ISSN 0494-3244

Тутун/Tobacco,Vol. 65, N$^0$ 1-6, 49-53, 2015 UDC: 633.71-152.61(497.775)"2013/2014"

Original Scientific paper

# THE PHYSICAL CHARACTERISTICS OF RAW TOBACCO- PRILEP 66 - 9/7

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## ABSTRACT

Prilep 66 - 9/7 is the most common variety in production of oriental tobacco in Prilep area. This variety provides the raw material with high quality and flavor, typical for oriental tobacco. Experiment was placed in the region of Prilep in the period 2013-2014. Oriental variety Prilep 66 9/7 was used as a testing material. The aim of this study was to demonstrate the quality of materials, expressed through the physical characteristics of the raw material, which is obtained by application of appropriate agro-technical measures in various meteorological years of tobacco production.

**Keywords:** physical characteristics, raw tobacco, Prilep 66- 9/7

## ФИЗИЧКИ КАРАКТЕРИСТИКИ НА ТУТУНСКАТА СУРОВИНА - ПРИЛЕП 66 - 9/7

Во производството на ориентalски тип тутун во прилепскиот реон, најзастапена е сортата Прилеп 669/7. Суровината од овој тип тутун е со висок квалитет, карактеристична за ароматичен ориентalски тип тутун. Опитот беше поставен во реонот на Прилеп, во 2013 и 2014 година. Како материјал во испитувањето беше користена сортата Прилеп 66 - 9/7. Целта на ова истражување беше да се демонстрира квалитетот на материјалот, изразен преку физичките карактеристики на тутунската суровина, добиена со користење на соодветни агротехнички мерки во различни метеоролошки години на производство.

**Клучни зборови:** физички карактеристики,тутунска суровина, Прилеп 66- 9/7

## INTRODUCTION

Tobacco (*Nicotiana tabacum L.*) has been cultivated almost in all districts in Macedonia with ages, especially when it comes to production of aromatic type of tobacco. It is traditional agricultural crop where labor force has a great importance. A large part of work activities are carried out manually, but recently, more attention is paid to implementation of new technical achievements in production process. So, most of the working operations are carried out mechanized (transplantation

of seedlings, cultivation, irrigation with fertilization etc.). The most important thing is to increase productivity while obtaining high quality tobacco. Modified traditional practices of tobacco producers made contribution for larger productivity. Therefore, modern tobacco producers pay more attention to agro-technical measures and protection from the starting point (production of seedlings), till the end of harvest. Mainly, oriental varieties of tobacco in Macedonia are grown in accordance with soil characteristics as well as climatic conditions in the territory, so tobacco receive specific characteristics which determines the value of raw tobacco material.

## MATERIAL AND METHODS

The experiment was placed in the region of Prilep, at the land of individual tobacco producer. Tobacco seedlings were traditionally produced, in cold beds covered with polyethylene. For that purpose, 5 g per 10 $m^2$ certified tobacco seed from Scientific Tobacco Institute – Prilep has been used. The sowing of tobacco was made on 15 March, in 2013 and on 19 March, in 2014. All necessary agro-technical measures were applied during the period of tobacco seedlings production.In this study, the experiment was set-aside area of 7 acres (fallow land from previous year, 2012). The main processing of the soil in 2014 year is due to loosening the soil as a result of the surface preparation in the previous year.To achieve the best results, the regulation must be carried out on plug plang, and semi-spiral functions of cultivator should be regulated. In order to collect the maximum moisture of autumn and winter precipitation, a different way of plowing is done, until the spring of preparation allows the trimming the surface, in order to achieve greater grinding of lumps. Transplanting of tobacco seedling was made in the second half of May, with mechanical transplanting machine (three seats program AGROBAR Vinica). Transplanting machine was served by five workers, from which three batteries for planting and the two positions for seedlings transplanting. Planting density of the tobacco seedling was 40x15 cm on previously prepared soil. Additional cultivation is carried out at a depth of 12-15 cm, after accepting tobacco seedlings (to reduce the growth of weeds). During the growing season in 2013 (July, August), irrigation was made several times with rotary sprinkler model "Rink". In both production years fertilization with mineral fertilizer NPK (8:22:20) was performed on the surface of about 350 kg/ha. Tobacco harvesting was performed manually in technical maturity of leaves. Tobacco leaves were strung with threading machine (Glotsas Tobacco Machines). Tobacco was sun cured in traditional way, on scaffolds covered with polyethylene. For two production years, following physical properties were determined: leaf dimension (cm), main rib (%), leaf thickness (μm), materiality of the tissue (g/m2), as well the yield of dry weight per unit area (kg/ha).Analysis of physical properties was performed on pre-prepared tobacco leaves, cleaned of soil, dust and other impurities.

## RESULTS AND DISCUSSION

The results showed that there is a need of using the respective equipment in the process of tobacco production, such is deep plowing to be executed with one aggregate composed of IMT-539 with two-raw plough, penetrating at about 25-30 cm. In order to keep on with good agricultural practice, the processing of the soil in autumn, was

controlled by on plows devices to plough arable layer on the surface on the soil rich with plant residues, but at the same time to translocate it at the bottom that will be used by the roots' system of the plant (Davchev, 2007). In the secondary management of soil, the same aggregate, tractor IMT 539 and two-raw plough were used. The results showed that if the unit is regulated, it is enough one spring plowing cultivation of the surface. When saving or reducing the working processes (instead of three main treatments, should be two treatments), up to 10 % energy per hectare area can be reduced, and thus, a lower production cost for one kilogram of tobacco can be directly saved. It is necessary to follow different conditions at the field in order to implement appropriate cultivation practices for producing high-quality tobacco. It is very important to emphasize the quality of tobacco seedlings and its manipulation, regulation of the discs itself as well, which directly depend on quality of transplantation. According to Davchev (2007), the success of the adoption of seedlings depends on agro-meteorological conditions at the time of transplanting, the type of the soil, the extent of its preparation etc..The frequent oscillations in temperature usually reduce the proper development of the root. Distribution of rainfalls through the vegetation period in 2013 was inadequate (May, June, July and August). Total rainfalls didn't exceed more than 178,2 mm. Accordingly, simultaneously with transplanting watering of tobacco was performed, thus allowing easier acceptance of tobacco seedlings in new conditions at the open field. Vukadinovic (1999), claims that in the period of transplantation the plant easy avoids stress as a result of particular morphological and physiological adaptations in addition with proper quantity of water. The next year (2014), irrigation of tobacco was not recommended due to excess of water (Table 1).

**Table 1.Meteorogical data (vegetation period 2013 -2014)**

| Month | 2013 | | 2014 | |
|---|---|---|---|---|
| | Temperature | Rainfalls | Temperature | Rainfalls |
| **May** | 17.3 | 74.8 | 15.2 | 52.1 |
| **June** | 19.8 | 78.0 | 19.7 | 35.0 |
| **July** | 22.4 | 9.2 | 22.1 | 74.6 |
| **August** | 23.8 | 16.2 | 22.2 | 68.6 |

*Source: National Hydrometeorological Services of R.Macedonia (weather station in Prilep)

During the vegetation, tobacco plants create and accumulate a certain amount of green mass in the leaves of which, after drying, it gets dry weight. This amount of tobacco depends mainly on the biological potential of the variety, the quality of tobacco seedling, meteorological conditions, largely byagro-technical measures during the vegetation, the degree of maturity of tobacco, and drying process afterward. Drying tobacco is very important postharvest practice for obtaining the best possible quality of tobacco. According to Dimitrieski&Miceska (2011), dry tobacco yield from Prilep 66 9/7, is ranged from 2000 to 3600 kg/ha. The yield is highly dependent on growing conditions and applied agricultural practices. The average yield for both years (2013-2014) amounted to 2400 kg/ha. The results of our research are in correlation with the data reported by authors. Maturity of the Tobacco and drying process have great influence on obtain dry mass. The results showed that 615 kg green mass of tobacco is required to be dried, so to be produced 100 kg of dry mass.The

dimensions of the leaves depend on the variety, environmental conditions as well as agro technical measures in the vegetation period. The following data show the average values of leaf dimensions by harvest.The leaves from the top have smallest size.

**Table 2. Average value of length and width of tobacco leaf (average 2013/14)**

| Harvest | Length, cm | Width, cm | Ratio L:W |
|---|---|---|---|
| Lower | 10.70 | 5.60 | 1.91 |
| Middle | 15.80 | 7.40 | 2.13 |
| Upper | 10.30 | 5.00 | 2.06 |
| Average | 12.26 | 6.00 | 2.03 |

Table 2, clearly express the legality regarding the dimensions of tobacco leaves. The highest average length have leaves from middle belt (15.8 cm), and the lowest ones from the upper belt (10.3 cm). Karajankov et al. (2007), claim that oriental types of tobacco have small leaves up to 18 cm. The highest average width have the leaves from the middle (7.4 cm), and least, those from upper belt (5.0 cm). Data show that dimensions of the leaves are the result of the type of tobacco, or variety, and agro-environmental conditions during vegetation. The ratio length:width of the leaf, actually determines the form of the leaf. In general, the form of tobacco leaf is varieties feature which depends on affiliation. It is directly affected by weather conditions of and agro-technical measures implemented during vegetation of tobacco (Boceski, 2003). The shape of the leaf is not a significant feature in the technological processing of the leaf, because during drying it changes as a result of contraction of the leaf and reducing the surface of tissue.Data in Table 2 show that the ratio L: W of the leaves as the average value of the leaves is 2.03. It means that ratio is favorable, if considered that the best ratio is 2: 1 (lamina is relatively symmetric with regard to the main rib). Mitreski (2012), points out that ratio green: dry mass of oriental tobacco Prilep varieties, ranges from 6.11-6.95: 1. In terms of technological characteristics of raw tobacco, or the contents of tobacco ribs, they are an important indicator of the quality of raw material. The high content of main rib is always a sign of poor quality. The content of main rib in the oriental tobacco is low and rarely exceed 20% of the total weight of the leaf (Mitreski, 2012).The thickness of tobacco leaf depends on the anatomical structure, cell size parenchyma, thickening of the membrane and intracellular spaces. For thickness, ribs have some effect. In general, as long as the leaves are thicker, the quality is even worse, and vice versa. Materiality tobacco leaves indicates the amount of dry matter (g / m$^2$), which is located in the leaf tobacco per unit leaf area without main rib and without secondary ribs. Materiality is variable, but within certain limits.The obtained values of the physical properties of the raw material of Prilep 66 9/7, shown in Table 3.

**Table 3. Physical characteristics of raw tobacco (average 2013/14)**

| Harvest | Rib, % | Leaflamina, % | Thickness, μm | Materiality,g/m$^2$ |
|---|---|---|---|---|
| Lower | 22.99 | 77.05 | 65.90 | 42.13 |
| Middle | 18.68 | 81.30 | 73.20 | 46.28 |
| Upper | 15.49 | 84.51 | 91.70 | 67.35 |
| Average | 19.05 | 80.95 | 76.94 | 51.92 |

The content of the main rib decreases from bottom to top (Table 3). According to the legality, increasing participation of leaf going from the bottom up, this is characteristic of oriental tobacco. The results show that leaf lamina is represented by 77.05% (lower leaves), 81.30% of the leaves from the middle band, and 84.51% in the top insertions. The average value (19.05%) of main rib and (80.95%) lamina as characteristic of the variety, positively influence physical and degustative properties of raw material. The thickness of the leaves increases, going from the bottom (65.9μm) to the middle band,up to the top (91.7μm). The results fit with the materiality of raw tobacco, in the range of oriental tobacco (Uzunoski 1985). The greatest features of materiality haveupperleaves (67.35g/m$^2$). Greater materiality in upper insertions explained as a result of their enhanced photosynthesis activity by transferring part of the plastic materials from the lower to the upper leaves (Macedonian oriental types of tobacco are characterized by moderate materiality).

## CONCLUSIONS

The yield and quality of tobacco began to be formed already in the process of production of tobacco seedlings, as a main factor for better acceptance after transplanting.

The results showed that there is a need of using the respective equipment in the process of tobacco production. The meteorological conditions have great influence on process of production.

Apart from the biological potential of the variety, the obtained yield and quality largely depend on influence of many other environmental factors, including on time solid preparation and tillage of the soil.

The ratio 6.1: 1 between green mass and dry mass of tobacco means that during the process of drying, significant physiological changes, took place in the structure of the leaves of tobacco.

Mainly, 80.95% is the leaf lamina, while the contents of the rib represents 19.5% of the entire leaf. Materiality of the Tobacco leaf is on average 51.92 g / m$^2$, ranges within the limits of oriental varieties of tobacco.

In order to achieve adequate yield and quality of raw material it is recommended to implement appropriate, on time agro technical practices.

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