

CHEMICAL PROPERTIES OF TOBACCO IN SOME ORIENTAL VARIETIES FROM THE TYPE PRILEP

Jordan Trajkoski, Milan Mitreski, Valentina Pelivanoska, Natasa Zdraveska, Robin Mavroski

*University "St. Kliment Ohridski"- Bitola
Scientific Tobacco Institute - Prilep Kicevska bb, 7500, Prilep, Macedonia*

e-mail: trajkoski89@gmail.com

ABSTRACT

The chemical composition of tobacco, comprise about 3000 components, but we studied those that most affect its quality, and through him the smoking properties of tobacco: nicotine, total N, protein, soluble sugars and minerals. Investigations were carried out in the Scientific Tobacco Institute – Prilep and included four varieties of Prilep tobacco: Prilep P-23 (Ø), P-66-9/7, NS-72 and P-79-94. The trial was set up in randomized block design with four replicates. The analysis of chemical composition of cured tobacco was made by standard and accepted methods in the accredited laboratory L03 of the Scientific Tobacco Institute - Prilep. From the results we can conclude that all the varieties are distinguished by good chemical properties, or it comes to good quality of tobacco raw type prilep.

Keywords: type prilep, chemical properties, tobacco varieties

ХЕМИСКИ СВОЈСТВА НА ТУТУНОТ КАЈ НЕКОИ ОРИЕНТАЛСКИ СОРТИ ОД ТИПОТ ПРИЛЕП

Хемискиот состав на тутунот го сочинуваат околу 3 000 компоненти, но ние ги проучивме оние што најмногу влијаат на неговиот квалитет, а преку него и на пушачките својства на цигарите: никотинот, вкупниот азот, белковините, растворливите шеќери и минералните материи. Истражувањата се извршени во Научниот институт за тутун во Прилеп. Опитот беше поставен во четири повторувања по методот Рандомизирани блокови. Испитувани се четири сорти од типот прилеп: прилеп П-23 (контрола); П-66-9/7; НС-72 и П-79-94. Анализите за хемискиот состав на сувиот тутун се направени по стандардни и општоприфатени методи во акредитираната Лабораторија - L03 во Одделението за хемија на тутунот, тутунскиот чад и остатоци од пестициди при Научниот институт за тутун - Прилеп. Од добиените резултати можеме да констатираме дека предметните сорти се одликуваат со добри хемиски својства, односно станува збор за квалитетна тутунска суровина од типот прилеп.

Клучни зборови: тип прилеп, хемиски својства, сорти тутун

INTRODUCTION

The consumption of tobacco in the world is increasing steadily. In recent decades, with the introduction of filter cigarettes, the manufacture of cigarettes with low nicotine content and the use of appropriate materials, greatly contribute to increasing growth.

Tobacco production takes an important place in the economy of the Republic of Macedonia. Its importance is reflected by the fact that the raw material is primarily intended for export to world tobacco markets. Our country is known producer of high-quality aromatic oriental tobacco type, participating in the recipes for making the finest cigarette brands in the world.

Uzunoski (1985), divides elements of quality that characterized tobacco into three groups:

- Chemical indicators of quality
- Physical indicators of quality
- Tasting properties of tobacco

A number of research and practical findings suggest that in the formation of the chemical composition of tobacco, the biggest impact have the type, variety, ecological conditions in the region and applied agro-techniques. From the connection of these factors depends the intern relationship of chemical

components, which in turn reflect the quality of smoking tobacco.

Our purpose with this study was to investigate the chemical and display those properties that most affect the quality of tobacco: total nitrogen, nicotine, proteins, soluble sugars and minerals.

MATERIAL AND METHOD

The trial was set up in 2014 on dilluvial-colluvial soil in the field of Tobacco Institute-Prielp with four varieties of Prilep tobacco (P-23, P-66-9/7, NS-72 and P-79-94). Seedlings were produced in cold seedbeds. The second spring ploughing was followed by fertilization with NPK 10:30:20 in a rate of 250 kg/ha. The experiment was designed in randomized blocks with four replicates. Tobacco was transplanted manually at 40 cm spacing between the rows and 12 cm between the stalks. The area of each plot was 10 m². All necessary agro-technical measures for normal growth and development were applied in the field during the growing season. In July watering of the trial with

wing sprinklers system was applied with 25 l/m² water. After harvesting, tobacco was sun-cured in barns specially designed for drying of oriental tobacco. Average samples for chemical analysis were taken from fermented tobacco by standard methods. Analyses of chemical composition were performed in accredited laboratory L03 in Tobacco Institute-Prielp, by recognized and generally accepted methods.

Subject of our investigations was the content of the following chemical compounds in dry tobacco leaves: nicotine, Total nitrogen, proteins, soluble sugars and mineral matters. Shmuk quality index was also determined.

SOIL CONDITIONS

Production of high quality tobacco is closely related to the soil type. Soil with its mechanical composition and nutrients content is a medium in which tobacco plants grow, develop and reach their genetic potential.

The trials were performed on delluvial-colluvial, the most represented soil type in the region of Prilep. Agrochemical characteristics of the soil on which the trial was conducted are presented in Table 1.

Table 1. Agrochemical characteristics of the soil

Horizon	Depth (cm)	Humus (%)	CaCo3 (%)	pH in		Available nutrients mg/100gr		N (%)	C:N
				H2O	KCl	P2O5	K2O		
				I	0 - 30	0,53	-		
II	30 - 57	0,43	-	5,94	4,78	1,75	19,2	0,055	4,53
III	57 - 83	0,39	-	6,15	4,95	1,9	18,5	0,055	4,11
IV	83 - 100	0,26	-	6,29	5,05	1,25	13,3	0,049	3,08
V	> 100	0,24	-	6,70	6,01	2,00	9,3	0,046	3,03

Data presented in Table 1 show that the soil on which the trial was conducted is characterized by a very low content of organic matter, low total nitrogen, moderately acid-

ic, slightly acidic to neutral pH of the soil solution, low to extremely low supply of P2O5 and medium to good supply of physiologically active K2O.

RESULTS AND DISCUSSION

Chemical composition of tobacco is a complex of substances such as organic acids, organic bases, alkaloids, nitrogen compounds, proteins, carbohydrates, essential oils and resins. Tobacco is very adaptable plant to the external environment which highly affects its chemical composition, anatom-

ic structure and physical properties. Any change of water, nutrient and light regime leads to modification of the basic properties of raw tobacco (Vesselinov, 1964). The results of our investigation on chemical composition of some varieties are presented in Table 2.

Table 2. Chemical composition of tobacco

No.	Variety	Nicotine %	Total N %	Proteins %	Soluble sugars %	Mineral matters %	Shmuk quality index
1.	P - 23 Ø	0.94	1.90	6.59	14.15	16.66	2.15
2.	P-66-9/7	0.87	2.16	6.63	17.99	14.29	2.71
3.	NS-72	0.88	2.30	6.98	14.67	15.78	2.10
4.	P-79-94	0.91	2.20	6.75	13.67	16.49	2.03

Nicotine

Nicotine as a chemical compound is one of the major representatives of the alkaloids contained in tobacco plant and an important indicator of quality of tobacco raw. In fresh condition it is oil-like liquid, without color and smell. When exposed to air it turns yellow and then dark (Uzunoski, 1985). The nicotine content is a variety characteristic that varies depending on the agri-environmental

conditions and the cultural practices applied. Nicotine is synthesized in the roots and then through the stalk it comes to the leaves.

Turšić (1993), reports that tobacco fertilization with certain doses of nitrogen can increase the nicotine content from 20.7 to 34.9%.

In the tested varieties from type Prilep in 2014, the content of nicotine was slightly

lower and it is from 0.88% in the variety NS-72, to 0.94% in the control variety P-23.

This reduction is due to the larger amount of rain during the vegetation.

Total N

A number of authors reported that higher amount of Total N in tobacco has a negative impact on its quality.

According to Uzunovski (1985), total nitrogen content increases from lower to the upper insertions and varies depending on the conditions of growing and the type of

tobacco.

The average values show that maximum total N (2.30%) has the variety NS-72, and the minimum has the control variety (1.90%). In the other two varieties the total N content is nearly the same or is from 2.16 for P-66-9/7, to 2.20% in P-79-94.

Proteins

Proteins are complex organic compounds that have a special place in the chemical composition of tobacco, expressed through the smoking and taste properties of tobacco raw material.

According to Timov et al. (1974), the optimum content of Total N ranges between 5% and 10%. The contents below 5% impair the taste of tobacco and the smoker feels bitterness, irritation of throat and unpleas-

ant smell.

According to Shmuk (1948), good quality tobacco should contain between 7 and 9% protein.

The results of our investigations have shown that the content of proteins for three varieties of the type Prilep are in optimal range as an expression of the quality of tobacco raw material, or it is from 6.59 for control variety, to 6.98% for NS-72.

Soluble sugars

Soluble sugars (monosaccharides and disaccharides) are the first products of the photosynthesis. The quality of tobacco is highly affected by the content of soluble sugars. The higher content of soluble sugars has a beneficial influence on tobacco taste and improves the aroma through neutralization of the negative impact of proteins, giving tobacco smoke an acidic reaction.

Veselinov (quoted by Uzunovski, 1985), reported that high quality oriental tobaccos should contain 14 to 18% of soluble sugars. Table 2 clearly shows that the variety P-66-9/7 contains the greatest amount of soluble sugars (17.99%), and lowest amount we have for the variety P-79-94 (13.67%). And for the check variety P-23, the value of this property is 14.15%.

Mineral matters

Mineral matters are important part of the chemical composition of tobacco and their share in the total dry mass content ranges from 9 to 30%. They are expressed through the ashes content that remains after the burning of tobacco. It is considered that higher content of mineral matters has a negative impact on tobacco quality.

Mitreski (2012) reported that the content of mineral matter in Prilep tobacco varieties

ranges between 10.7% and 14.5%.

According to Alić - Đemidžić et al (1999), and Butorac (2009), the most important ingredients of the mineral complex of tobacco are potassium, calcium and magnesium.

In our research (Table 2), the average content of mineral substances is from 14.29 for P-66-9/7, to 16.66 for P-23 (Ø). The data presented in the table for this property, shows that it is a quality varieties tobacco from type Prilep.

Shmuk quality index

Shmuk index is the ratio between soluble sugars and proteins and it presents a coefficient for evaluation of tobacco quality. Its higher value denotes better quality of tobacco raw. In our investigations, the Shmuk index ranges from 2.03 in the variety P-79-94, 2.10 in NS-72, 2.15 in P-23 to 2.71 variety P-66-9/7.

Donev and Zlatev (1974), pointed out that the soluble sugars and proteins ratio is used as an objective criterion for estimation of tobacco quality. According to them, good quality tobaccos are those with Shmuk index 2 and over 2. Therefrom, it can be stated that the investigated varieties of Prilep tobacco are characterized by a very good quality.

CONCLUSION

Based on the results obtained from research on the chemical properties of the subject varieties, we made the following conclusions: The content of total nitrogen is within the limits of oriental tobaccos from type Prilep. In all varieties, the total nitrogen is below 3%, which will positively reflect in the tobacco smoking material.

Nicotine content is from 0.87 for P-66-9/7, to 0.94% of P-23. Although the content of nicotine is a variety feature, it depends on soil and climatic conditions in the region of production.

The average protein content is within the limits of oriental tobacco. The same ranges from 6.63 in P-66-9/7, to 6.98% in NS-72,

which is a sign of quality tobacco raw.

Soluble sugars are also in the optimal range. Their proportion of protein is a versatile, which indicates on good quality tobacco.

The average values of minerals are moving from 14.29 in P-66-9 / 7, to 16.66% in P-23. In the other two varieties the average content of minerals is at 15.78 NS-72, or 16.49% in the variety P-79-94.

Shmuk quality index has a positive value (greater than one), for all tested varieties from the type Prilep.

Studies on the chemical composition of the varieties have shown that it is a high quality oriental tobacco raw which is likely to have good tasting features.

REFERENCES

1. Alić - Đemidžić N., Beljo J., Đemidžić M., 1999. Tehnologija obrade i prerada duhana, Sarajevo.
2. Butorac J., 2009. Duhan. Naklada Stih. Kugler, Zagreb.
3. Веселинов Д. М., 1964. Стокознание на тютюна, София.
4. Донеv Н., Златев Г., 1974. Тютюнот в България.
5. Митрески, М., 2012, Компаративни проучувања на поважните производни, технолошки и квалитетни својства кај некои сорти тутун од типот прилеп. Докторска дисертација, Научен институт за тутун - Прилеп.
6. Тимов А., 1974. Ориенталският тютюн в България. Издателство на Българската академия на науките, София.
7. Turšić I., 1993. Komparativno istraživanje različitih dubina osnovne obrade tla u intez akcij s mineralnom gnoilom za duhan tipa virdžinia. Doktorska disertacija, Zagreb.
8. Узуноски М., 1985. Производство на тутун. Стопански весник, Скопје.
9. Шмук А., 1948. Хемија табака и махорки, Москва.