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Some Physical Characteristics of Tobacco Raw Material Type Virginia Grown in the Republic of Srpska Production Area

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Abstract: The aim of the research was to determine major physical properties of Virginia tobacco varieties DH-17 and Hewessi-17, grown at two different locations in the Republic of Srpska region. Investigations were carried out in 2004 - 2006, during three growing seasons (May - September). Dry tobacco leaf samples from the lower, middle and upper stalk belts were used in the investigation.

According to the obtained results, DH-17 had a better yield output as compared to Hewessi-17. Physical indexes of quality (length, width, thickness and midrib content in the total mass of leaf tissue) were better in Hewessi-17. The exception from this was leaf tissue substantiality, which was higher in D-17 than in Hewessi-17, as confirmed by the number of cigarettes produced from 1 kg of tobacco.

The study on Virginia tobaccos grown in the Republic of Srpska region suggest that DH-17 has a higher usability value compared to Hewessi-17.

Key words: tobacco, Virginia, growing period, insertion, physical properties, quality.

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Introduction

Tobacco, being a consumer item, is an original vegetative material of its kind. It is obvious that no other vegetative product has influenced political, economic, social and religious life of all nations and people to such a great extent, due to which they have always expressed an enormous interest in the production, trade, industrial processing and, of course, use of tobacco.

Virginia is a type of big leaf tobacco of great significance in modern cigarette production. Virginia tobacco is becoming an ever more demanding tobacco raw material worldwide and nationally.

The production of this type of tobacco is of recent date, commercial production in today's Republic of Srpska started in 1965. At the beginning, it spread in Croatia, in Virovitica area in the social sector, in the former Yugoslavia, which was the starting point for its further production by individual growers based on cooperative agreements. Significant efforts were made to introduce Virginia to other production areas of the former Yugoslavia, as well as to the area of today's Republic of Srpska.

The demanded quality of Virginia tobacco can be achieved through model production. Requirements for successful production of Virginia, in the first place, include a proper choice of land that has satisfactory physicochemical features and climate in terms of sum of temperatures and rainfalls in the growing period, and choice of proper varieties and drying performed in a quality manner.

Due to this, we believe that research on physical characteristics, apart from other features of the American tobaccos produced in the Republic of Srpska, has contributed both to evaluating the results from the production of this tobacco so far, and to assessing further potential intensification of the production of this type of tobacco, which is used in cigarette production – the main goal of this research.

In the Republic of Srpska, Virginia tobacco has been grown successfully due to similarity in climate and pedological conditions with those in the USA, where this tobacco originates from.

Materials and methods

Nowadays, Virginia tobacco is being grown on 800 hectares of land in the production area of the Republic of Srpska, namely on dominant types of land and in various environments.

The material used for the research comes from Virginia variety DH – 17, from the area of Bijeljina, and Hewessi – 17, from the area of Donji Žabar. Three-year studies were conducted from 2004 to 2006.

The middle leaves are of the best quality in Virginia tobacco. Quality drops as going from the middle part forward to the lower and upper positions of the leaves on the stalk. In order to evaluate the physical characteristics of the study material in a more complex manner, the middle leaf samples were selected in three variants: lower middle, actual middle and upper middle leaf for both varieties for all three experimental years.

These three variants of the middle leaf were selected for the research since the insertions account for 70% of mixing formulas for cigarettes.

Leaves of fermented tobaccos, processed using standard procedure, were used for the research. During the research, there were six samples per year, making up 18 in total for three years.

Each chosen tobacco sample was used for determination of physical parameters: length, width, thickness of tobacco leaf, main nerve content in total mass of the leaf tissue and substantiality of the leaf tissue. Physical characteristics of the tobacco were determined in accordance with internationally recognized methods, which are accepted and applied in the Tobacco Institute – Prilep, Republic of Macedonia.

Results are presented in tables and in graphs. Significance of results and difference in quality characteristics of tobacco were established through statistic analysis of variance using LSD test.

Climatic Conditions

Three-year data for air temperature and rainfall as basic climatic elements for the formation of physical characteristics of tobacco are presented in Tables 1, 2, 3. and 4.

During the tobacco growing period, the average air temperature in the area of Donji Žabar (Table 1) was 19.76°C and was higher than the long-term average of 19.60°C. However, in May, when tobacco was replanted, the air temperature was 16.33°C, and during the intensive growth period (June and July) the average air temperature was higher, which served as evidence of sufficient warmth for undisturbed tobacco growth in the field.

Likewise, during the tobacco growing period, the average air temperature in the Bijeljina region (Table 2) was 19.77°C and was lower than the long-term average of 20.10°C. However, in May, when tobacco was replanted, the air temperature was 16.56°C, and during intensive growth months (June and July), the average air temperature was higher, which served as evidence of sufficient warmth for the undisturbed growth and development of tobacco in the field.

Table 1. Average monthly air temperatures (°C) during the growing period (from V to IX) in the Donji Žabar region

Month	2004	2005	2006	Average 1997-2006
May	16.7	16.1	16.2	16.7
June	20.8	20.4	20.1	20.5
July	22.7	22.3	22.8	22.1
August	21.6	21.1	21.2	21.2
September	18.5	18.3	17.0	17.4
Average	20.1	19.7	19.5	19.6

Table 2. Average monthly air temperatures (°C) during the growing period (from V to IX) in the Bijeljina region

Month	2004	2005	2006	Average 1997-2006
May	15.4	17.2	17.1	17.8
June	20.3	20.3	20.9	21.4
July	22.6	22.4	24.8	22.4
August	22.0	20.4	19.7	22.3
September	18.4	17.9	17.7	16.8
Average	19.7	19.6	20.0	20.1

Data in Table 3 on rainfall in the Donji Žabar region during the research show that 2004 was the driest year, with 426 mm of precipitation in the growing period. The highest amount of rainfall was in 2005 - 701 mm, and in 2006 - 465 mm. These rainfall amounts satisfy tobacco needs for water in the growing period. However, since rainfall amounts are not uniformly distributed, it is necessary to use irrigation.

Table 3. Rainfall sum (mm) during the growing period (from V to IX) in the Donji Žabar region

Month	2004	2005	2006	Average 1997-2006
May	136	61	49	78
June	86	164	208	83
July	57	177	30	75
August	87	236	154	57
September	60	63	24	55
Sum for growing period	426	701	465	348
Annual sum	824	1042	772	786

Table 4, illustrating rainfall in the Bijeljina region during the research, shows that 2006 was the driest year, with 372.7 mm of precipitation in the growing period. The highest amount of rainfall was in 2005 – 487.6 mm, and in 2004 – 439.4 mm. These rainfall amounts satisfy tobacco needs for water in the growing period. However, since rainfall amounts, as in the Donji Žabar area, are not uniformly distributed, it is necessary to use irrigation.

Table 4. Rainfall sum (mm) during the growing period (from V to IX) in the Bijeljina region

Month	2004	2005	2006	Average 1997-2006
May	116.1	59	49.3	73.4
June	87.7	128.4	117.0	85.0
July	97.9	146.3	34.7	85.3
August	91	102.2	149.9	53.0
September	46.7	51.7	21.8	71.2
Sum for growing period	439.4	487.6	372.7	367.9
Annual sum	1009	1020	747.5	870

Results and Discussion

Physical characteristics of raw material

It could be claimed that physical characteristics of tobacco leaf, more than any other of its characteristics, reflect conditions in which tobacco was grown. Apart from variety, physical characteristics depend on many factors, such as: climatic conditions, use of agricultural engineering, drying and processing methods, position of the leaf on the stalk, as well as leaf ripening at tobacco harvest.

Tobacco leaf length (cm)

Tobacco leaf length is one of the most important characteristics of a variety. It depends on the insertion the leaves are taken from, although leaves of the middle insertion are always the longest. Maksimović (1986) states that tobacco leaf length depends on growing location, way of nutrition, irrigation and other agricultural engineering measures. Results of studying tobacco leaf length in the testing material are shown in Table 5.

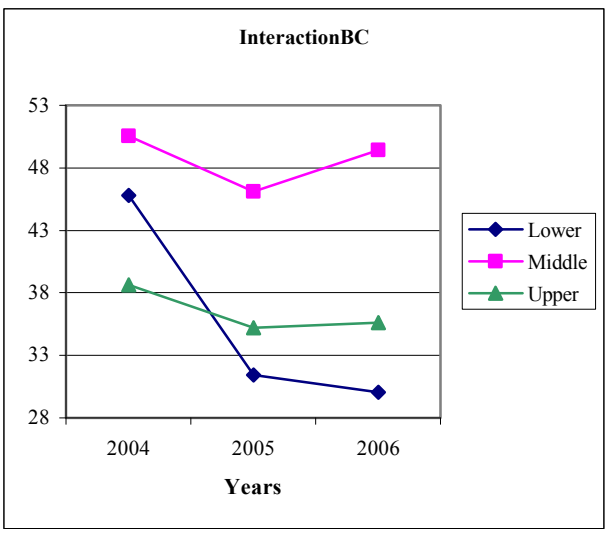
Table 5. Virginia tobacco leaf length (cm)

Varieties	*Year*	Insertions		
		Lower	*Middle*	*Upper*
DH - 17	2004	42.80	48.70	30.60
	2005	31.40	42.90	29.45
	2006	29.50	49.20	33.50
Hewessi - 17	2004	48.81	52.36	46.63
	2005	31.50	49.30	40.99
	2006	30.56	49.60	37.70
Basic factor C, $X_{average}$		35.76	48.68	36.48

Data on average values point to certain laws, suggesting that the longest was the leaf of the middle insertion (48.68cm), followed by the leaf of the upper insertion (36.48cm), and the leaf of the lower insertion (35.76cm).

The analysis of variance of average leaf length in Virginia tobacco varieties shows a statistically significant interaction effect between year and insertion, as illustrated in Graph 1.

Graph 1. Interaction effect between year and insertion



This deviation, implied by the interaction effect, referred to tobacco leaf length of the lower insertion in 2004. The average leaf length of the lower insertion was greater in comparison to the upper insertion, due to agricultural and climatic conditions, although it was expected to have a lower value, based on the tendencies observed. The analysis of variance clearly shows that leaf length in Hewessi – 17 was significantly greater than in DH – 17.

Tobacco leaf width (cm)

As a rule, tobacco leaf width is about 50% lower compared to leaf length. The relation between length and width is shown in tobacco practice. This relation can be of better use to breeders in further research on new varieties and improvement of existing varieties than it is in the tobacco practice itself. There is a demand in tobacco technology for tobaccos with longer and narrower leaves. This is important as it ensures better use of sunlight and facilitates mechanized harvest and drying of tobacco (Maksimović, 1986).

Results of the three-year research on tobacco leaf width are provided in Table 6.

Table 6. Virginia tobacco leaf width (cm)

Varieties	*Year*	Insertions		
		Lower	*Middle*	*Upper*
DH - 17	2004	22.40	23.20	14.30
	2005	1670	21.05	13.80
	2006	18.40	25.40	15.10
Hewessi - 17	2004	22.57	19.40	21.52
	2005	16.80	23.90	18.00
	2006	20.40	23.00	16.20
Basic factor C, $X_{average}$		19.54	22.66	16.49

The analysis of variance of average leaf width in the tested Virginia tobacco varieties does not show a statistically significant interaction; therefore, the conclusions could be in accordance with the average values of basic factors.

The analysis of the results provided in Table 6 shows that the largest width of tobacco leaf was found in the leaf of the middle insertion (22.66cm), followed by the leaf of the lower insertion (19.54cm) and the leaf of the upper insertion (16.49cm).

Tobacco leaf thickness (µ)

Tobacco leaf thickness is a physical characteristic used for evaluation of tobacco quality. Leaf thickness is a component used for determination of tobacco leaf tissue fullness.

Tobacco leaf thickness is positively correlated with tobacco leaf tissue fullness. Thin tissue is usually fuller, i.e. it has more content, meaning that this type of tissue features increased "sponge" spaces, with a deficiency in positive organic substances. Smaller thickness shows a higher quality of tobacco, so thin leaves are the result of starving tobacco leaves. Tobacco leaf thickness depends on variety, soil and climatic conditions and use of agricultural engineering practices in the growing period.

Filiposki (1986) says that mineral nutrition and increased soil moisture lead to a decrease in leaf thickness.

Tobacco leaf thickness varies across insertions, years and along the leaf itself. The leaf is not of the same thickness. The width of the leaf blade increases from the base toward the top, and it is vice versa at the main nerve: it is the thickest at the base and the thinnest at the top. Results of the three-year research are presented in Table 7.

Table 7. Virginia tobacco leaf thickness (μ)

Varieties	*Year*	Insertions		
		Lower	*Middle*	*Upper*
DH - 17	2004	178.00	191.00	203.00
	2005	94.75	89.50	117.75
	2006	65.40	70.50	110.50
Hewessi - 17	2004	216.00	213.00	207.00
	2005	96.00	105.00	104.00
	2006	80.00	82.00	109.50
Basic factor C, $X_{average}$		121.69	125.17	141.96

The analysis of variance of average leaf width in Virginia tobacco varieties does not show statistically significant interactions; therefore, the conclusions could be in accordance with the average values of basic factors.

The thickest is the leaf of the upper insertion (141.96μ), followed by the leaf of the middle insertion (125.17μ) and the leaf of the lower insertion (121.69μ), which points to certain laws. The average tobacco leaf thickness of the tested varieties shows that Hewessi – 17 has thicker leaves on average (134.72μ) in comparison to DH – 17 (124.48μ). Tobacco leaf thickness shows that the leaf was the thickest in 2004, and thickness was the smallest in 2006 in both varieties, which implies that agricultural and climatic conditions influenced this physical characteristic in the growing period.

Substantiality of leaf tissue (g/m^2)

Substantiality of the leaf tissue is also known as fullness of the leaf tissue. This characteristic depends more on leaf structure and less on chemical structure. Substantiality of the leaf tissue refers to dry matter content in a unit of leaf surface expressed in g/m^2.

Substantiality of the leaf tissue can be a positive or a negative index of tobacco quality. As regards substantiality of quality tobaccos, those with dominating material components (aromatic substances and soluble sugar) have a positive effect on quality and are marked as concentrated tobaccos. Fullness of the tissue is considered to be a highly important tobacco characteristic, since it produces a higher or lower degree of fullness, as well as more profitable usage in making cigarettes. Full and empty tobaccos, which have very high or very low substantiality, are negative indexes for tobacco quality. The use of agricultural engineering practices, fertilization and irrigation, have a certain influence on the substantiality of the tobacco leaf.

Filiposki (1986) stated that mineral nutrition and excess moisture lead to a significant decrease in substantiality of tobacco type Prilep.

Lazaroski (1983) reported that substantiality of the leaf tissue is an important factor in providing plants with water during the growing period.

Uzunovski (1985) found that tobaccos produced on fertile soil treated with nitrogen fertilizers are usually full tobaccos.

An analysis of substantiality of the leaf tissue in Virginia tobacco varieties is provided in Table 8.

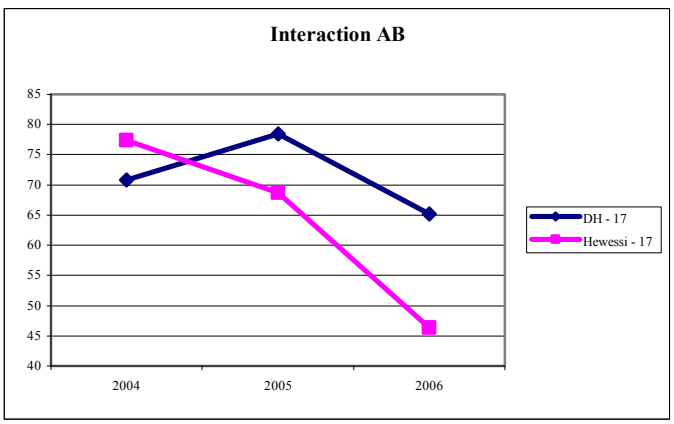
Table 8. Virginia tobacco leaf substantiality (g/m^2)

Varieties	*Year*	Insertions		
		Lower	*Middle*	*Upper*
DH - 17	2004	75.15	54.52	82.65
	2005	70.79	68.09	96.48
	2006	55.20	54.52	85.94
Hewessi - 17	2004	78.05	75.62	78.42
	2005	56.87	73.12	76.02
	2006	41.30	47.39	50.50
Basic factor C, $X_{average}$		62.89	62.21	78.33

The analysis of the data provided in Table 8 suggests that the leaf of the middle insertion has the least average substantiality of the leaf tissue (62.21 g/m^2), followed by the leaf of the lower insertion (62.89 g/m^2) and the leaf of the upper insertion, which has the largest substantiality (78.33 g/m^2).

The analysis of variance shows a significant interaction effect between variety and year, as illustrated in Graph 2.

Graph 2. Interaction between variety and year



The graphic analysis shows that the average substantiality of the leaf tissue in variety DH – 17 is larger than in Hewessi – 17. The substantiality of the leaf tissue in both varieties was larger in 2005 in comparison to 2006, while in 2004, it demonstrated deviations from the expected values, as implied by the interaction effect. The deviation was caused by agricultural and climatic conditions.

Results of the study on the substantiality of the leaf tissue are similar to those reported in available literature. Substantiality of the leaf tissue is a positive index of quality, to be confirmed in cigarette production, since 1 kg of cut tobacco produces a bigger number of cigarettes. An analysis of the number of cigarettes made out of 1 kg of cut tobacco of the test varieties is provided in Table 9.

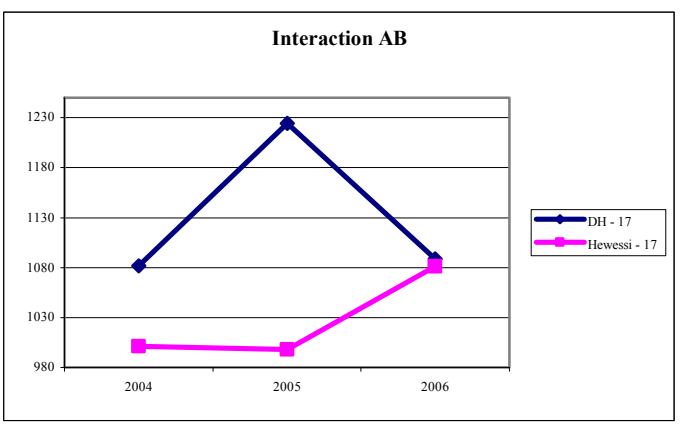
Table 9 shows that the smallest number of cigarettes was made out of the lower insertion leaf (1009), followed by the leaf of the upper insertion (1075), and the biggest number of cigarettes was made out of the leaf of the middle insertion (1121).

Table 9. Number of cigarettes made out of 1 kg of Virginia tobacco

Varieties	*Year*	Insertions		
		Lower	*Middle*	*Upper*
DH - 17	2004	930.00	1061.00	1065.00
	2005	1189.00	1224.00	1261.00
	2006	1033.00	1091.00	1143.00
Hewessi - 17	2004	954.00	1135.00	914.00
	2005	938.00	1042.00	1013.00
	2006	1010.00	1174.00	1059.00
Basic factor C, $X_{average}$		1009.00	1121.12	1075.83

The analysis of variance of the average number of cigarettes made out of 1 kg of cut tobacco shows a statistically significant interaction effect between year and insertion (Graph 3).

Graph 3. Interaction effect between variety and year



The graphic analysis of the interaction effect suggests that the average number of cigarettes made out of 1 kg of cut tobacco is higher in variety DH – 17 than in Hewessi – 17. The deviation implied by the interaction effect refers to the number of cigarettes made out of 1 kg of cut tobacco in 2005 in DH – 17, when it was statistically significantly higher in comparison to Hewessi – 17 in the same year.

Main nerve content in total mass of a leaf (%)

Leaf structure comes from leaf function and the content of chemical components. Tobacco leaf consists of two parts: the nerve and the leaf blade. The nerve is located at the middle of the leaf, across its length, from the base to the top. The nerve is different from the leaf blade in both chemical composition and technological characteristics. The leaf blade, as opposed to the nerve, bears biochemical and physical characteristics of the leaf. The contents of the nerve, in comparison to the total leaf mass, indicate leaf fineness and leaf thickness, which has a negative effect on cigarette production, due to increased specific weight, as well as due to the negative effect on the composition (length) of the tobacco tissue.

Modern processing of tobacco, with the introduction of re-drying systems with threshing, has provided extraction of the main nerve and its physical transformation (expansion) for easier usage in cigarette mixture. The use of the expanded main nerve in cigarette mixture, first of all, leads to an increase in the power of the filling material. Therefore, the content in the amount of 25% of the main nerve in composition of the tobacco leaf is not a problem any longer, as it used to be. Nowadays, we use the expanded nerve in the amount of 10% - 20 % in tobacco mixtures. In some world tobacco companies, the expanded nerve makes up to 30% of tobacco mixture. The expanded nerve has a significant influence in reducing tar and nicotine in tobacco smoke, as well. The use of the expanded nerve in tobacco mixtures has especially increased with the passing of the Law of the World Health Organization on tar and nicotine reduction in tobacco smoke of a cigarette. However, it is obvious that the expanded nerve is significantly used in the tobacco mixture technology, not only to reduce tar in tobacco smoke but also to reduce the price of the tobacco mixture used for cigarette production.

Filiposki (1986) observed that irrigation and fertilization increase the main nerve content of the overall mass of the tobacco leaf.

Iskilieva (1969) reported that the main nerve content of big leaf tobacco ranges from 28.70% to 33.30 %.

Ishity (in accordance with the statements of Maksimović, 1986) points out to the fact that topping and removal of cotters lead to an increase in leaf blade weight towards the nerve especially in upper harvesting. Anyway, the increase of the main nerve should be seen from the point of leaf size and, due to this, it is a relative size.

Maksimović (1986) reported that the main nerve content in Virginia tobaccos in the area of Veliko Gradište ranges from 23.27% to 28.54 %.

Results of the study on the main nerve content in the overall mass of the tobacco leaf are in accordance with the literature results.

The content of the main nerve in the overall mass of the tobacco leaf of Virginia tobacco is provided in Table 10.

Table 10. Content of the main nerve in the overall mass of the tobacco leaf (%)

Varieties	*Year*	Insertions		
		Lower	*Middle*	*Upper*
DH – 17	2004	19.95	24.10	16.44
	2005	19.00	18.80	14.57
	2006	20.30	24.16	16.09
Hewessi - 17	2004	25.30	32.10	25.20
	2005	21.29	22.74	17.52
	2006	20.10	28.08	18.92
Basic factor C, $X_{average}$		20.99	25.00	18.12

Since the analysis of variance of the main nerve content in the overall mass of the tobacco leaf does not show statistically significant interaction effects, conclusions could be in accordance with the average values of basic factors.

The highest content of the main nerve is in the leaf of the middle insertion (25.00%), followed by the leaf of the lower insertion (20.99%), and the smallest in the leaf of the upper insertion (18.12%). The average content of the main nerve in the overall mass of the tobacco leaf shows that Hewessi – 17 has a higher average content of the main nerve (23.47%) in comparison to DH – 17 (19.27%). The highest content of the main nerve in the overall mass of the tobacco leaf was in 2004 (23.85%) and the lowest in 2005 (18.97%). When testing significance through LSD test, it was found that the content of the main nerve in the overall mass of the tobacco leaf in 2004 in Hewessi – 17 had significantly higher values, and the effect of agricultural and climatic factors was also observed.

Conclusion

The results of the present study suggest the following:

Judging by long-term data, meteorological factors in the Republic of Srpska are in accordance with tobacco type.

Temperature conditions favored the production of Virginia tobaccos.

Average rainfall was satisfactory. However, rainfalls in the growing period were not uniformly distributed. These data clearly point to the necessity of using proper agricultural engineering practices to achieve proper quality of the raw material.

Tobacco leaf length in the studied samples ranged from 29.45 cm to 52.36 cm. The longest was the leaf of the middle insertion, in both varieties and in all three years, followed by the leaf of the upper insertion, and the smallest length was in

the leaf of the lower insertion. The analysis of variance clearly shows that length of Hewessi – 17 is significantly greater in comparison to DH – 17.

Tobacco leaf width in the studied samples ranged from 13.30 cm to 25.40 cm. The largest width of tobacco leaf was found in the leaf of the middle insertion (22.66cm), followed by the leaf of the lower insertion (19.54cm), and the leaf of the upper insertion (16.49cm). Hewessi – 17 had a wider leaf (20.20 cm) in comparison to DH – 17 (18.93cm).

Tobacco leaf thickness of the studied varieties ranged from 65.40 μ to 216.00 μ. Virginia tobacco of variety Hewessi – 17 (134.72μ) had thicker average leaf in comparison to DH – 17 (124.48μ). The tobacco leaf was the thickest in 2004 (201.33 μ), and the thinnest in 2006 (86.32 μ). The thickest was the leaf of the upper insertion (141.96μ), followed by the leaf of the middle insertion (125.17μ), and the leaf of the lower insertion (121.69μ).

Substantiality of the leaf tissue in the studied samples ranged from 41.30 to 96.48 g/m^2. The largest substantiality of the leaf tissue was found in the leaf of the upper insertion, followed by the leaf of the lower insertion and the leaf of the middle insertion. The average substantiality of the leaf tissue in DH – 17 was larger than in Hewessi – 17. Substantiality of the leaf tissue in all varieties is a positive index of quality, as confirmed by the number of cigarettes produced out of 1 kg of tobacco. The number of cigarettes produced out of 1 kg of tobacco of the studied samples ranged from 914.00 to 1261.00. The biggest average number of cigarettes was made out of the leaf of the middle insertion (1121.12), followed by the leaf of the upper insertion (1075.83), and the leaf of the lower insertion (1009.00). On average, the biggest number of cigarettes was produced from variety DH – 17 in comparison to variety Hewessi – 17.

The contents of the main nerve in the overall mass of the tobacco leaf in the studied samples ranged from 14.57% to 32.10 %. Hewessi – 17 had a higher content of the main nerve on average (23.47%) in comparison to DH – 17 (19.27%). The highest main nerve content was in the leaf of the middle insertion (24.99%), followed by the leaf of the lower insertion (20.99%), and the leaf of the upper insertion (18.12%).

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NEKE FIZIČKE KARAKTERISTIKE DUVANSKE SIROVINE TIPA VIRDŽINIJA SA PROIZVODNOG PODRUČJA REPUBLIKE SRPSKE

- originalni naučni rad -

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Rezime

Fizička svojstva duvanskog lista su odraz uslova u kojima je duvan gajen. Osim od sorte, fizička svojstva zavise od klimatskih uslova, primenjene agrotehnike, načina sušenja i obrade, položaja lista na stabljici, kao i zrelosti lista u momentu berbe duvana. U radu su izneti rezultati ispitivanja fizičkih karakteristika virdžinijskih duvana (sorte DH - 17 sa područja Bijeljine i sorte Hewessi – 17 sa područja Donji Žabar) pored ostalih svojstava, kako bi se procenila upotrebna vrednost ovog tipa duvana koji se koristi u fabrikaciji cigareta. Da bi se što kompleksnije sagledale fizičke karakteristike ispitivanih materijala odabrani su uzorci srednjeg lista u tri varijante: donji srednji, pravi srednji i gornji srednji. Ove tri varijante su odabrane za istraživanja zato što u 70% slučajeva date insercije učestvuju u mešavinama cigareta. Od fizičkih svojstava određivani su: dužina, širina, debljina duvanskog lista, materijalnost lisnog tkiva i sadržaj glavnog rebra u ukupnoj masi lista. Dužina lista je jedna od najvažnijih sortnih karakteristika. Rezultati ispitivanja su različiti i zavise od položaja lista na struku. Najveća dužina je na pravom srednjem listu kod obe sorte, kod sorte DH – 17 kreće se od 42,90 – 49,20 cm, a kod Hewessi – 17 od 49,30 – 52,36 cm. Najmanju širinu ima gornji srednji list 16,49 cm, a najveću širinu ima pravi srednji list 22,66 cm. Najveću debljinu ima gornji srednji list 141,96 μ, a najmanju donji srednji list 121,69 μ. Sorta Hewessi – 17 ima deblji list u odnosu na sortu DH – 17. Za materijalnost lisnog tkiva najveću vrednost ima gornji srednji list 78,33 g/m^2 , a najmanju pravi srednji list 62,21 g/m^2 . Veću materijalnost lisnog tkiva pokazuje sorta DH – 17. Sadržaj glavnog rebra predstavlja važan fizički parametar kvaliteta duvana. Zastupljenost glavnog rebra u ukupnoj težini lista je najveća u pravom srednjem listu 25%, a najmanja u gornjem srednjem listu 18,12%. Sorta Hewessi – 17 pokazuje veću zastupljenost

glavnog rebra. Istraživanja pokazuju da na fizičke karakteristike virdžinijskih duvana proizvedenih na području Republike Srpske uticaj imaju klimatski uslovi u toku vegetacije, a dobijeni rezultati su slični rezultatima koji su prezentovani u dostupnoj literaturi.
Ključne reči: duvan, Virdžinija.