Technological Investigation on Virginia Variety Group Tobacco. Message I: Technological Investigation on Virginia Type Tobacco from Different Regions of South Bulgaria

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Abstract

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The quality tobacco production depends not only on soil conditions and applied agrotechnics and also on choice of the suitable variety. Every variety in the given conditions is characterized with strictly determinate qualities and indexes. In this connection many investigations are connected to investigation possibilities for Virginia tobacco quality raw obtaining by investigation of the big set of introduced varieties in different regions in our country. Independently of the achieved good technological results represented interest for production it is lacking the varieties approval for batches formation with market demanded indexes of the processed raw. The **aim** of present investigation is comparative technological assessment of the introduced and local Virginia tobacco varieties quality from different regions of South Bulgaria. Tobacco is analyzed by main indexes characterized quality: tobacco and tobacco smoke chemical composition; physical indexes; spectrophotometer, expert and degustation assessments. The complex assessment is accomplished on the base characteristic indexes for tobacco type. It's determined that categorical results have not for essential differences in total quality manifestation of introduced varieties in comparison to local. The results are better convincingly for PVH 19 variety from Yambol region in which it should to expand its production.

Key words: Virginia type, quality index, chemical composition, tobacco smoke, physical indexes, expert assessment, degustation assessment

Introduction

The quality tobacco production depends not only on soil conditions and applied agrotechnics and also on the choice of the suitable variety. Every variety in the given conditions is characterized with strictly determinate qualities and indexes (Andonov and Petrov, 1991). The new varieties creating and introduction and the technology of its growing improvement are indicated by authors (Chinchev and Sto-

yanov, 1987) as the most dynamic means for tobacco production intensification. The introduction as possibility for improving the biological factor and the market requirements satisfaction to respective tobacco types is investigated by Pophristev (1981). The author prognosticates the necessity of the introduced varieties biological and technological qualities exact assessment with a view to successful market requirements satisfaction coming from the scientific and market points of view. In this connection a number of authors (Andonov and Petrov, 1991; Ralovski and Chinchev, 1991; Ralovski et al., 1984; Staikov, 1981; Stoyanov, 1997; Chifudov, 1992; Shabanov et al., 1987) investigate the possibilities for Virginia tobacco quality raw obtaining by investigation of the big set of introduced varieties in different regions in our country. Independently of the achieved good technological results represented interest for production it is lacking the varieties approval for batches formation with market demanded indexes of the processed raw.

All the mentioned above give us reason for investigations implementation in this direction. The present investigation is continuation of the implemented two years investigations (Drachev et al., 2004; Drachev and Nikolova, 2005; Nikolova and Drachev, 2005). The aim of investigation is comparative technological assessment of the introduced and local Virginia tobacco varieties quality from different regions of South Bulgaria.

Materials and Methods

The object of investigation is the introduced and local Virginia type tobacco varieties of crop 2005. The introduced varieties are: PVH 19, K 326 and K 394. The traditional produced in respective regions V 0454 and V 0514 varieties served like control. The regions were as follows:

• Stara Zagora – two controls: V 0514 and V 0454 and introduced PVH 19 variety;

• Yambol - two controls: V 0514 and V 0454 and introduced PVH 19 variety;

• Parvomai – two controls: V 0514 and V 0454 and introduced PVH 19, K 326 and K 394 varieties;

• Pazardjik – V 0454 control and introduced PVH 19 variety.

The samples taking is accomplished at the place from curing stations of different production firms. The samples are formed from the most characteristic for type stalk position „C" including quality material (I class) as for controls as for experimental tobacco.

The tobacco is analyzed as the following indexes are determined:

1. Tobacco chemical composition: nicotine, reduced sugars, total nitrogen and ash.

The definitions are accomplished by following methods:

• Nicotine, % - ISO 15152.

• Reduced sugars, % - ISO 15154.

• Total nitrogen, % - BSS 15836-88.

• Ash, % - ISO2817.

The analyses are made in two replications by two parallel samples.

2. Smoke chemical composition: tars, mg/cig and nicotine, mg/cig. The tobacco smoke composition determination is accomplished by deduced regression dependences between tobacco and tobacco smoke composition by method developed by Popova and Georgiev (1998).

3. Physical indexes: length, width, ratio length/width, percentage main stem, cut tobacco density and conventional cigarette yield. The definitions are made by routine methods.

4. Spectrophotometric assessment (Take the „image") of tobacco - it's accomplished by discreet values determination of tobacco water extract absorption in UV-part of spectrum in range of 220 to 350 nm by method developed by Gujzelev and Mohnacheva (1982). For statistical check for differences significance (Student criterion) is applied the case – „Assessment of average difference between extracts of general totalities connected by two" (Lakin, 1990). In spectral analysis for every sample the measurements are accomplished in n=14. In this case the table value (t_{st}) is the same and it is equal to 2.16 for confidence level α=0.05 and 3.01 for α=0.01, for k=n-1 degrees of freedom. The made conclusions for availability or lack of difference are based on advance determined values for t_f and t_{st} for every separate case in comparison by two. The differences are reliable and vice versa in $t_f > t_{st}$.

5. Expert assessment – it's accomplished by commission in respective coding of samples. The two methods are applied depending on the investigation task: direct and indirect (by two) ranking. The concordance coefficient of Kendal is calculated with check statistical significance of the same (Borovikov and Borovikov, 1998).

6. Degustation assessment – it's accomplished by degustation commission by the same way as for expert assessment.

For results comparison of organoleptical assessment (expert and degustation) is applied rank correlation coefficient of Spirman-Pirson that gives the relation between two assessments and represents a "semi-quantitative" assessment. Its application is possible as the members of expert and degustation commission are the same and they evaluate the same samples by two indexes.

7. Complex assessment of quality – accomplished on base of the main indexes determined quality (tobacco chemical composition – characteristic indexes for type; tobacco smoke composition; specific volume; expert and degustation assessment). Every sample is ranking on base value of respective index depending on its positive or negative significance for quality. In positive significance for quality the sample with the highest value receive rank one and the rest samples arrange by decreasing series. In negative significance – *vice versa*. The significance coefficient (influence) by expert commission is determined in advance for these indexes. The final assessment is formed by quality index determination; complex characterized the quality of respective sample. The lower value of quality index corresponds to higher quality i.e. the best is sample with the lower value etc.

Results and Discussion

The investigation of Virginia type tobacco for this crop is accomplished in comparison of introduced varieties with mass ones for respective regions.

The results for investigated tobacco chemical composition are represented in Table 1.

The total assessment of tobacco chemical analysis data by separate indexes shows comparative equalization of characteristic values for Bulgarian Virginia tobacco.

In assessment the chemical composition indexes of separate varieties is mainly accented on indexes characteristic for type: nicotine content, reduced sugars content and ratio total nitrogen/nicotine and reduced sugars/nicotine. It's known that ni-

Table 1

Chemical indexes of Virginia type tobacco

Indexes	Region												
	Stara Zagora			Yambol			Parvomai					Pazardjik	
	V*	V*	PVH	V*	V*	PVH	V*	V*	PVH	K	K	V*	PVH
	0514	0454	19	0514	0454	19	0514	0454	19	326	394	0454	19
1. Tobacco chemical composition, %													
Nicotine	1.39	1.40	1.16	1.23	1.79	2.43	1.58	0.85	1.17	1.13	1.03	1.81	1.35
Red. sugars	21.60	21.60	20.30	27.10	19.60	15.70	22.80	21.70	22.90	18.80	23.80	17.50	13.30
Red. sug./nic.	15.54	15.43	17.50	22.03	10.95	6.46	14.43	25.53	19.57	16.64	23.11	9.67	9.85
Total nitrogen	1.55	1.72	1.75	1.75	1.70	2.27	1.63	1.49	1.42	1.74	1.33	1.78	2.11
Total nitr./nic.	1.12	1.23	1.51	1.42	0.95	0.93	1.03	1.75	1.21	1.54	1.29	0.98	1.56
Ash	12.06	11.63	11.78	11.19	13.95	12.74	11.87	12.10	13.13	15.53	11.81	13.17	14.01
Potassium	1.87	1.54	1.97	2.11	1.50	2.19	1.97	2.22	1.93	1.65	1.64	2.59	1.82
Hexan extract	5.33	5.08	5.23	3.54	6.00	5.34	5.76	4.75	4.55	5.75	5.00	6.89	6.51
2. Smoke chemical composition, mg/cig													
Nicotine	1.10	1.10	0.92	0.97	1.45	2.14	1.26	0.70	0.92	0.89	0.82	1.47	1.06
Tars	18.38	18.43	18.38	19.29	18.50	18.51	18.65	18.36	18.50	18.45	18.42	21.59	19.30

V* - Control

cotine content must be not lower than 1.8%; the ratio total nitrogen/nicotine in limits from 0.6 to 1.0; reduced sugars moderate content – between 15-20%; the ratio reduced sugars/nicotine must have lower values (between 7-12), which are characteristic for quality ("typical") Virginia and express bigger balance in smoking properties.

We use the accepted criteria for level and for difference to make comparison of investigated tobacco chemical indexes according to data in Table 2.

If differences passed the methods accuracy for determination, we accept the availability of difference and *vice versa,* i.e. we accept that tobacco samples differ in relation to respective index in difference in limits or bigger than indicated in table.

Stara Zagora region: The expressed differences not exist between controls and introduced variety by chemical indexes. The introduced PVH 19 variety has comparatively lower nicotine content and higher values of ratio total nitrogen/nico-

Table 2

Criteria for level and for difference in investigated tobacco chemical indexes

Index	Index value			Difference**
	Level *			
	low	middle	high	≥
Nicotine in tobacco, %	below 1	1-1.6	over 1.6	0.15-0.20
Reduced sugars, %	below 12	12-15	over 15	2-2.5
Total nitrogen, %	below 1.4	1.4-1.6	over 1.6	0.5-0.7
Ash, %	below 11	11-13	over 13	1.5-2
Nicotine in smoke, mg/cig	below 0.7	0.7-1.15	over 1.15	0.1-0.2
Tars, mg/cig	below 22	22-25	over 25	1.5-2.0

*Chemical indexes values for assessment its content (level)

**Tobacco samples differ (in relation to respective index) if it has difference
in limits or bigger than indicated in table

tine i.e. has comparatively more unfavourable chemical composition.

Yambol region: The introduced variety PVH 19 has the expressed better chemical indexes characteristic for "typical" Virginia tobacco in comparison to controls – higher nicotine (2.43%), lower ratio total nitrogen/nicotine (0.93) and comparatively lower ratio reduced sugars/nicotine (6.46). This is sample (tobacco) with most favorable chemical composition in comparison to all the rest for 2005 crop. The control V 0454 is more near to it. There aren't expressed essential differences between the rest indexes.

Parvomai region: The nicotine content of the introduced varieties (PVH 19, K 326 and K 394) has middle level in comparison to two controls. The same is referring to ratio total nitrogen/nicotine and reduced sugars/nicotine. The differences are inessential in relation to the rest indexes.

Pazardjik region: The nicotine content is higher for control in comparison to PVH 19. The values of control variety are

more favorable for ratio total nitrogen/nicotine. There aren't essential differences for the rest indexes. The indexes of mass variety are better for this crop.

The nicotine in smoke follows the same dependence as nicotine in tobacco for all regions and for tars there aren't expressed essential differences.

The obtained results show as a whole that there aren't expressed essential differences between separate regions i.e. the comparative equalization exists. The differences are outlined between controls and introduced varieties without one-way advantage of introduced in separate regions. The introduced variety PVH19 by chemical indexes gives pointedly better values in Yambol region as we can consider that they are quite near or even corresponded to that what are accepted as typical for Virginia tobacco. In the rest cases (regions) don't report essential underlined differences between controls V 0514, V 0454) and introduced varieties (K 326, K 394, PVH 19).

Physical indexes. The physical in-

Table 3

Physical indexes of Virginia type tobacco

Region	Variety	Indexes					
		L av., cm	B av., cm	L/B	Main stem, %	Cut tobacco density, g/cm^3	Conventional cig. yield, num.cig/kg tob.
Stara Zagora	Control -V 0514	45.70	20.60	2.22	25.30	0.219	1353
	Control -V 0454	43.30	19.50	2.22	25.00	0.238	1247
	PVH 19	45.00	20.30	2.22	22.20	0.228	1299
Yambol	Control -V 0514	46.70	20.60	2.27	21.70	0.270	1098
	Control -V 0454	45.80	19.60	2.34	25.64	0.214	1385
	PVH 19	49.50	18.60	2.66	31.58	0.208	1424
Parvomai	Control -V 0514	48.40	21.90	2.21	26.00	0.248	1195
	Control -V 0454	47.60	21.00	2.27	28.57	0.214	1385
	PVH 19	46.80	19.60	2.39	28.26	0.219	1353
	K 326	46.10	21.00	2.20	26.83	0.223	1328
	K 394	40.60	18.50	2.19	26.30	0.241	1228
Pazardjik	Control -V 0454	48.40	21.00	2.30	28.57	0.220	1346
	PVH 19	48.60	19.20	2.53	31.32	0.213	1389

dexes (Table 3) of investigated tobacco show lack of essential differences. As we take into consideration that these indexes have importance in tobacco processing and treatment, where the technological level of equipment has importance for effectiveness (looses, yield etc.) we can consider that by these indexes can't make conclusions for different varieties.

Take the "image" of variety. The comparison is accomplished by the same approach as for assessment of tobacco chemical indexes of different regions – introduced and control (local) varieties. The results are represented on Figures 1, 2, 3 and 4.

The obtained results can refer in two groups:

The first group in which the essential differences not outline between varieties in respective region namely Stara Zagora and Yambol (Figures 1 and 2). The results of statistical processing show lack of reliable difference between the compared samples from Stara Zagora region (t_f =-7.49; -3.44; 0.79<t_{st}=2.16 and 3.01) and Yambol - t_f=-3.49; -0.28; 2.02, in comparison by two – mass with introduced as between two mass.

Second group in which Pazardjik (Figure 4) and Parvomai (Figure 3) refer for which bigger differences between varieties grown in these regions are determined i.e.the region's influence is higher expressed in comparison to genetic factor (variety) in quality forming. The reliable difference is proved by total quality manifestation (t_f=2.65) between control V 0454
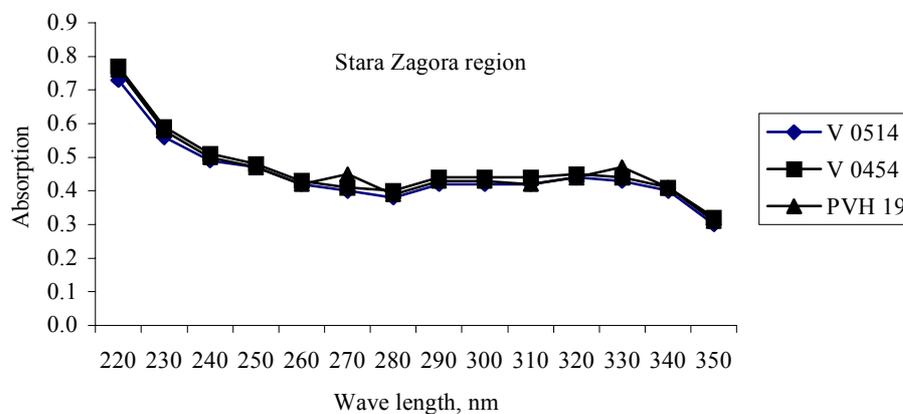
Fig. 1. Absorption spectra of Virginia type tobacco from Stara Zagora region
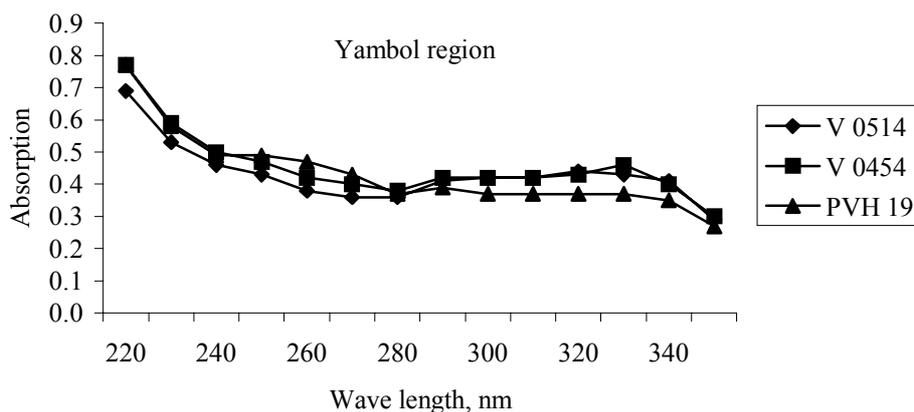

Fig. 2. Absorption spectra of Virginia type tobacco from Yambol region

and experimental variety PVH19 for Pazardjik region. The reliable difference isn't determined between the experimental variety K 326 and two controls for Parvomai region. The proved difference isn't determined between the experimental varieties i.e. they have one type quality manifestation except for K 326 variety which differ from K 394 (t_f=7.95).

Expert assessmnet. The results of samples expert assessment for different regions are represented in Table 4 and also:

the sum of ranks (Σxij), relative ranking coefficient and rank coefficient.

In comparison of only two varieties for given region, as the case for Pazardjik for assessment availability of difference between samples and their grading is used direct method for comparison. The statistical processing for reliability is accomplished by criterion "Critical number of ratio" (CNR).

In the rest cases of comparison is used indirect method (of "two") and the con-
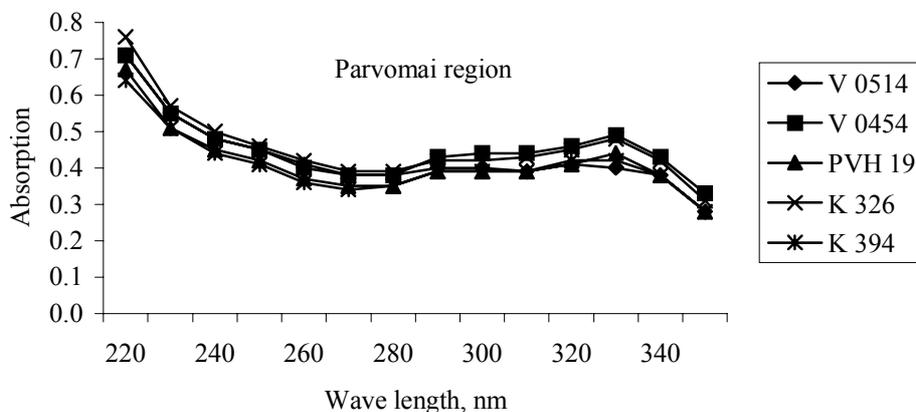
Fig. 3. Absorption spectra of Virginia type tobacco from Parvomai region
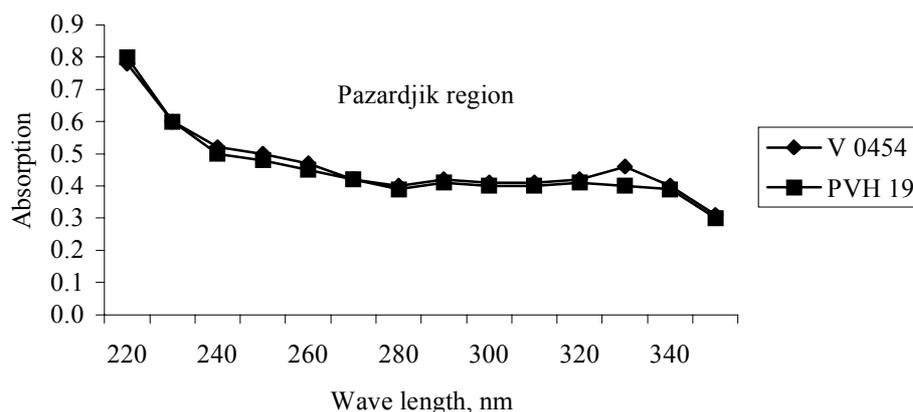

Fig. 4. Absorption spectra of Virginia type tobacco from Pazardjik region

cordance in assessments of the commission members is determined by concordance coefficient of Kendal and its significance by Fisher criterion for statistical significance.

In Table 5 are given results from data statistical processing – the values of the indicated above criteria and coefficient.

In comparison by two for Pazardjik region are determined differences between produced in this region varieties as with better external quality indexes is V 0454 (control).

In cases with three compared samples (Yambol and Stara Zagora) is determined availability of concordance and reliability for difference in experts' assessments (Table 5). The preference is given to control varieties (V 0514 and V 0454) in comparison to introduced PVH19 for Yambol region. As the result is opposite for Stara Zagora region – with better external quality indexes is introduced variety PVH19 in comparison to the same two control varieties for this region.

In case with more than three compared

Table 4

Expert assessment of Virginia type tobacco

Expert-i	Stara Zagora			Yambol		
	V 0514	V 0454	PVH 19	V 0514	V 0454	PVH 19
1	3	2	1	2	1	3
2	3	2	1	3	1	2
3	3	1	2	3	1	2
4	3	2	1	2	1	3
5	3	2	1	2	1	3
Sum of ranks	15	9	6	12	5	13
Coef. of rel. ranking	0.5	0.3	0.2	0.4	0.17	0.43
Rank coefficient	0.4	0.67	1	0.42	1	0.38
Grading	**3**	**2**	**1**	**2**	**1**	**3**

Expert-i	Parvomai					Pazardjik	
	V 0514	V 0454	PVH 19	K 326	K 394	V 0454	PVH 19
1	2	1	4	3	5	+	-
2	1.5	1.5	3	5	4	+	-
3	1	2.5	2.5	5	4	+	-
4	1.5	3	1.5	4	5	+	-
5	1	2.5	2.5	4	5	+	-
Sum of ranks	7	10.5	13.5	21	23	-	-
Coef. of rel. ranking	0.09	0.14	0.18	0.28	0.31	-	-
Rank coefficient	1	0.67	0.52	0.33	0.3	-	-
Grading	**1**	**2**	**3**	**4**	**5**	**1**	**2**

varieties (Parvomai) also is determined the results concordance in availability of coefficients significance (Table 5). The preference has the local control varieties (V 0514 and V 0454) in comparison to introduce. From the last with better indexes is PVH 19.

Degustation assessment. The results analysis of degustation assessment is accomplished with the same approach, as for expert assessment. Data by regions are represented in Tables 6 and 6A.

For region with two varieties (Pazar-djik) by smoking properties is determined the difference between local variety (control) and introduced – PVH19 as the control variety (CNR) has better smoking properties.

In regions with three compared varieties (Stara Zagora and Yambol) has not concordance in assessments of degustation commission i.e. by smoking properties in two cases is not established difference availability (W=0.14; 0.06).

In region with more than three varieties (Parvomai) the results of degusta-

Table 5

Expert assessment - statistical criteria for concordance and significance of results

Region	Critical number of ratio (CNR)	Concordance coefficient W	f_1	f_2	Fisher criterion F	
					F_f	F_t
Stara Zagora	-	0.84	1.6	6.4	21	5.32
Yambol	-	0.76	1.6	6.4	12.67	5.32
Parvomai	-	0.78	3.6	14.4	14.18	3.18
Pazardjik	2.24	-	-	-	-	-

tion assessment have not concordance i.e. the degustation commission can't determine differences in smoking properties between varieties as the grading of samples is not reliable (W=0.46).

Comparison results of organoleptical assessment (expert and degustation). Because of lack of one-way results of expert and degustation assessments in different cases of comparison the interest represent and more especially for introduced varieties to determine connection (correlative dependence) between expert and degustation assessment. The calculated values of rank correlation coefficient are represented in Table 7.

The data show that in most cases the expressed dependence has in experts assessments by external quality indexes and smoking properties for the same variety (sample) as this coefficient K>0.50. The exception has for Parvomai region for varieties K 326 and K 394 (K<0.50). It's confirmed more often that the dependence is established between expert and degustation assessments i.e. between quality external indications and smoking properties.

Complex assessment. The complex assessment is accomplished on the base main quality indexes included objective (chemical and physical) indexes and

organoleptical determined (experts' report and degustation) as it is indicated in methodological part. The ranking (arranging) of indexes is accomplished on the base obtained data for its values for respective varieties and its influence (positive or negative) on quality.

The significance coefficients determination (rank coefficients) of the indexes included in complex assessment is accomplished by expert commission and obtained results are as follow: nicotine – 0.20; total nitrogen/nicotine – 0.18; reduced sugars/nicotine – 0. 12; tars – 0.10; specific volume – 0.05; expert assessment – 0.10; degustation assessment – 0.25. The quality index is calculated for respective variety after ranking.

The case is given in Table 8 in which more than three varieties are compared. The introduced PVH 19 variety for Parvomai region is better than the rest two introduced varieties (K 326 and K 394) but it defer to one of the local varieties V 0514.

Because of one type tables for quality indexes determination we represent only final results of investigated tobacco complex assessment on Figure 5.

V 0454 is outlined better by complex assessment in comparison to PVH 19 for Pazardjik region.

The introduced PVH 19 variety is bet-

Table 6

Degustation assessment of Virginia type tobacco

Degustator-i	Stara Zagora			Yambol		
	V 0514	V 0454	PVH 19	V 0514	V 0454	PVH 19
1	1	3	2	1	3	2
2	2	3	1	2	1	3
3	2	1	3	1	3	2
4	2	1	3	3	1	2
5	3	1	2	3	2	1
6	2	1	3	1	2	3
7	1	2	3	2	1	3
Sum of ranks	13	12	17	13	13	16
Coef. of rel. ranking	0.31	0.29	0.40	0.31	0.31	0.38
Rank coefficient	0.92	1	0.71	1	1	0.81
Grading	**2**	**1**	**3**	**1.5**	**1.5**	**3**

Table 6 A

Degustation assessment of Virginia type tobacco

Degustator-i	Parvomai					Pazardjik	
	V 0514	V 0454	PVH 19	K 326	K 394	V 0454	PVH 19
1	4	5	2	2	2	+	-
2	1.5	5	3.5	3.5	1.5	+	-
3	3	4.5	1.5	1.5	4.5	+	-
4	2	5	3.5	1	3.5	+	-
5	4	5	2	2	2	+	-
6	3	4.5	1.5	1.5	4.5	-	-
7	1	4	5	2.5	2.5	-	-
Sum of ranks	18.5	33	19	14	20.5	-	-
Coef. of rel. ranking	0.18	0.31	0.18	0.13	0.20	-	-
Rank coefficient	0.76	0.42	0.74	1.00	0.68	-	-
Grading	**2**	**5**	**3**	**1**	**4**	**1**	**2**

ter in comparison to local for Yambol region as the reverse result is obtained for Stara Zagora.

Interest represent to compare the quality level of introduced PVH 19 variety in comparison to mass spread varieties in respective regions. Table 9 is made for this aim in which the assessments are represented general in comparison by main quality indexes.

Table 7

**Spirman-Pirson coefficient for rank correlation between expert assessment
and degustation assessment**

Region	PVH 19	K 326	K 394
Stara Zagora	0.65	-	-
Yambol	0.65	-	-
Parvomai	0.52	-0.43	-0.33
Pazardjik	1	-	-

Table 8

Complex assessment of Virginia type tobacco from Parvomai region

Indexes	Sample ranking					Signifi-cance coeffi-cient	Quality index of variety				
	V 0514	V 0454	K 326	K 394	PVH 19		V 0514	V 0454	K 326	K 394	PVH 19
Nicotine, %	1	5	3	4	2	0.20	0.20	1.00	0.60	0.80	0.40
Total nitrogen/ nicotine	1	5	4	3	2	0.18	0.18	0.90	0.72	0.54	0.36
Red. sugars/ nicotine	1	5	2	4	3	0.12	0.12	0.60	0.24	0.48	0.36
Tars, mg/cig	5	1	3	2	4	0.10	0.50	0.10	0.30	0.20	0.40
Spec. volume, cm^3/g	5	1	3	4	2	0.05	0.25	0.05	0.15	0.20	0.10
Expert assessment	1	2	4	5	3	0.10	0.10	0.20	0.40	0.50	0.30
Degust. assessment	3	3	3	3	3	0.25	0.75	0.75	0.75	0.75	0.75
							2.10	3.60	3.16	3.47	2.67
							1	**5**	**3**	**4**	**2**

The control varieties are marked with "K" and introduced one with I; for determined difference it is marked respectively: for +K – the control varieties are better in comparison to introduced; for +I – the introduced variety is better in comparison to controls and for equity (=) – there isn't difference between local and introduced variety. The reason for this assessment is made on the base of general quality indexes for separate varieties. The lack of difference in 4 cases is established from total 12 cases for comparison which 1 by chemical indexes and 3 by degustation assessment. We have 6 cases with higher quality for local varieties from which respectively 2+3+1. Better quality is estab-
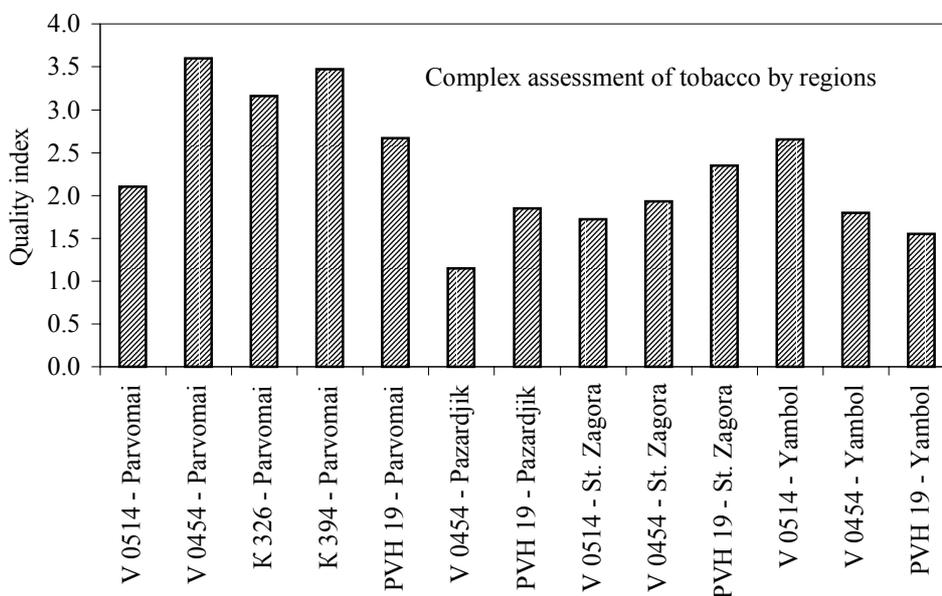
**Fig. 5. Complex assessment of introduced and control varieties produced
in respective regions**

Table 9

Comparative assessment of tobacco by main quality indexes

Region	Chemical composition	Expert assessment	Degustation assessment
Stara Zagora	+K	+I	=
Yambol	+I	+K	=
Parvomai	=	+K	=
Pazardjik	+K	+K	+K

Note: K - control variety; I - introduced variety (PVH 19);

Determined difference +; No difference =

lished for introduced variety in 2 cases, respectively 1+1+0. The lack of difference is determined in 4 of cases and 8 are with difference availability.

The differences are bigger in manifestation of external quality indications and less – in relation to smoking properties i.e. it's confirmed bigger equalization of smoking properties Virginia type tobacco in comparison with oriental for instance.

The obtained results show that the categorical conclusions can't make for essential differences in total quality manifestation as by objective (chemical composition) as by organoleptical indexes (expert and degustation assessment) between introduced PVH 19 variety and local varieties for respective regions.

Conclusions

The obtained results of technological investigation of introduced and local Virginia type tobacco varieties produced in different South Bulgaria regions give reason to make the following conclusions:

It's determined that in relation to chemical composition of different Virginia type tobacco varieties from separate regions have not expressed essential differences i.e. the comparative equalization exists with little exceptions for levels values of separate ingredients characteristic for Bulgarian Virginia tobacco.

The introduced PVH 19 variety has chemical composition most near to this of quality so called "typical" Virginia tobacco for Yambol region. The local varieties have more favorable chemical composition in comparison to introduce in definite regions (Stara Zagora and Pazaesjik). Total character of quality manifestation of Virginia varieties (introduced and controls) is kept. The bigger influence of region (ecological, climatically and agrotechnics factors) in comparison to genetic factor (variety).

Expert assessment by external quality indications shows different directions results. The introduced PVH 19 variety has better assessment in this relation for Stara Zagora region and respectively the local (control) varieties are better for Yambol, Parvomai and Pazardjik.

The differences between introduced and local varieties are significant slighter expressed in respect to smoking properties i.e. equalization exists. The control varieties are outlined with better qualities for Pazardjik region.

The availability of some correlative dependence is confirmed between external quality indications and smoking properties.

For varieties complex assessment – the one way grading (ranking) not determine for different varieties in respective regions.

The varieties grading by regions is as follow:

Stara Zagora region: V 0514, V 0454 and PVH 19

Yambol region: PVH 19, V 0454 and V 0514

Parvomai region: V 0514, PVH 19, K 326, K 394 and V 0454

Pazardjik region: V 0454 and PVH 19

There are not the categorical results for essential differences in total quality manifestation of introduced varieties in comparison to local. The results are better for PVH 19 variety from Yambol region in which it's follow to expand its production. Mass varieties are outlined better for Pazardjik and Stara Zagora regions, as for Parvomai not determine definite trend.

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