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Influence of micronutrient norms and methods of application on tobacco plant development

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Abstract
In this paper, some data obtained when studying the effect of micronutrient standards and methods of application on the development of the tobacco plant are presented.

Keywords: Microelement, vegetation period, background, visual diagnostics, inhibitor, carbohydrate, protein, nicotine

Introduction
The fertilization system plays an important role in the production of high-quality products from crops. The fertilization system of these crops is radically different from each other, and when the system is developed, their affiliation to certain plant systematic groups (systems) is taken into account. Based on current scientific advances, experiments have shown that the nutrient requirements of crops belonging to different systematic groups vary throughout the growing season, and these data are cited in the relevant field literature. There are also specific systematic groups of tobacco plants, each of which differs in certain aspects of the fertilization system and agro-technological measures. According to the published literature on tobacco, tobacco varieties were first classified by S.A. Egiz (1913) and M. Nesterov (1928) and described the existing varieties. Currently, E.N. Pisareva's classification by types of tobacco is the most perfect systematics in tobacco.

A.F. Buchinsky divides all available agroecological types of tobacco into three groups: 1-Eastern group of tobacco which makes cigarette (this group also includes a group of varieties distributed in central Europe); 2- American Cigarettes tobaccos; 3-Cigarette tobacco [1].

Determining the most appropriate mineral fertilizer rate and ratio for the Virginia type is one of the most important and complex questions. The correct setting of fertilizer rates depends on the amount of yield, the quality of raw materials, and the economic purpose, the effect of these fertilizers on additional yields. Different amounts of mineral fertilizers have a significant impact on the yield elements of tobacco: the number of technically viable leaves, leaf surface area, leaf size (size), leaf raw materials, etc. [7].

The effect of micronutrients on the yield of tobacco raw materials and the variety of goods is reflected in the timing of leaf breakage. The maximum demand for micronutrients is observed during the formation of the assimilation surface of the leaves in the middle tier and the ripening stage of the leaves. The introduction of micronutrients at this stage gives the maximum effect [5]. Under conditions of sufficient nitrogen, phosphorus, and potassium, the demand of plants for micronutrients increases, because micronutrients affect the transformation of fertilizers in the soil, the assimilation of nutrients by plants and participate in metabolism [6].

Since Virginia-type varieties are very demanding on nutrients, they absorb large amounts of them throughout the growing season, especially during the period of intensive growth, i.e. from May to the end of July. On the fortieth day of the growing season in the field, i.e. when the plant accumulates 25% of the dry matter, it assimilates 32% nitrogen, 36% phosphorus, and 47% potassium from the total extracted substance. On the sixtieth day of vegetation, it accumulates 60% of dry matter, while 60% of nitrogen, 50% of phosphorus, and 95% of potassium are assimilated from the total excreted substance [3, 2].

Nitrogen content of 120 kg/ha leads to an increase in the amount of nicotine and protein when used with nitrifying inhibitors. These figures are specific to washable and washed soils.

The use of nitrifying inhibitors with a small amount of nitrogen significantly increases the amount of water-soluble carbohydrates and improves the technological performance of tobacco raw materials [4].

Based on the above data and analysis of the literature, it can be concluded that the effect of macronutrients nitrogen, phosphorus, potassium-based micronutrients copper, molybdenum, and cobalt on various processes in the studied tobacco variety is almost unknown. Today, this complex process is being studied through field experience and a unique database is being compiled.

The purpose of the study is to study the effect of micronutrients on the growth, development, yield, crop quality, and chemical composition of the tobacco plant variety "K-326" type "Virginia" in typical gray soils and to determine the optimal amount.

Materials and Methods

The study was conducted on the experimental site of UzBAT located in Navoi alternative car tractor parking of Urgut district based on the following scheme: Control (without fertilizer), N_{125} P_{135} K_{26} (FON), FON+Co $^{0,5\ кg}$, FON+Co $^{0,05\%}$, FON+Mo ^{0,5кg}, FON+Mo$^{0,05\%}$, FON+Cu^{1кg}, FON+Cu $^{0,1\%}$.

Virginia variety of Tobacco was placed in a field experiment area with 8 variants, 4 repetitions in a 90x60 cm scheme. Carbamide was used as a nitrogen fertilizer, PS Agro as a phosphorus fertilizer, potassium nitrate, and potassium sulfate as potassium fertilizers, and micro-fertilizers: cobalt sulfate, ammonium molybdate, copper sulfates. Percentage solutions of applied micro fertilizers were applied to the plant leaves by spraying. All experimental fieldwork was determined by agrochemical methods.

In this case, soil and plant samples were analyzed by generally accepted methods. The amount of humus in the soil is determined by the method of I.B. Tyurin, gross NPK from one sample by Maltseva-Gritsenko method, N-NH_4-Nessler reagent, N-NO_3 by Grandvald-Lyaju method, mobile phosphorus (P_2O_5) -Machigin method, protein Barnstein method, amount of carbohydrates was determined by the Bertrand method, the amount of nicotine by the express and spectrophotometric methods, the soil environment by pH meter, biometric, phenological and physiological observations were determined by special methods adopted in tobacco.

Results

Field experiments showed that the soil of the field was provided with the following nutrients when analyzed from the agrochemical point of view before the experiment:

Table 1: Amount of plant nutrients in the soil, mg/kg, (2019)

Soil layer, cm	mg / kg N - NO_3^-	mg / kg N - NH_4^+	mg / kg P_2O_5	mg / kg K_2O
	2019y			
0-30	18,0	10,5	34,0	365
30-60	20,1	7,0	23,2	215

Table 2: Total amount of nutrients in the soil, %, (2019)

Soil layer, cm	Soil environment, pH	Total			humus %
		N%	P%	K%	
0-30	7,2	0,149	0,20	2,5	1,3
30-60	7,2	0,119	0,14	2,3	1,1

Table 3: Influence of micronutrient standards and methods of application on biometric indicators of tobacco leaves (2019)

Options	The average number of leaves per plant	The average weight of a single leaf gr	The Average width of a single leaf, cm	The average length of a single leaf, cm
Control (withoutfertilizer)	17,1	45,2	20,5	50,2
NPK (FON)	21,1	55,3	28,6	52,4
FON+Co $^{0,5\ кg}$	23,2	63,4	32,3	62,5
FON+Co $^{0,05\%}$	23,3	63,5	32,3	62,7
FON+Mo ^{0,5кg}	24,1	64,1	32,6	62,9
FON+Mo$^{0,05\%}$	24,2	64,3	32,7	63,2
F ON+Cu^{1кg}	23,0	63,0	32,0	62,2
FON+Cu $^{0,1\%}$	23,1	63,2	32,1	62,3

All biometric changes were more pronounced in the micronutrient variants compared to the control and FON variants, and in the variant where the same FON + Mo$^{0.05\%}$ was used, these values were highly reflected.

Table 4: Influence of micronutrients on tobacco productivity, ce/ha (2019y)

Options	Returns				Average productivity
	I	II	III	IV	
Control (without fertilizer)	19,0	15,0	15,5	15,1	16,15
NPK (FON)	25,8	29,1	25,8	30,5	27,8
FON+Co $^{0,5\ кg}$	31,8	32,1	33,8	33,3	32,75
FON+Co $^{0,05\%}$	33,1	34,4	33,7	36,1	34,326
FON+Mo ^{0,5кg}	34,4	34,2	33,8	35.0	34,35
FON+Mo$^{0,05\%}$	34,4	36,4	36,5	37,0	36,075
F ON+Cu^{1кg}	31,6	32,3	33,8	33,0	32,675
FON+Cu $^{0,1\%}$	32,3	33,8	34,1	31,6	33,0

HCP(convincingly the smallest difference)$_{05}$ -2,07

The trace elements copper, molybdenum, cobalt are extremely important in all vegetation stages of the plant, especially in the formation of plant leaf surface and photosynthetic processes. This, in turn, is reflected in the metabolism of chemicals in plant organs and the direct effect on the chemical composition of leaves. The data obtained during the study showed that the yield in the FON + Mo$^{0.05\%}$ variant was slightly different from the other variants.

Conclusion

Based on the data above, it can be concluded that the main changes were observed in the variants sprayed with a solution of micronutrients at a certain concentration. Hence, the norms of micronutrients, the form of feeding, have a significant impact on plant development, leaf surface formation, yield, and chemical composition

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