

# Features of the technology of growing tobacco type Virginia Uzbekistan

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## Abstract

The article presents data on the impact of agrotechnical measures on the yield and quality of Virginia type tobacco in Uzbekistan. The optimal terms and schemes of planting, irrigation terms, doses of mineral fertilizers of large-leaf tobacco, as well as the influence of these factors on yield and quality indicators were determined.

**Keywords:** tobacco, Virginia, planting dates, planting schemes, irrigation terms, doses of mineral fertilizers, productivity, quality.

## INTRODUCTION

Relevance of the topic. Tobacco belongs to the group of plants with high plasticity. More than any other agricultural plants, they are subject to profound changes in their composition and, consequently, in quality, depending on the growing conditions. This opens up great opportunities for improving the technology of tobacco production in our republic.

At present, due to the lack of production of large-leaf American varieties of tobacco, the tobacco industry of Uzbekistan does not receive high-quality raw materials in the required quantity, and its deficit is made up by annual import purchases. Increasing the production of premium quality cigarettes to the required volumes would require huge expenditures to obtain scarce tobacco raw materials.

In this regard, the issue of developing varietal agricultural technology for the most promising varieties of tobacco such as Virginia is of great relevance.

Purpose and objectives of research. The purpose of this work is to scientifically substantiate the technology of cultivation of the American Virginia tobacco variety under completely atypical conditions and, on the basis of this, to develop a promising energy and resource-saving technology for the production of tobacco raw materials that provides a combination of optimal tobacco yield with high quality indicators. The task of the research is to determine rational schemes for the placement of tobacco plants, irrigation regime, optimal doses and ratios of mineral fertilizers for varieties of the American variety type Virginia.

Object of research. Typical grey-earths of the Zarafshan valley, varieties of tobacco such as Virginia, mineral fertilizers. The objects of research were plants, leaves (the main product) and other organs of the variety from the American variety types Virginia.

Subject of study. Study of the influence of the planting scheme, the timing and norms of irrigation, the dose and ratio of mineral fertilizers on the growth and development of plants, the leaf area, the yield and quality of Virginia type tobacco.

## Research methods and methodology

Field experiments were carried out in specialized tobacco-growing farms of the MMTII named after Navoi, Urgut district, Samarkand region from 2016 to 2021. The analytical part of the research was carried out in the laboratories of the All-Russian Research Institute of Tobacco and Shag in the city of Krasnodar, as well as the scientific center of the joint venture British American Tobacco Uzbekistan.

Soil type - typical gray-earth of old irrigation with loamy mechanical composition. The depth of groundwater is from 3 to 8 m. The content of humus in different parts of the crop rotation field ranges from 1.00 to 1.28%, and gross nitrogen from 0.089 to 0.119%. In the under arable layer of 30...60 cm, the amount of humus, total nitrogen and phosphorus is significantly reduced, while potassium, on the contrary, increases.

During the period of ripening, harvesting and drying of tobacco, the indicators of climatic conditions are not stable.

Field experiments were carried out in accordance with the "Methodology for conducting field agrotechnical experiments with tobacco and shag" (Krasnodar, 1978). The quality indicators of raw materials were determined in tobacco samples according to the method of the All-Russian Research Institute of Tobacco and Shag.

Theoretical and practical significance of the work. The scientific significance of the results of the study is characterized by determining the influence of the nutrition area, the timing and norms of irrigation, the dose and ratio of nutrients on the biological and economic characteristics of Virginia type tobacco.

The practical significance of the work consists in the development of elements of technology for growing tobacco such as Virginia in the conditions of Uzbekistan, which allows the industry to reduce the import of large-leaf tobacco raw materials.

Scientific novelty of the research. For the first time, a scientifically based technology for the cultivation of large-leaf American tobacco of the Virginia type has been developed, and the possibility of growing tobacco in irrigated conditions in Uzbekistan has been experimentally proven. For the first time, optimal planting densities, irrigation scheme and doses and ratios of tobacco mineral fertilizers were established.

## Results of the study and their discussion.

### 1. Influence of the feeding area on the yield and quality of tobacco.

Of great importance for the growth and development of Virginia tobacco, as well as for obtaining high-quality raw materials, is the planting density on the plantation.

Based on this, the choice of the optimal planting density of Virginia tobacco is considered an important element in its cultivation.

This issue was studied by us in the period 2016 ... 2000. on typical sierozem soils of the Urgut region with the introduced variety SG - 28 from the Virginia variety type.

It has been established that changes in the feeding area of large-leaf tobacco of the SG-28 variety are reflected to varying degrees on the morphological and biological characteristics of plants (Table 1).

When growing Virginia-type tobacco, the duration of the rooting phase differs sharply from the medium-leaved varieties of local origin. The range of planting density studied by us has practically no effect on leaf maturation.

From the data (table 1) it can be seen that the planting density of tobacco has a significant impact on the main elements of plant productivity - leaf area and dry matter content in the leaves. Changes in planting density from 22.2 to 16.7 thousand plants per 1 ha increase the average leaf area by 35.3%, the dry matter content per unit leaf area by 4.6%.

Increasing the area and materiality of the leaf provides a high yield with the best commercial and taste qualities of tobacco of the Virginia variety type.

Table 1. Influence of planting density on the passage of individual phases of development and formation of tobacco leaves of the Virginia type

Landing pattern, m	Length of period from landing, in days		Number of technical leaves, pcs	The area of the middle sheet, cm <sup>2</sup>	Dry matter content in leaves, g/m <sup>2</sup>
	before rooting	before the leaves of the lower tier ripen			
0,90x0,50 (control)	23	85	25	570	70,3
0,90x0,55	22	85	25	638	71,4
0,90x0,60	23	85	26	718	72,8
1,20x0,40	23	85	25	547	69,0
1,20x0,45	22	85	25	642	72,4
1,20x0,50	23	82	27	771	73,5

Table 2. Yield and quality of Virginia type tobacco depending on planting density

Landing pattern, m	Productivity, t/ha	Deviation from control, t/ha	The output of commercial varieties, %		Chemical indicators, %	
			first	second	nicotine	carbohydrates
0,90x0,50 (control)	2,45	-	27,3	18,9	1,7	13,1
0,90x0,55	2,56	0,11	30,1	20,2	1,7	14,2
0,90x0,60	2,76	0,31	32,4	23,8	1,9	15,7
1,20x0,40	2,37	-0,08	25,7	19,7	1,8	14,7
1,20x0,45	2,41	-0,04	25,2	20,2	1,9	15,0
1,20x0,50	2,65	0,20	27,5	21,4	2,1	15,2
HCP095	0,07... 0,09	t/ha				

The results of field experiments show that the density of standing significantly affects the formation of the yield of leaves and the quality of raw materials. As the number of plants decreases (from 22.2 thousand to 16.7 thousand plants per hectare), the yield per hectare increases by 8.1 - 12.6%. At the same time, the maximum yield was noted with a planting scheme of 0.90x0.60 meters - 2.76 t/ha, which is 12.6% higher compared to the control variant (0.90x0.50m). However, these recommendations should be applied taking into account the impact on the quality indicators of the raw materials obtained. Changing the area of plant nutrition significantly affects the quality of tobacco. The commodity assortment of raw materials noticeably increases in sparse plantings, a particularly sharp increase is observed with a planting scheme of 0.90x0.60 m (18.5 thousand plants per ha). As the feeding area increases, the chemical composition of the raw material changes in the desired direction. They increase the content of nicotine and the amount of water-soluble carbohydrates.

Consequently, in the irrigated conditions of the Urgut region of Uzbekistan for large-leaf tobacco of the Virginia variety type (variety SG - 28), the optimal feeding area can be considered 0.90x0.60 m (18.5 thousand plants per ha).

## 2. Terms and scheme of watering tobacco.

The irrigation regime and their impact on the yield and quality of large-leaf tobacco of the Virginia variety type in Uzbekistan has not been studied in essence.

In accordance with the growth phases, the growing season of tobacco was conditionally divided into three parts: rooting of seedlings, intensive growth of plants with a maximum increase in mass, and ripening of the crop.

In our studies, we used the method of establishing the timing of irrigation by soil moisture in combination with the external morphological features of plants and the growth phases of tobacco. Depending on the moisture content of the soil during planting, seedlings were irrigated, while the normal depth of seedlings and the creation of sufficient soil moisture in the root system zone were well combined. On average, for three years, on the 15-20th day after planting the seedlings, the need arose for the first vegetation irrigation. On the 3rd-4th day after watering, as the soil matured, the aisles of tobacco were loosened to cover moisture.

It has been established that after planting the seedlings for about three weeks, it takes root, the aerial part almost does not grow. Irrigation at this time contributes to the rapid development and deep penetration of the root system into the soil and replenishes the loss of water for evaporation by soil that has not yet been covered by plants.

Irrigation scheme for Virginia tobacco has a significant impact on the mass and volume of the root system (Table 3). Under the 1-2-1 irrigation scheme, the total mass of raw roots was 189.3 g, that is, 13.1% less than in the control variant, where watering was carried out according to the 2-2-2 scheme. Irrigation according to the scheme 2-4-4 contributed to the formation of a powerful root system of tobacco. At the same time, the total mass of raw roots of one plant was 256.4 g, that is, 38.6 g more than in the control variant. A similar pattern is preserved when determining the volume of the roots, but in other numerical values.

Table 3. Weight and volume of Virginia-type tobacco roots at different irrigation rates

Irrigation scheme, during the period			Root mass,		Root volume, cm <sup>3</sup>	Share of roots in total biomass %
rooting	intensive growth	leaf maturation	raw	dry		
2	2 (control)	2	217,8	45,4	343,9	27,9
1	2	1	189,3	40,3	313,8	22,3
2	3	3	243,5	49,7	361,4	28,7
2	4	4	256,4	52,3	375,8	29,3

In the technology of cultivation of large-leaf tobaccos of the Virginia type, one of the main tasks is to establish the optimal number of leaves and the leaf surface area characteristic of this type. Different irrigation schemes caused some differences in the number, area of harvested leaves and leaf materiality, which determine the yield of tobacco (table 3).

Table 4. The influence of the number of irrigations on the elements of the productivity of tobacco type Virginia

Irrigation scheme, during the period			Elements of Tobacco Productivity			
rooting	intensive growth	Leaf ripening	number of technical leaves, pcs.	total area of technical leaves, dm <sup>2</sup>	dry matter content in leaves, g/m <sup>2</sup>	
					middle tier	upper tier
2	2 (control)	2	24	102,48	71,4	75,5
1	2	1	19	75,05	68,1	73,2

2	3	3	28	139,60	73,9	79,9
2	4	4	28	142,80	70,2	76,4

Table 5. Yield and Quality of Virginia Type Tobacco under Different Irrigation Modes

Irrigation scheme, during the period			Productivity, t/ha	% to controller	Quality indicators of raw materials			
rooting	intensive growth	Leaf ripening			yield I-commercial grade, %	yield II-commercial grade, %	nicotine content, %	carbohydrate content, %
2	2	2 (control)	2,28	100,0	31,4	32,9	2,1	15,6
1	2	1	1,52	67,0	21,4	18,9	2,0	15,2
2	3	3	2,63	115,4	38,7	42,4	2,2	16,1
2	4	4	2,45	107,5	27,4	31,8	2,2	16,7

HCP095 0,090 - 0, 11 t/ha

The maximum indicators were noted with the irrigation scheme 2-3-3. At the same time, the total area of technical leaves and leaf materiality were significantly higher than in the control variant and in the variant where watering was carried out according to the 1-2-1 scheme.

Various irrigation schemes, depending on the period of development of tobacco, have a noticeable effect on the formation of the crop and its quality (Table 4).

A decrease in the number of irrigations during the growing season and leaf maturation led to a sharp decrease in tobacco yields. This is especially noticeable in the phase of intensive growth of tobacco, when the leaves of the main tiers are formed. Thus, the 1-2-1 irrigation scheme led to a decrease in yield by 48.4%, while the yield of the first commercial variety is 21.4%.

The most optimal of the studied options turned out to be watering according to the 2-3-3 scheme. At the same time, the yield of tobacco averaged 2.63 t/ha, the yield of the first commercial grade was 38.7%, which is, respectively, 0.35 t/ha and 7.3% more compared to the control variant.

The chemical analysis of tobacco raw materials shows that with the improvement in the water supply of Virginia tobacco plants, a gradual decrease in the nicotine content and an increase in water-soluble carbohydrates are observed.

Thus, in order to obtain high yields with the best quality indicators of large-leaf tobacco of the Virginia variety type in the conditions of Uzbekistan, it is necessary to irrigate twice during the rooting period, and three times during the period of intensive plant growth and ripening of tobacco leaves.

### 3. Development of effective doses of mineral fertilizers for tobacco

Needing a lot of nutrients, Virginia tobacco absorbs them throughout the growing season, but mainly during the period of intensive growth, that is, from May to the end of July. On the fortieth day of vegetation in the field, when the plant accumulates 25% of dry matter, it absorbs about 32% of nitrogen, 36% of phosphorus and 47% of potassium from the total removal. On the sixtieth day of vegetation, when the plant accumulates 60% of dry matter, it receives 60% nitrogen, 50% phosphorus and 95% potassium of the total removal (N.I. Volodarsky, 1971; McCants, Woltz, 1963; R.Andersen, J.Chaplin, R.Currin, Z.Ford, 1970; F.Peedin, 1998).

Table 6. Influence of doses of mineral fertilizers on the formation of Virginia-type tobacco leaves

Application rates of NPK, kg/ha	Number of technical leaves, pcs.	Leaf area, cm <sup>2</sup>		Midrib thickness, mm.	Dry matter content in leaves, g/m <sup>2</sup>
		middle tier	upper tier		
Without fertilizer (control)	23	495	225	9	61.0
<b>N60 P70 K70</b>	25	552	298	10	71.7
<b>N80 P90 K90</b>	26	639	374	11	72.3
<b>N100 R110 Ktso</b>	27	673	420	12	72.6
<b>N120 P130 K130</b>	28	745	496	12	72.8
<b>N140 P150 Ki50</b>	28	943	568	13	72.9

Thus, the initial period of vegetation is decisive for Virginia type tobacco, it is at this time that it requires a sufficient amount of nutrients in the soil in easily digestible forms, otherwise it develops poorly and poorly resists diseases and pests.

Various doses of mineral fertilizers have a significant impact on the elements of tobacco productivity: the number of technically suitable leaves, leaf area, leaf size, leaf materiality, and others (table 5).

The data in the table show that all the elements of tobacco productivity taken into account when changing the doses of mineral fertilizers in the range N60P70K70 - N140P150K150 kg a.i. per ha varies significantly. Consequently, with an increase in the doses of mineral fertilizers, the productivity of tobacco increases: the number of leaves increases by 4-5 pieces, the area of the middle tier is up to 88.6%, the upper tier is up to 2.5 times, the thickness of the midrib by 41.2%, the materiality of the leaf by 19.5% compared to the unfertilized variant. At the same time, the maximum indicators were noted when mineral fertilizers were applied at a dose of N140P150K 150 kg of a.i. per ha.

Biometric measurement data is in good agreement with tobacco yield data. As expected, the maximum yield was observed when mineral fertilizers were applied at a dose of N140P150K 150 kg a.i. per hectare (Table 6).

Under the conditions of the Urgut region, on typical gray-earth soils, the created favorable water and nutrient regime contributes to a high yield of the Virginia tobacco variety. But, at the same time, the quality of the crop may not be high due to the violation of the correlative relationship between the individual parts and organs of tobacco. In most cases, under such conditions, the resulting raw material does not meet the requirements of a particular type of tobacco. The data obtained on the commercial grade of tobacco raw materials shows that mineral fertilizers have largely influenced the assortment of raw materials.

An increase in fertilizer doses from N100P110K110 to N140P150K150 led to a decrease in the yield of the first and second commercial grades by 20.3-29.9%. It should be noted that the highest yield of higher commercial grades was obtained by applying mineral fertilizers at a dose of N100P110K110 - 85.9%, while the share of the first commercial grade in the total assortment of raw materials is 47.4%.

Table 7 Yield and quality of Virginia-type tobacco at various combinations of doses and ratios of fertilizers

Application rates of NPK, kg/ha	Productivity, t/ha	Yield increase, %	Output of commercial varieties, %		Nicotine content, %	Carbohydrate content, %
			first	second		
Without fertilizer (control)	1,81	-	15,4	23,8	1,6	15,1
N60P60K70	2,34	29,3	30,1	33,1	1,8	15,7
N80P90K90	2,48	37,0	35,4	27,9	1,9	16,0
N100P110K110	2,56	41,4	47,4	38,5	1,9	16,2
N120P130K130	2,71	49,7	31,2	34,4	2,0	16,2
N140P150 K150	2,88	59,1	26,3	29,7	2,2	16,3
HCP095	0,07...0,09 t/ha					

Increasing the doses of fertilizers has some effect on the content of nicotine and water-soluble carbohydrates. This is especially noticeable when applying mineral fertilizers at a dose of N140P150K150.

Thus, in the conditions of gray earth soils of the Urgut district of the Zarafshan valley of Uzbekistan, in order to obtain raw materials of a certain type from large-leaved varieties of the Virginia type, mineral fertilizers should be applied at a dose (kg a.i. tobacco industry).

## Conclusion

The development of a technology for the production of American-type Virginia tobacco, new for tobacco growing in Uzbekistan, in relation to local soil and climatic conditions, is of great economic, scientific and practical importance.

Virginia-type tobaccos are characterized by specific properties and differ in many respects from oriental tobacco varieties in terms of requirements for soil, fertilizers, climatic indicators, and so on. The noted features of this type of tobacco determined the need to develop a technology for its cultivation, which would ensure the production of tobacco raw materials with specific smoking properties.

It has been established that under our conditions, the most effective planting density of tobacco is 90x60 cm (18.5 thousand plants per ha), while the largest yield (2.76 tons per ha) was obtained with a good yield of the first commercial grade (32.4%).

In the climatic conditions of the republic, the Virginia variety type is cultivated only in irrigated areas. Experiments have shown that for large-leaf tobacco of the SG-28 variety, vegetative irrigation should be carried out according to the 2-3-3 scheme, with such soil moisture, the maximum dry mass yield is accumulated - 2.63 t/ha and an increase in the commercial grade of raw materials is ensured.

Virginia tobacco makes more demands on fertilizers. It has been experimentally established that mineral fertilizers have a great influence on product quality. The most effective dose of fertilizer was N100P110K110 kg a.i. per hectare. In this variant, the highest yield of the first commercial grade was noted - 47.4%, which is a determining indicator of the effectiveness of fertilizer application in the cultivation of the American type of Virginia tobacco.

The development and implementation of the basic agrotechnical methods of growing American-type Virginia tobacco in specific soil and climatic conditions makes it possible to obtain high-quality raw materials for the manufacture of cigarettes of the highest quality that meet modern requirements.

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