same meaning as that in Table 2 except that a panel consisting of 13 professional persons is employed therein, instead of that consisting of 10 professional persons in the case of Table 2.

Table 3

Tobacco Product		Aroma	Taste	Mildness
		Number of Persons Preferring		
Burley tobacco of the invention	10 %	6	7	3
Shredded tobacco of the flue-curing process	90 %			
Shredded burley tobacco of the conventional process	20 %	7	6	8
Shredded tobacco of the flue-curing process	80 %			

It is observed from the data of Table 3 that the product of the invention exhibits the blending effect of the burley tobacco leaf sufficiently even when the blending ratio of the product of the invention to the shredded tobacco of the flue-curing process is smaller.

EXAMPLE 2

Smoking leaf of Nicotiana tabacum var. burley 21 is harvested and predried, followed by hanging in a barn at 30 °C and at 60 percent RH for 88 hours so as to cause yellowing and to reduce the moisture content of the leaf to about 50 percent (w.b.). The yellowed leaf is crushed with a kneader having a double paddle for an hour, and the crushed leaf is then placed in a dryer at a temperature of 100 °C for 30 minutes, followed by drying at 50 °C for 4.5 hours while aerating the leaf. The product having been dried in this way is moisture-conditioned, made into a cigarette and the cigarette is submitted to the sensory test, above described. Thereby, it is observed that the present product has the essential aroma of burley tobacco as well as physiological lightness.

EXAMPLE 3

Smoking leaf of Nicotiana tabacum var. burley 21 is harvested and predried, followed by standing at room temperature for 90 hours so as to cause yellowing and to cause the moisture content of be the leaf to 60–70 percent. This yellowed leaf is subjected to a process of passing it through 3 pairs of rollers each of which is covered with rubber-sheet, in order: The said pair of neighboring rollers is operated with a closing pressure of 3 kg/cm^2 and each of said rollers has a diameter of 10 cm and is operated at a rate of 30 r.p.m. Thereby, the midribs of the leaf are crushed and the whole tissue of the leaf body appears to have water uniformly soaked therein. Ten of the thus treated leaves are spread out and put one upon another in a thermostat controlled chamber at a temperature of 40 °C and allowed to stand for 2 hours. The leaves are then heated at 90 °C for 15 minutes, followed by drying at 50 °C for 4.5 hours while aerating the leaves. The product having been dried in this way is subjected to moisture-conditioning,: the midribs thereof are removed; and the remaining leaf bodies are shredded and made into a cigarette. This cigarette is submitted to a sensory test, and it is observed therefrom that the product has a strong aroma proper to burley tobacco and also physiological lightness.

What we claim is:

1. Air-curing process of tobacco leaf which comprises:

A. subjecting tobacco leaf selected from the group consisting of leaves of burley tobacco, domestic (Japanese) tobacco and cigar tobacco to the routine manner of the air-cure so as to prepare the leaf in which the yellowing is completed and the moisture content thereof is reduced to 40–70 percent,

B. bruising the yellowed leaf in step (A) mechanically to such an extent that the whole of the leaf tissue contains moisture uniformly and appears as if water has soaked therein,

C. heating the bruised leaf in step (B) at a temperature of 90°–130 °C so as to stop the enzymatic reaction in the leaf, and

D. drying the leaf treated in step (C) at 50°–60 °C while aeration is carried out.

2. Process described in claim **1,** wherein the leaf having been bruised mechanically in (B) is, before the heating step (C) of the bruised leaf, allowed to stand under the condition of from room temperature to 45 °C and relative humidity of 70°–90 °C in the state of being put one upon another in a thin layer for 24 hours at most.

3. Process described in claim **1,** wherein the yellowed leaf is crushed in a kneader equipped with a double paddle or the like in order to practice the bruising step (B) of the leaf.

4. Process described in claim **1,** wherein the yellowed leaf is passed in order through several pairs of pressing rollers, in order to practice the bruising step (B) of the leaf.

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