

NECESSARY HYGIENIC-TECHNICAL MEASURES IN THE POSTHARVEST TREATMENT OF TOBACCO

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Abstract

Hygienic-technical measures applied during the post-harvest treatment of tobacco are necessary for obtaining a good quality product. Proper storage of tobacco improves its qualitative characteristics and enables optimum reduction of dry matters.

Cured tobacco leaves packed in bales must be stored in clean and dry rooms. Wet disinfection of floors, walls, ceilings, doors and windows is mostly made with lime-petroleum emulsion (4 kg fresh slacked lime and 1 liter of petroleum ether are added in 10 liters of water). Due to its ability to absorb different odors, tobacco should not be stored in stables, moist basements, uncovered ceilings and balconies. Tobacco is hygroscopic plant and therefore, during storage, continuous control of its humidity is necessary, in order to prevent the occurrence of microbiological processes - moulds.

Tobacco can be also kept in wooden boxes (istiva) held in canopies. This form of storage has advantages over traditional forms, because the supply of oxygen is limited and the effect of environmental factors is reduced to a minimum.

Most of the time, there is decay of the main nerve or all the nerves, caused by the following fungi species *Botrytis cinerea*, *Sclerotinia sclerotiotum*, *Rhizopus arrhizus*, *Alternaria alternata* etc.

Treated tobacco packed in yarma-bales must be stored in dry and cold rooms, with regular controls of tobacco humidity and adequate aeration in order to prevent the appearance of mould.

Key words: Tobacco, hygroscopic, unpleasant odor, yarma bales, istiva, microbiological processes, mould.

1. Introduction

Tobacco is a specific product, and its quality is closely related to the conditions of cultivation, drying, storage, primary (production), manipulation and processing.

Application of hygienic-technical measures for obtaining good quality tobacco is essential in tobacco

drying and storage processes, until the primary (domestic) tobacco manipulation, as well as in tobacco keeping with the manufacturer until the buyout.

Tobacco drying is a very important and necessary stage in the tobacco production technology. The main purpose of tobacco drying is making transformations on the tobacco leaves that will allow tobacco raw material to obtain the best possible quality.

The most commonly applied curing barn for tobacco drying is the curing barn - Prilep. Proper storage of tobacco improves its quality characteristics and enables optimum reduction of dry matters.

It is necessary for the cured tobacco leaves formed in "fives" or "Ballina" to be kept in clean and dry premises, isolated from the external influences and ventilated-if possible. Disinfecting of the premises before tobacco storage is recommended.

Tobacco can also be stored in layers or istiva (wooden boxes), where oxygen access is limited. When using these ways of storage, the influence of external factors is minimized.

Processed tobacco wrapped in yarma-bales needs to be kept in dry and cool premises and humidity controlled conditions.

2. Tobacco drying

Drying is not just a physical phenomenon of simple water removal from the tobacco leaf, or plain dehydration made in order to preserve the material which is amassed in the leaves during the tobacco vegetation in the field. If this happens, the tobacco leaves are not suitable for consumption. The main purpose of tobacco drying is making transformations on the tobacco leaves that will allow obtaining tobacco raw material with the best possible quality. There are several methods for tobacco drying. Most of them are the result of long-time experience from the general practice. Their range depends on climate conditions

and types of farmed tobacco. Raw material obtained by applying different drying methods is characterized by specific physical and chemical tasting characteristics (Uzunoski [1]).

Methods of tobacco drying can be divided into two groups according to the thermal sources:

1. Tobacco drying without artificial heating
2. Tobacco drying with artificial heating.

2.1 Solar tobacco drying (Sun-curing method)

This method is used for oriental and semi-oriental tobacco, as well as for the tobacco of the type Virginia with reduced quality.

For a larger quantity of tobacco different curing barns can be used. The best known curing barn is Prilep curing barn (Uzunoski [1]). This type of curing barn consists of one (Figure 1), two (Figure 2) or several floors, which are covered with PVC cover. In this way only a small amount of direct sun rays penetrates inside. That is why the tobacco is cured with diffuse heat radiation and the discoloration of the leaves is excluded. For better sun exposure the lower floors are placed at greater distance from the upper ones. Lately, this type of curing barn is wrapped with polyethylene cloth, because of the better heat retention inside the curing barn. The polyethylene canvas or PVC foil should not be pulled down on the frontal side, because of the ventilation (there should be a flow of air for the moisture that is released during the tobacco curing, to be removed).

The higher side of the curing barn is exposed to the south, and the strings are placed in a north-south direction (Boceski [2]). Otherwise the time required for curing will be prolonged and the quality of tobacco will be lowered.

Curing barns should not be placed in windy areas, shady places; they are usually placed next to a protective wall on the north. The floor of the curing barn is mostly unpaved and flat, and if there are any weeds, they should be removed.



Figure 1. Curing barn - one floor



Figure 2. Curing barn - two floors

2.2 Cured tobacco storage

The storage of the tobacco until its primary manipulation is also an important stage in post-harvest processing. Proper storage of tobacco improves its quality characteristics and enables optimum reduction of dry matters.

Tobacco is considered cured when the main nerve of the leaves is dried. Partly dried leaves or partly dried main nerve is a common reason for the deterioration of the tobacco quality (Boceski [2]).

In such cases, especially in wet seasons, tobacco can be attacked by some pathogens. Most of the time, there is decay of the main nerve or all the nerves, caused by the following fungi species: *Botrytis cinerea*, *Sclerotinia sclerotiotum*, *Rhizopus arrhizus*, *Alternaria alternata* etc. Tobacco rotting can do great harm, meaning that tobacco will have very low quality or will become almost useless (Alić-Đemidžić [8]).

The main reason for this is the occurrence of high moisture during the tobacco curing.

In this case dry leaves are removed from the curing barn. Both ends of the strings are assembled and each five strings are attached together with iron hook, forming so-called "fives" or "Ballina". Taking down of the strings from the curing barn and forming of the "fives" should be carried out in the morning when tobacco has a higher percentage of moisture, in order to prevent the damaging of the leaves (Jovanovic [3]).

"Fives" or "Ballina" are kept in clean and dry premises. The premises for tobacco storage should be isolated from the external influences and ventilated-if possible. When the manufacturer does not have such facilities then with minor adaptations ceilings and barns can be used for tobacco storage. Disinfecting of the premises before tobacco storage is recommended. Wet disinfection of floors, walls, ceilings, doors and windows is mostly made with lime-petroleum emulsion

(4 kg fresh slacked lime and 1 liter of petroleum ether are added in 10 liters of water) (Dimitrov [6]). However, tobacco should not be stored in stables, moist basements, uncovered ceilings and balconies, because in these circumstances tobacco is directly exposed to unfavorable atmospheric conditions. Any premises where materials with unpleasant smell are stored should be avoided, because tobacco easily absorbs other odors (Dimitrov [7]).

Tobacco storage should be performed in following manner: the tobacco with the highest quality should be hanged in the middle of the room and lower quality tobacco on the peripheral part. The “fives” of the tobacco strings should not reach the walls of the room, because there is a possibility for the tobacco to get wet because of the condensation in the cold places.

Besides the storage of the oriental tobacco in “fives”, the tobacco is also stored in layers, “istiva” and strings.

After curing tobacco in these strings, it can not be immediately placed in istiva, because it is dry. Therefore it is necessary for the tobacco to obtain humidity from 13 to 15%. During moisturizing, one should be careful not to moisturize the tobacco too much, because there is a possibility of appearance of undesirable microbiological processes. Istiva is made when the tobacco is previously placed on the right platform with a predefined size. Also the istiva can be made on the floor.

The istiva is made on the following way: The first string is laid across the istiva with the rib of the leaves from the external side. The second string is laid next to the first one, so that a part of the rib covers the tips of the leaves of the previous (first) string, and an overlap is made. Next strings are laid in the same way. The last string is laid with the rib of the leaves from the external side. The second row is laid on the first one; strings are laid in the same way, only in the length of the istiva. The third one is laid in the same way as the first one, until a certain height is achieved, which is 1,5 meters width, 1,5 m length and 1-1,2 m height (Boceski [4]).

Because of tobacco protection from the external influences, external istiva parts should be wrapped with polyethylene material.

In this way the tobacco is stored until its manipulation. Storing tobacco in istiva has advantages over conditional state. Here the absolute moisture of tobacco does not have big fluctuations in comparison with storing of tobacco in strings - “fives”. Also, this way of storing has advantages regarding tobacco quality. Tobacco kept in istiva has brighter color and better flavor compared to tobacco stored in strings - “fives” (Boceski [4]).

2.3 Primary (production) tobacco manipulation

The word manipulation comes from the Latin word *manipulus* which means skill, skilful and professional handling of something, touching or smoothing with hand. According to that, tobacco manipulation means separation of tobacco according to qualitative features and packaging of tobacco (Boceski [2]). There are two ways of tobacco manipulation: primary (temporary) and final (industrial) manipulation.

The primary manipulation is performed by the manufacturer and therefore it is also called production manipulation. By the primary manipulation the tobacco is classified, all foreign objects (sand, tiny pebbles, feathers, and straws), are removed, moldy leaves are removed, and leaves with diseases or damaged by pests are separately classified (Andonov [5]).

Before performing tobacco manipulation, it needs to be prepared, i.e. to be brought to normal conditional state (it should contain 14-16% moisture of the dry substance).

That is why it is best for the strings to get wet naturally, by taking the “fives” out, when the weather is wet. When the weather does not allow this, the tobacco is usually moisturized in cellars-in pits (holes) dug for that purpose; or in special premises with required humidity (done by wetting the floor). Any of the abovementioned ways of tobacco moisturizing should be performed carefully: direct watering of the tobacco should be avoided, because the tobacco will start to decay (Uzunoski [1]).

After the manipulation, tobacco is packed in yarma-bales. If the yarma-packaging bales of tobacco have higher moisture than the optimal, an unpleasant moldy smell can appear, and if the temperature is favorable a mould can actually appear (Uzunoski [1]).

2.4. Storing tobacco by manufacturer, packed in yarma-bales until the purchase

Processed tobacco wrapped in yarma-bales needs to be stored in dry and cool rooms. Sunrays should not penetrate in these premises, because they can influence on the speed of the tobacco curing. If direct sun rays reach tobacco and if it is packed with moisture higher than 18%, then the bale will warm up to extent which is favorable for creating conditions for development of undesirable microbiological processes and tobacco decaying. Also, it should be kept in mind that mould can appear if the tobacco is stored in a room with a relative humidity higher than 85%. Temperature amplitude of moulds ranges from 4°C to 40 °C, and the optimal temperature is between 20 °C and 35 °C. That means that the temperatures from 3 °C to 5 °C will stop any mould

development and temperatures higher than 40°C will kill the moulds (Uzunoski [1]).

Moulds substantially or completely destroy the value of tobacco, because the thermal processing destroys the fungus that causes mould, but the unpleasant smell of mould will remain (Alić-Đemidžić [8]).

The main causes of mould are fungi *Aspergillus* and *Penicillium*. Besides the fact that they reduce the tobacco quality, it is not clarified yet how many and what kind of consequences they can provoke, because there are indications that moulds can release carcinogenic substances (Alić-Đemidžić [8]).

3. Conclusions

- When properly stored, tobacco enhances its qualitative characteristics and enables optimum reduction of dry matters.
- The most commonly applied curing barn for tobacco drying is the curing barn - Prilep. The polyethylene canvas or PVC foil should not be pulled down on the frontal side, because of the ventilation (there should be a flow of air for the moisture that is released during the tobacco curing, to be removed. Curing barns should not be placed in windy and shady places.
- Tobacco is considered cured when the main nerve of the leaves is dried. Partly dried main nerve is a common reason for its own decaying or decaying of all the nerves, caused by the following fungi species: *Botrytis cinerea*, *Sclerotinia sclerotium*, *Rhizopus arrhizus*, *Alternaria alternata* etc.
- Disinfecting of the premises before tobacco storage is recommended. Wet disinfection of floors, walls, ceilings, doors and windows is mostly made with lime-petroleum emulsion (4 kg fresh slacked lime and 1 liter of petroleum ether are added in 10 liters of water). However, tobacco should not be stored in stables, moist basements, uncovered ceilings, balconies and any premises where materials with unpleasant smell are stored because the tobacco easily absorbs other odors.
- Storing tobacco in istiva has advantages over conditional state.
- Here the absolute moisture of tobacco does not have big fluctuations in comparison to the storing of tobacco in strings-“fives”.
- Before performing tobacco manipulation, it needs to be prepared, i.e. to be brought to normal conditional state (it should contain 14-16% moisture of the dry substance).
- For this purpose it is best for the strings to get wet naturally, it also can be done in cellars-in pits (holes) dug for that purpose; or in special premises

with required humidity (done by wetting the floor). Anyway this should be performed carefully: direct watering of the tobacco should be avoided, because the tobacco will start to decay.

- After the manipulation, tobacco is packed in yarma-bales. If the yarma-packaging bales of tobacco have higher moisture than the optimal, an unpleasant moldy smell can appear, and if the temperature is favorable a mould can actually appear.
- Processed tobacco wrapped in yarma-bales has to be stored in dry and cool rooms. Sunrays should not penetrate in these premises, if the relative moisture is higher than 85%, conditions for undesirable microbiological processes will appear and tobacco will decay.
- The main causes of mould are fungi *Aspergillus* and *Penicillium*, which reduce the tobacco quality a lot. There are indications that mould can release carcinogenic substances which can harm the human health.

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