
INVESTIGATION ON TECHNOLOGICAL INDEXES OF LARGE LEAF TOBACCOS PRODUCED IN DIFFERENT AREAS IN BULGARIA

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ABSTRACT

The large leaf tobaccos (Virginia and Burley) produced in our country have definite characteristic distinguished it more or less in comparison to typical famous and world known tobaccos of this type. The aim of present investigation is to determine quality level tobaccos of the same variety, produced in different areas of our country and to make comparison to some countries typical producers. Tobaccos type Virginia variety V 454 and type Burley variety 1317 were analyzed in respect of: tobacco chemical composition, tobacco smoke chemical composition and physical indexes. The spectrophotometric assessment "take down of image" was made of Virginia tobacco. The results of comparative assessment of Virginia tobacco show that essential differences haven't in respect of quality between it, but the tobacco from Byala Slatina area is with better quality. The Bulgarian tobaccos (Virginia and Burley) have comparatively good quality in comparison to large leaf tobaccos from countries typical producers, but it defer to some indexes – lower nicotine content, higher sugar content and higher values of number overall nitrogen/nicotine.

Introduction

For the past years the large leaf tobacco production outline as important sub branch of tobacco economy in Bulgaria. It is due to circumstance that in composition of produced cigarettes put in significant quantities of these tobaccos, because increasing production of "american blend" type. The large leaf tobaccos produced in Bulgaria have determinate characterization distinguishing it more or less in comparison with typical famous and world known these type tobaccos. Typical Virginia is characterized in respect of chemical composition with comparative high nicotine content 2.5-3%; dissolve sugars content 15-20% and overall nitrogen content 1.5-2.5% (1,6). They have larger leaf size 40-60 cm and saturated yellow orange colour except this. These qualities are desir-

able and demanded of cigarette production as they allow to produce cigarettes with desirable control matters content in smoke. Burley tobaccos is characterized with high nicotine 2.5-3.5% content, lack of sugars and large nucleus structure composition because of they are carriers of flavor-improving matters for american blend cigarettes.

The significant interest is the problem for investigation our large leaf tobaccos producing in different areas and compare with quality indexes of typical large leaf tobaccos. The aim of present investigation is to determine quality level of large leaf tobaccos (Virginia and Burley) from the same variety V454 and Burley 1317, produced in different areas and to make comparison with some tobaccos from countries typical producers of these type.

Materials and Methods

The tobacco samples I grade were taken from different areas (curing points) for production of large leaf tobacco V454 Virginia variety, in respect Burley 1317: areas of Pazardjik (Debrashtitza) and Pleven (Koinare), Burley II grade from areas of Haskovo (Yabalkovo); Stara Zagora (Mogila) and Stara Zagora (Stara Zagora) of 2003 crop. The samples were carefully inspected and answered to requirements for I and II grade according to "Minimal quality requirements".

Tobaccos of different samples analyzed in respect of:

1. Chemical composition of tobacco

Virginia

- nicotine
- dissolve sugars
- overall nitrogen
- ashes
- potassium
- hexan extract

Burley

- nicotine
- dissolve sugars
- overall nitrogen
- ashes
- potassium
- chlorine
- ether extract

The known routine methods applied for the aim and results are expressed in %.

The quality numbers are calculated: sugars/nicotine and overall nitrogen/nicotine (number of Tso) only for Virginia tobaccos.

2. Chemical composition of tobacco smoke: The smoke composition was determined by deduced regression dependencies between chemical composition of tobacco and tobacco smoke (5).

- nicotine, mg/cig
- tars, mg/cig

3. Some more characteristic quality groups of typical large leaf tobaccos (Virginia and Burley) of 1996 crop were analyzed in respect of nicotine, dissolve sugars, overall nitrogen, ashes; the quality numbers calculated sugars/nicotine and overall nitrogen/nicotine:

Virginia

USA – FKF; OL2; C4KR and B5F
Zimbabwe – FKF; 33FT and M3LT
Brasil – BO; OL and OCL

Burley

USA – KA
Malawi – BLU
Italy

4. Physical indexes

The Bulgarian tobacco samples are investigated in respect of:

- leaf massiveness, cm
- percentage of stem, %
- thickness of cut tobacco, g/cm³
- conditional cigarette output, num. cig/kg tobacco

5. Expert assessment

The expert assessment of tobaccos from different areas was made by method of direct ranging (4).

6. It was made spectro photometric assessment ("take down of image") of Virginia type tobaccos (3).

Results and Discussion

Chemical composition of tobacco

Data for chemical composition of Virginia type tobaccos are represented in **Table 1** (for Bulgarian) and **Table 2** (for tobaccos from countries – typical producers).

The results in respect of separate components show, that nicotine content of Bulgarian large leaf tobaccos Virginia is significantly lower than typical one. Only for some of them (II grade Byala Slatina and II grade Plovdiv-Manole) is near to this of typical.

The dissolve sugars of our tobaccos is significantly higher, as its content is middle double higher than this of exported tobaccos.

The nitrogen content of typical tobaccos in most cases is comparatively higher than this of Bulgarian tobaccos with little exception for II grade Plovdiv-Manole and I and II grade Pleven-Koinare.

TABLE 1

Chemical composition of Virginia tobacco

Indexes	I grade Pazardjik Debrashtitza	I grade Pleven Koinare	II grade Pazardjik Debrashtitza	II grade Parvomai Debar	II grade Plovdiv Manole	II grade Byala Slatina	II grade Pleven Koinare
1. Chemical composition of tobacco							
Nicotine, %	0.86	1.01	1.26	1.22	2.48	2.03	0.91
Sugars, %	28.40	27.30	24.40	29.80	20.80	23.40	25.00
Overall nitrogen, %	1.37	1.98	1.66	1.68	1.98	1.63	2.01
Ashes, %	9.33	10.60	10.90	9.30	11.40	12.90	11.10
Potassium, %	0.73	1.23	1.60	0.48	0.78	0.76	0.85
Hexan extr., %	4.87	5.28	6.02	4.66	7.87	5.61	4.89
Sugars/ nicotine	33.02	27.03	19.37	24.43	8.39	11.53	27.47
Overall nitrogen/ nicotin	1.59	1.96	1.32	1.38	0.80	0.80	2.21
2. Chemical composition of smoke							
Nicotine in smoke. mg/cig	0.71	0.81	0.99	0.96	2.20	1.69	0.74
Tars. mg/cig	19.37	18.48	18.57	20.14	19.80	18.56	19.17

TABLE 2

Chemical composition of Virginia tobacco from countries typical producers

Indexes	USA – quality group				Zimbabwe quality group			Brasil quality group		
	FKF	OL2	C4KR	B5F	FKF	33FT	M3LT	BO	OL	OCL
1. Chemical composition of tobacco										
Nicotine. %	2.64	1.15	3.84	2.84	2.91	1.93	1.84	3.72	3.22	3.63
Sugars, %	6.20	16.62	18.16	14.02	20.80	15.50	17.10	15.10	10.30	15.40
Overall nitrogen, %	2.26	2.01	2.54	1.52	1.67	1.67	1.67	2.13	2.21	2.10
Ashes, %	9.10	10.01	9.33	8.32	10.09	12.17	11.34	9.68	12.16	10.17
Sugars/ nicotine	2.35	14.45	4.73	4.94	7.15	8.03	9.29	4.06	3.20	4.24
Overall nitrogen/nicot ine	0.86	1.75	0.66	0.54	0.57	0.87	0.91	0.57	0.69	0.58
2. Chemical composition of smoke										
Nicotine in smoke. mg/cig	2.25	1.84	2.66	2.93	-	2.47	-	-	-	-
Tars. mg/cig	29.59	25.91	31.18	27.65	-	21.26	-	-	-	-

It doesn't outline significant differences in respect of mineral matters.

Very characteristic however and different are results for ratio sugars/nicotine and overall nitrogen/nicotine. The ratio sugars/nicotine in most cases for Bulgarian tobaccos is 2-2.5 time bigger than this of typical Virginia tobaccos, which due to higher content of dissolve sugars and lower content of nicotine. The highest is quality of Virginia tobaccos for values of ratio overall nitrogen/nicotine 0.6-0.7 in satisfactory no high ratio of sugars and nitrogen. The tobacco quality decrease for low ratio value below 0.6. These tobaccos are very strong because high nicotine content combined with low content of dissolve sugars (2). This number for our Virginia tobaccos is with higher values in comparison with tobaccos from countries typical producers (0.54-1.75) and is in limitations 0.8-2.21.

The Bulgarian Virginia tobaccos are with lower nicotine content in smoke in respect of chemical composition by analogy to lower content in tobacco but with tars don't differ from typical significantly.

It outline on base of chemical indexes as conclusion that Bulgarian Virginia tobaccos have good quality but depart from typical by some indexes. The potential possibilities exist for increasing quality level with introduction of suitable varieties of this type and applying of necessary cropping practice and curing technology.

Data for chemical composition of Burley tobacco and of some typical tobaccos of this type are shown in **Table 3** for investigated crop. They show comparatively high quality in respect of chemical composition namely: high nicotine content, without availability of dissolve sugars and comparatively high content of nitrogen indexes, which are particularly characteristic for this type tobacco. The chlorine content is comparatively no

high in middle potassium content. The ashes content outline higher for Bulgarian tobaccos. By analogy high nicotine content in tobacco is high nicotine content in smoke. The tars for Bulgarian Burley type tobaccos don't differ significantly from these of imported tobaccos (2).

Higher quality of type Burley tobaccos is characteristics for investigated tobaccos (crop 2003) in comparison with previous crops. This show that in keeping of necessary cropping practices and curing conditions the Bulgarian tobaccos Burley can form sufficient good quality according to requirements of buyers.

Categorical conclusions can't make in respect of influence of area by data for chemical composition. If we outgoing from quality number of Tso and nicotine and sugars content we can consider as more quality outline Virginia tobaccos of Byala Slatina and Plovdiv-Manole areas. The influence of ecological conditions is given respective reflection to most plastic matters of chemical composition, connected to quality (dissolve sugars, nicotine and nitrogen).

With better chemical indexes for Burley tobaccos can record this from Stara Zagora-Stara Zagora and Haskovo-Yabalkovo areas (in respect of nicotine). Such conclusions can't make for other indexes.

Physical indexes

There aren't significant differences in respect of physical indexes between tobaccos of different areas (**Table 4**).

The investigated Bulgarian tobaccos are with middle size in comparison with typical Virginia and Burley, as the largest are these from Pleven-Koinare and Byala Slatina areas. The percentage of stem is high – to 25.9% for Virginia and to 30.61 for Burley. They have good filling ability and cigarette output. Higher filling ability of Burley confirm in comparison with Virginia which is characteristic for this type tobacco.

TABLE 3

Chemical composition of Burley tobacco 2003

Indexes	II grade Haskovo Yabalkovo	II grade St. Zagora Mogila	II grade St. Zagora St. Zagora	II grade Yambol Srtaldja	USA KA	Italy	Malawi BLU
1. Chemical composition of tobacco\							
Nicotineq %	4.67	2.84	4.86	3.15	2.77	2.52	1.98
Sugars, %	no	no	no	no	1.00	1.15	1.15
Overall nitrogen, %	4.15	3.65	4.36	4.04	3.92	3.50	3.06
Ashes, %	18.40	18.40	16.20	19.20	17.29	17.13	15.40
Chlorine, %	0.59	0.42	0.08	0.11	-	-	-
Potassium, %	1.62	1.21	2.18	1.90	-	-	-
Ether extract, %	9.45	10.39	10.99	7.57	-	-	-
2. Chemical composition of smoke							
Nicotine in smoke. mg/cig	3.64	2.07	3.82	2.31	1.86	1.95	1.64
Tars. mg/cig	27.58	35.79	42.37	18.81	23.33	25.01	-

TABLE 4

Physical indexes of Virginia and Burley tobacco

Sample	VIRGINIA					
	Length L cm	Width B cm	Ratio L/B	Stem %	Density of cut tobacco g/cm ³	Conditional cigarette Output Num.cig./kg tobacco
IIgr.Pazardjik-	39.20	17.74	2.21	25.90	0.233	1271
Debrashtitza	41.38	18.02	2.30	21.46	0.252	1175
II grParvomai-Debar	40.78	17.74	2.30	24.24	0.218	1359
II gr Plovdiv-Manole	44.72	19.36	2.31	24.00	0.218	1359
II gr Byala Slatina	44.34	19.08	2.32	22.90	0.260	1139
II gr Pleven-Koinare						
BURLEY						
II gr Haskovo	46.60	21.12	2.21	23.53	0.168	1760
II gr St. Zagora (MR1) ¹	44.90	18.58	2.42	30.61	0.228	1299
II gr St. Zagora (MR2) ²	42.58	16.62	2.56	26.53	0.188	1575
II gr Yambol - Straldja	52.26	23.24	2.25	27.27	0.172	1721

¹(MR1) – Stara Zagora area, micro area Mogila²(MR2) – Stara Zagora area, micro area Stara Zagora

Expert assessment

The expert assessment for Virginia type tobaccos is made by “method of direct comparison” of samples (4). The results of ranging for determine coefficient of co-ordination of group expert assessment are represented in **Table 5**, for II grade as the material of middle hand predominate.

TABLE 5

Direct comparing of samples

Expert -I	Number of sample - j				
	1	2	3	4	5
1	4	1	2	5	3
2	3	2	1	5	4
3	5	4	1	2	3
4	5	2	3	4	1
5	3	2	1	4	5
Σx_{ij}	20	11	8	20	16
Sum ranging	4,5	2	1	4,5	3

Spectro photometric assessment of samples Virginia II grade tobacco

Length of wave nm	Sample				
	A V454	B V454	C V454	D V454	E V454
220	0.75	0.86	0.80	0.84	0.83
230	0.61	0.71	0.63	0.66	0.65
250	0.52	0.59	0.53	0.54	0.53
260	0.47	0.53	0.49	0.47	0.51
270	0.44	0.49	0.45	0.45	0.47
280	0.41	0.48	0.40	0.43	0.41
290	0.46	0.54	0.44	0.48	0.42
300	0.45	0.53	0.43	0.49	0.43
310	0.45	0.53	0.43	0.49	0.42
320	0.46	0.55	0.45	0.51	0.43
330	0.47	0.56	0.44	0.51	0.42
340	0.40	0.49	0.40	0.46	0.39
350	0.30	0.36	0.29	0.34	0.29
Xmid.	0.4762	0.5554	0.4754	0.5131	0.4769
σ	0.1077	0.1199	0.1245	0.1214	0.1353

The coefficient of co-ordination (of Kendal) has lower values namely $W = 0.46$ from necessary (0.50) to receive that has co-ordination i.e. that samples differ by expert assessment. The tobacco from Byala Slatina area outline better by external quality indexes (expert opinion) received range one which correspond to results from chemical indexes. Spectro photometric assessment “take down of image”

The method “take down the image” reports complex composition of matters in different tobaccos and is one general criterion for comparative assessment content of chemical composition for different tobacco samples. The results of spectro photometric assessment of samples Virginia tobacco – II grade are represented in **Table 6** and on **Fig. 1**.

The comparison is made for corresponding or difference in total quality characteristic (assessment) of different tobacco samples, compared by pairs in full combination between them by coefficient of Student - t.

The theoretical value of t is (for $S=95\%$) = 2.18 for all pairs, as number of measurements is the same. When $t_{\text{fact.}} > t_{\text{teor.}}$ the reliable difference has in total quality characteristic of comparative samples and reverse.

The little differences exist in absorption of extract in the same length of wave between different samples as shown from data in **Table 6**. The statistical processing by criterion of Student prove lack of difference between samples in respect of total characteristic of quality as for all comparative pairs t-criterion has very little values (from 0 to 0.090). These

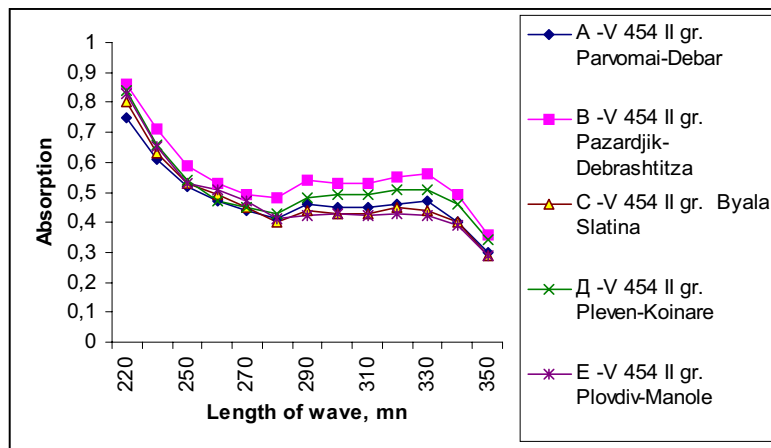


Fig.1. Spectro photometric assessment of samples Virginia tobacco II grade.

results confirm the said above that between samples on base of total characteristic of quality (by chemical composition, physical indexes and expert assessment) don't determine availability of essential quality differences between Virginia tobaccos produced in different our areas. This show that genetic factor has determine role for forming of large leaf tobacco quality produced in different areas.

Conclusions

The following conclusion can make in result of made investigation:

The comparative assessment of Virginia tobacco produced in different areas in Bulgaria show that there aren't essential differences in respect of quality between them. Better quality outlines for tobacco from Byala Slatina area.

The Bulgarian large leaf tobaccos have comparatively better quality in comparison with large leaf tobaccos from countries typical producers but they defer to some indexes (lower nicotine content, higher sugar con-

tent and higher values of number overall nitrogen/nicotine).

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