UDC 633.71
Тутун/Tobacco, Vol.56, Nº 9-10, 183-189, 2006
Институт за тутун - Прилеп, Р. Македонија

ISSN 0494-3244

УДК: 633.71-152.61(497.2)
Изворен научен труд

INVESTIGATION ON THE TYPICAL NATURE OF THE BULGARIAN VIRGINIA TOBACCOS

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1. INTRODUCTION

The big variety resulting from the combination of the different soil and climatic conditions in the separate regions of the country substantiates also the obtaining of a raw stuff different in nature (3). Tabakova et al. (7) studying the chemical composition of the Bulgarian large leaf tobaccos established that the variation of the indicators is mainly depending on the harvest belt and the crop, and less on the region and micro region of growing. The investigations performed by the Apostolova (1), Yordanov (10) and Chifudov (2) prove that by application of differentiated agrotechnical devices in proper regions, it is possible to guide and manage the tobacco production into the desired direction - either to neutral or aromatic type.

Johnson (6) made a differentiated quality description of the types of Virginia tobacco, grown in the USA, Brazil, Canada and Zimbabwe, with the purpose of their application in the respective cigarette blends. Davids &. Nielsen (4) set up and guide their investigations, originating from the contemporary trends of production and search of Virginia tobacco of the "aromatic" type, having favourable carbohydrate and nicotine content.

It is well-known that main criteria to assign this type of tobaccos to one group or another are the nicotine content, which for the "aromatic" type should exceed 2,0-2,5%, the ratio of total nitrogen/ nicotine within 0,6 to 1,0 at relative content of soluble sugars - 15 - 18%. Virgin tobaccos that deviate from these levels of the mentioned indicators are of the so-called "neutral" type and are used in the composition of the cigarette blends for filling, blend price regulation and tobacco utilization. Vital for the consumption prove to be the smoking properties of the product, depending on the above indicators (5, 11).

This investigation aims at studying the level of typicality of the Vriginia tobacco, grown in the different regions of our country, with view of its assigning to the groups "aromatic" and "neutral".

Subject to investigation have been tobaccos of 2004 crop from the largest yield regions according to the state quotas for the different varieties and regions. To determine the level of typicality and to assign the Virginia tobaccos, grown in our country, to the groups of "neutral" and "aromatic" main objective quality indicators have been applied.

2. MATERIJALS AND METHODS

The investigation of the Virginia variety group, with view of assigning to the groups of "aromatic" and "neutral" was made with the widely grown varieties in Bulgaria V 0454 and V 0514.

The regions where this investigation took place are, as follows: Stara Zagora - variety V 0454; Parvomay - variety V 0454; Pazardzhik - variety V 0454; Yambol - variety V 0514; Byala Slatina - variety V 0514; Opaka - variety V 0514; Belene - variety V 0514.

The samples for investigation were taken from the drying points of the relevant growers. They were formed of the best typical (the best quality) harvest belt for the type - "C', including class I.

The material from the respective regions has been preliminary prйcised (unified), with view of investigating one and the same raw stuff from the different regions.

The indicators used for the assessment are:

Physical indicators: length, cm; width, cm; ratio of length/width; thickness of the leaf blade, mm; cut tobacco density, g/cm3.

Well-known routine methods have been applied.

Chemical indicators of tobacco: nicotine, % - ISO 15152; reducing sugars, % - ISO 15154; total nitrogen, % - BDS 15836-88; mineral composition (ashes), % - ISO 2817; potassium, % - BDS 17365-94; hexane extract, % - TTPI by SOXTEC; ratio of reducing sugars/nicotine; ratio of total nitrogen/nicotine (Tso number) (8).

Chemical indicators of tobacco smoke: nicotine, mg/cig; tars, mg/cig.

These indicators have been calculated on the basis of some regressive dependencies established between tobacco composition and smoke.

"Image" taking of the varieties. It was performed by means of a spectrum photometric determination of the discrete values of absorption of a water extract from tobacco within the range of 220 to 350 nm wave length.

Expert estimation. It was made by a seven-member commission by the method of direct comparison at preliminary encoding of samples.

Taste estimation. It was made by puffing up the cigarettes by the method of Profile Description of the smoking properties. For each feeling it was established the intensity of its performance (for taste and flavour) in three stages (weak, average and strong), and in six stages for the physiological power, respectively, by giving a certain number of "penalty scores".

3. RESULTS AND DISCUSSION

The physical indicators of the investigated tobaccos are placed in Table 1.

The results show insignificant differences with regard to the investigated indicators. Larger dimensions - length, breadth, respectively, is typical for the tobaccos of the variety V 0514, except for those of the region of Belene. For the tobaccos of the same variety it was established a bigger filling ability, less density, respectively, except for the region of Yambol and Stara Zagora. The existing differences as to the indicator of density are better expressed for the region of Opaka (less density) and the region of Stara Zagora (bigger density).

Table 1 - Physical indicators of tobacco
Таб.1 Физички показатели за тутунот

Region Реон	Variety Сорта	Length L, cm должина	Width W, cm ширина	Ratio L/W Однос Д/Ш	Leaf blade thickness, mm Дебелина на лисна плојка	Cut tobacco density, g/cm^3 Дензитет на режан тутун
Stara Zagora	V 0454	41.26	18.44	2.24	0.14	0.288
Parvomay	V 0454	45.91	16.54	2.35	0.16	0.222
Pazardzhik	V 0454	47.04	20.22	2.33	0.19	0.214
Yambol	V 0514	51.90	24.52	2.12	0.16	0.296
Byala Slatina	V 0514	52.29	19.55	2.01	0.20	0.198
Opaka	V 0514	52.80	24.35	2.17	0.17	0.178
Belene	V 0514	44.32	19.42	2.28	0.17	0.186

The data about the chemical indicators of the investigated tobaccos are placed in Table 2.

On considering the mentioned in the introduction about the typical indicators (nicotine, ratio of nitrogen/nicotine and reducing sugars), featuring Virginia tobacco and the data in Table 2, we may divide the tobaccos into the following three groups: Group One - includes the tobaccos from the regions of North Bulgaria in the following order: Byala Slatina, Opaka and Belene - having relatively the most balanced chemical composition for this type of tobacco. Group Two - Stara Zagora, Pazardzhik and Parvomay. Group Three - Yambol. The tobaccos of group two stay closer to group one, and there are no significant differences between the latter. Group three has the most significant deviations from the typical indicators for Virginia. By the other investigated chemical indicators no significant indicators have been established. It is proved that the same variety (V 0514) under the impact of the ecological and climatic factors gives essential differences in quality aspect.

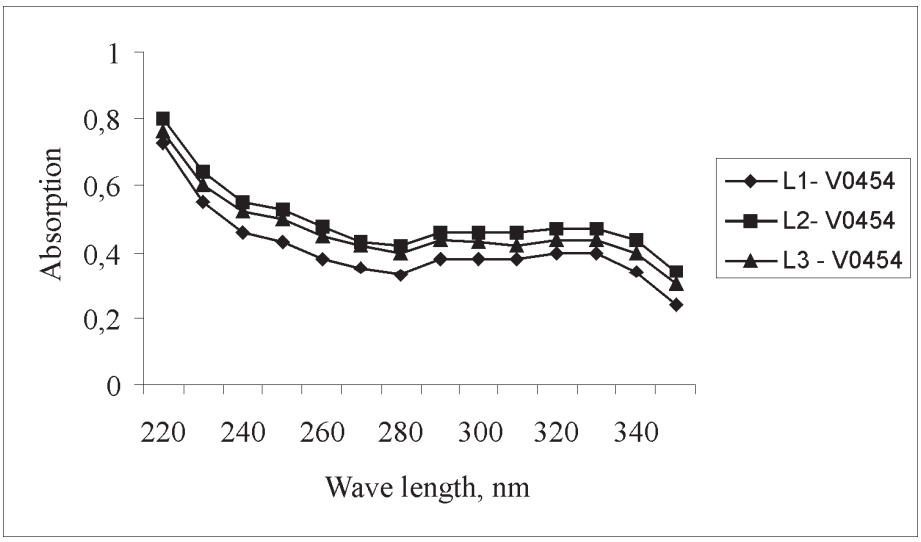
Table 2 - Chemical composition of tobacco and tobacco smoke
Таб.2 Хемиски состав на тутунот и тутунскиот чад

Region	Stara Zagora	Parvomay	Pazardzhik	Yambol	Byala Slatina	Opaka	Belene
Variety	V 0454	V 0454	V 0454	V 0514	V 0514	V 0514	V 0514
Chemical composition of tobacco, % - Хемиски состав на тутунот, %							
Nicotine	1.69	1.40	1.40	0.61	2.50	2.27	1.79
Red. sugars	20.50	22.10	19.50	29.70	12.10	16.40	16.70
Red. sugars/nicotine	12	16	14	49	8	7	9
Total nitrogen	1.62	1.41	1.38	1.24	1.47	1.81	1.82
Total	0.96	1.01	0.99	2.03	0.59	0.80	1.02
nitrogen/nicotine	13.90	11.40	12.10	8.30	12.20	16.80	11.60
Ashes	1.71	1.53	1.31	1.95	1.25	1.79	0.83
Potassium	6.14	6.57	6.59	3.62	5.70	6.11	6.71
Hexane extract							
Chemical composition of tobacco smoke, mg/cig - Хемиски состав на тутунскиот чад mg/cig							
Nicotine	1.36	1.10	1.10	0.56	2.22	1.95	1.45
Tars	18.75	19.00	18.79	19.41	18.36	18.79	18.52

As to the chemical composition of smoke there is a completely expressed correlative relation between nicotine in tobacco and nicotine in smoke. The ash content between the different samples does not show any differences, because they vary within the method for their establishment.

The spectrum photometric estimation of tobaccos through "image taking" was performed on the basis of comparison of the same variety from different regions of growing. The results (Fig. 1.) demonstrate that the variety V 0454 (grown in the regions of Stara Zagora, Parvomay and Pazardzhik) has the same kind of quality performance, expressed through the spectral features.

Fig. 1. Spectrum photometric estimation of tobaccos through "image taking": L1- V 0454 Stara Zagora; L2- V 0454 Parvomay; L3- V 0454 Pazardzhik
Граф. 1 Спектрофотометриска проценка на тутунот со сликање



Despite of keeping the general nature, the charts show presence of certain quantity differences in the substances, which results from the differences in the soil climatic and ecological conditions in these regions. Closer to the values of absorption stay the tobaccos from the region

of Parvomay and Pazardzhik unlke the region of Stara Zagora. The general nature of the spectral curves depends on the variety that retains its biological peculiarities in the performance of the quality indicators.

Analogous to them are also the results reflected in Figure 2 for variety V 0514 grown in the regions: Yambol, Byala Slatina, Opaka and Belene.

The closest by general description of quality are the regions of Byala Slatina and Opaka, as after wavelength of 280 nm the differences between the tobaccos from the regions of Yambol, Byala Slatina and Opaka are getting smaller, i.e. the substances, whose spectra cover this range are closer. It makes the impression that the spectral curve, concerning the region of Belene, differs more significantly from the rest.

The results obtained from the expert's estimation of the samples are placed in Table 3.

It was checked the coordination of the results of the commission (arrangement) by the criterion of Kendal, W=0,55 and its importance by the criterion of Fischer - Ff=7,34>F?=2,38 for ?<0,05%. This result demonstrates that experts estimate the samples in the same manner and that the differences between them are reliably differentiated (they actually exist).

Fig. 2. Spectrum photometric estimation of tobaccos through "image taking":
L4- V 0514 Yambol; L5- V 0514 Byala Slatina; L6- V 0514 Opaka; L7- V 0514 Belene.
Граф. 2 Спектрофотометриска проценка на тутунот преку сликање

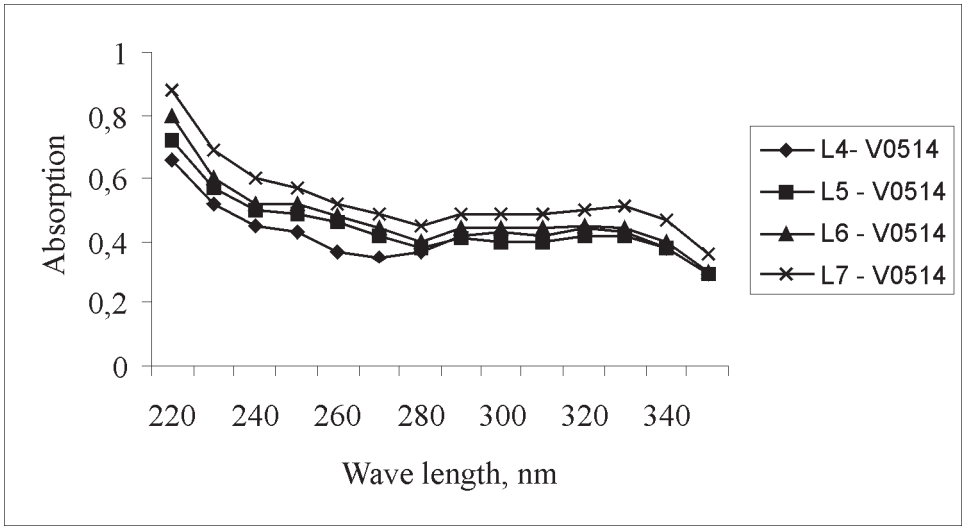


Table 3 - Expert's estimation of tobaccos
Табела 3 Експертска проценка на тутуните

Expert – i Експерт-и	Sample – j Мостра - j						
	1	2	3	4	5	6	7
1	3	6	5	7	1.5	1.5	4
2	4	6	5	7	2	1	3
3	3	6	5	7	2	1	4
4	2.5	6	5	7	2.5	1	4
5	4	7	5	6	2	1	3
6	4	6	5	7	3	1	2
7	3	6	5	7	2	1	4
Σxij	23.5	43	35	48	15	7.5	24
Ranging	3	6	5	7	2	1	4
Coef. of relative ranging	0.12	0.22	0.18	0.24	0.08	0.04	0.12
Rank Coefficient	0.32	0.17	0.21	0.16	0.50	1	0.31
Total estimation	3.2	1.7	2.1	1.6	5	10	3.1

*Legend: 1 - V 0454 Stara Zagora; 2 - V 0454 Parvomay; 3 - V 0454 Pazardzhik;
4 - V 0514 Yambol; 5 - V 0514 Byala Slatina; 6 - V 0514 Opaka; 7 - V 0514 Belene

As a result the following grading was obtained: in the first place - V 0514 Opaka, followed by V 0514 Byala Slatina, V 0454 Stara Zagora, V 0514 Belene, V 0454 Pazardzhik, V 0454 Parvomay and in the last place V 0514 Yambol.

The taste estimation (Tables 4, 5 and 6) of the smoke properties, performed by the method of Profile Description through penalty scores, gives the reason for the following conclusions with regard to their performance.

The average values obtained from the penalty scores for taste with the individual samples demonstrate certain differences between them. We may consider that the differences in the average values of the penalty scores should be no less then 2-3 units to establish any difference in the smoke properties.

Table 4 - Taste estimation
Табела 4 Оцена на вкусот

Taster – i	Sample	–	total	number	of	penalty	scores
	1	2	3	4	5	6	7
1	13	13	9	14	19	13	19
2	5	15	9	15	9	5	9
3	15	9	13	19	15	13	19
4	15	13	9	19	19	13	9
5	5	5	5	5	3	5	3
6	5	5	6	7	5	11	5
7	5	5	9	13	9	13	5
X aver.	9.00	9.29	8.57	13.14	11.29	10.43	9.86

*Legend to Tables 4, 5, 6: 1 - V 0454 Stara Zagora; 2 - V 0454 Parvomay; 3 - V 0454 Pazardzhik; 4 - V 0514 Yambol; 5 - V 0514 Byala Slatina; 6 - V 0514 Opaka; 7 - V 0514 Belene.

In general, there are no significant differences established between the compared samples individually within Northern and Southern Bulgaria. Anyway, as better ones appear the tobaccos from the region of Pazardzhik, Stara Zagora and Parvomay. It is a small difference for the samples from Byala Slatina, Opaka, Belene. Yambol stays last.

All samples are qualified by the performance of pleasant, but not so typical to the type flavour (Table 5), divided into two degrees - weak and average, whereby the differences between the samples are minimal.

Table 5 - Flavour estimation
Табела 5 Оцена за аромата

Taster -i	Sample	–	total	number	of	penalty	scores
	1	2	3	4	5	6	7
1	2	2	5	2	5	2	5
2	2	5	2	5	2	5	5
3	5	2	5	5	5	5	5
4	5	2	5	5	5	5	5
5	5	5	5	5	5	5	5
6	5	5	5	5	5	5	5
7	5	5	2	5	5	5	5
X aver. by flavour	4.14	3.71	4.14	4.57	4.57	4.57	5.00
X aver. by taste	9.00	9.29	8.57	13.14	11.29	10.43	9.86
Σ xij	13.14	13.00	12.71	17.71	15.86	15.00	14.86
Ranging	3	2	1	7	6	5	4

Nevertheless, in this relation tobaccos, with which a better taste is established (Parvomay, Pazardzhik and Stara Zagora) prevail.

According to the number of the penalty scores (for taste and flavour) the grading of the samples is as follows: Pazardzhik, Parvomay, Stara Zagora, Belene, Opaka, Byala Slatina and the tobacco of Yambol comes last.

The strongest tobaccos as to smoking are those from the region of Opaka and Belene (Table 6).

Table 6 - Power estimation
Табела 6 Оцена за јачината

Taster -i	Sample	–	total	number	of	penalty	scores
	1	2	3	4	5	6	7
1	5	4	4	5	5	5	6
2	4	4	4	2	4	5	4
3	4	4	4	4	4	5	4
4	4	5	5	2	4	5	4
5	2	2	2	2	2	4	5
6	4	4	4	4	4	5	5
7	2	4	5	5	4	5	4
X aver.	3.57	3.86	4.00	3.43	3.86	4.86	4.57
Grading	6	4.5	3	7	4.5	1	2

Among the rest of the samples no significant differences have been established, except for Yambol, where tobacco has the least physiological power, which also corresponds to the data from the chemical composition.

To test the activity of the tasting commission, i.e. whether all its members estimate the samples in the same manner, it was determined the criterion of Kohren - Gf individually by taste, flavour and power. Since the number of the samples and of the tasters is the same with the three estimations (taste, power and flavour), then the values of Gt shall be the same and equal to Gt= 0,377 (for a=0,05, ?=6 and m=7). The analysis of results shows that regarding the criteria for the taste sensations is available homogeneity (Gf = 0,243<Gt). When the flavour is evaluated Gf = 0,240<Gt, when the power is evaluated Gf = 0,249<Gt, i. e. the valuations of the experts are accorded.

When comparing the results from the taste and expert estimation, it was established variance in the results. Mostly it refers to the estimation as to the taste feelings and less to the flavour. Anyway, taking into account of the subjective nature of the organoleptic estimation, the minor differences in the penalty scores (smaller than 2-3 units - Table 5) and the chemical indicators, as objective ones we think we have to accept the grouping of tobaccos on the basis of the objective quality indicators.

If we have to assign tobaccos in two groups - "aromatic" and "neutral", according to the purpose of use, the first group will go to "aromatic", and the second and the third one to the group of "filling" (neutral) type of tobacco.

It confirms the results obtained from the previous investigations and made by other authors (1, 9), i.e. in regions of good combination of the variety with the climatic and soil factors there are actual opportunities to obtain a quality aromatic type of raw material.

4. CONCLUSIONS

As a result of the investigation performed to determine the level of typicality of the Bulgarian Virginia tobaccos, with view of their differentiation in quality aspect, it was found, as follows:

1. In the estimation of tobaccos on the basis of objective chemical indicators and the accepted criteria of typicality: The closest to the quality characteristics of the Virginia tobaccos stay those from the region of North Bulgaria - Byala Slatina, Opaka and Belene (variety V 0514), which we conditionally may assign to the group of "aromatic". The tobaccos from the rest of the regions we may assign to the group of "neutral" (filling).

2. The widely grown Virginia tobaccos from the region of North Bulgaria have better objective chemical indicators of quality than those from South Bulgaria.

3. In the estimation of tobaccos on the basis of organoleptic indicators (expert estimation and tasting) the tobaccos from North Bulgaria are better by expert estimation, while by smoking properties the result is reverse without any significant differences between the samples within the region - North and South Bulgaria.

4. Bulgarian Virginia tobaccos have a good "level of typicality" compared to the indicators typical for the so-called typical Virginia tobaccos.

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ИСПИТУВАЊЕ НА ТИПСКИОТ КАРАКТЕР НА БУГАРСКИТЕ ВИРЏИНИСКИ ТУТУНИ

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РЕЗИМЕ

Големата разноликост што е резулат на различните почвени и климатски услови во одделни реони на државата го определува добивањето на различна суровина од типот вирџинија, кој е незаменлива состојка на цигарите од типот американски бленд.Ова истражување имаше за цел да го проучи нивото на типичност на тутунот вирџинија произведен во различни реони на Бугарија, од аспект на неговиот однос кон групите "ароматичен" и "неутрален".Испитувани се тутуни од реколтата 2004 година, од реони со најголем принос, во согласност со државните квоти. За одредување на нивото на титпичност беа користени основните објективни показатели на квалитетот. Резултатите покажуваат дека најблиски до квалитетните карактеристики на типичните вирџиниски тутуни се тутуните од северна Бугарија - Бјала Слатина, Опака и Белене, кои можат да се стават во групата на "ароматични". Тутуните од останатите испитувани реони се ставени во групата "неутрални".

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