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INFLUENCE OF COMPLEX FERTILIZER NORMS ON STRUCTURAL ELEMENTS OF MAIZE PRODUCT, GRAIN AND GREEN MASS PRODUCT

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Abstract. In the paper, it is shown that different norms have different effects depending on the application method of complex fertilizers. It can be concluded that in the complex fertilizers we applied, the yield of grain in the variants of120 kg per hectare and the yield of green mass in the norm of 140 kg was high. Compared to the non-fertilizer case, the indicators were higher in these options.

Keywords: *maize, the height of plant, the weight of cobs, the weight of a grain of maize cobs, weight of 1000 grains, grain product, green mass product, mineral and organic fertilizers.*

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1. Introduction

The importance of agriculture in increasing food security and strengthening the rural economy has been extensively analyzed in the Azerbaijan State Program "Socio-economic development of the regions in 2019-2023".

Reliable food supply of the population in the Republic of Azerbaijan is one of the main directions of the state's economic policy. Grain growing, which is the basis of agriculture, is important in this area.

Research conducted in our country and abroad shows that the structural elements of corn products, especially its agronomic techniques, have been little studied. Studies show that the structural elements of corn products are closely related to agricultural technology.

It is known that in modern times it is impossible to get a high yield without applying fertilizer norms, espacially, predecessor crop grain which plant before maize in the intercropping,removes a lot of minerals from the soil. Therefore, determining the optimal fertilizer rates is an important factor in obtaining high green mass and grain yield.

At present, one of the most important measures in the field of agricultural development in the country is the expansion of intercroppings and increase their productivity. Efficient application of intercroppings ensures two or three harvests per year from a single plot of soil. As a result, the production of grain, especially fodder, is increasing, and soil and other means of production are being used more intensively and efficiently. Depending on weather conditions, corn should be watered 3-4 times during the growing season. The irrigation rate is 600-800 m^3 per hectare. The first irrigation should be carried out during the formation of the main embryonic roots in plants, 2nd - the formation of the 15-16 leaves, the 3rd tassel phase, the 4th in the grain filling stage. Irrigation should be stopped during the milk ripeness stage (Mammadova, 2016, pp.326-360).

2. Research Object

The object of the research carried out in the paper is "ASAU-80" corn variety purchased in the field laboratory of "Grain and legumes" of Azerbaijan State Agrarian University and regionalized in 2011.

3. Research methods

Determination of NPK in plant samples taken at different stages of development. To study the dynamics of the formation of wet and dry mass in the corn plant, 5-10 plants are removed from the repetitions in the main developmental phases (germination, broom formation, milk ripening and full ripening phases), and after determining the mass, the dried in the shade and dry masses are determined. The elements of protein, starch, oil and ash are determined in the laboratory in the product obtained according to the intended repetitions of the options.

3. Materials and discussions

As a result of our research, complex fertilizer norms have affected the overall development dynamics of corn, grain and green mass productivity in different ways (Bahmanli & Seyidaliyev, 2021; pp.74-80).

After the harvest of grain crops in the aran regions of the country, these fields remain empty. In this case, favorable solar energy, irrigation water, fertile soils allow to plant and cultivate fodder crops with short growing season in these areas. Intercroppings not only plays an important role in meeting the food needs of livestock, but also has a strong impact on maintaining soil fertility. İntercroppings not only plays an important role in meeting the food needs of livestock, but also has a strong impact on maintaining soil fertility.

Maize is a nutrient-demanding plant. It must be provided with organic and mineral fertilizers for normal growth and development and high yields throughout the growing season. Nitrogen, phosphorus and potassium have a special role in the regulation of physiological and biochemical processes in plants. These elements are considered the main nutrients of plants. When applying both organic and mineral fertilizers, the biological characteristics of the cultivated plant, the sown area, the agrochemical characteristics of the soil and the climatic conditions of the zone must be taken into account. In the early stages of growth and development, corn is more demanding to nitrogen and phosphorus. Corn does not grow well in very acidic soils. For its normal development, the reaction of the soil environment must be neutral (pH-6-7) (Bahmanli & Seyidaliyev, 2021).

The main purpose of the research is to study the green mass productivity of corn and product quality indicators by applying different norms of complex fertilizers in the intercrops.

Different norms of compound fertilizers had different effects. Compared to the non-fertilizer option, the indicators were higher in other options. It can be concluded that the norm of 120 kg and 140 kg per hectare was more effective in all three of the complex fertilizers we applied.

Compound fertilizers are rarely used in research and on farms. Complex fertilizers contain 2-3 or more nutrients. The main purpose of their production is to reduce the cost

of mixing, transporting and spreading fertilizers on farms, and to increase the utilization rate.

Depending on the number of nutrients they contain, complex fertilizers are double (nitrogen-phosphorus, nitrogen-potassium, phosphorus-potassium, etc.) and triple (nitrogen-phosphorus-potassium). Ammophos (containing 50% phosphorus and 11-12% nitrogen), Nitrofoska (containing 13-17.5% nitrogen, 11-30% phosphorus and 14-26.5% potassium) and Carboammophoska (containing 60% - The ratio of nutrients is a) 1: 1: 1, b) 1.5: 1: 1, c) 2: 1: 1, d) 1: 1.5: 1.

In the control fertilizer variant, the indicators of the structural elements were as follows:

The height of one plant was 282.4 cm, the weight of a grain of maize cobs of one plant was 297.3 grams, the weight of the grain from one plant was 224.8 grams, the grain yield was 70.3% and the weight of 1000 grains was 302.6 grams.

100 kg per hectare (NH4) 2HPO4 -Diammophos - in the applied variant, the plant height is 325.6 cm, the weight of a corn cobs of plant is 324.6 grams, the weight of a grain of a corn cob is 262.6 grams, the yield is 74.1% and the weight of 1000 grains is 321.2 grams; In the applied variant of 120 kg, the height of the plant is 333.7 cm, the weight of corn cobs from one plant is 331.8 grams, the weight of the corn cob from one plant is 293.5 grams, the grain yield is 80.0% and the weight of 1000 grains is 344.0 grams; In the applied variant of 140 kg, the height of the plant is 336.1 cm, the weight of corn cobs from one plant is 348.6 grams, the weight of the grain from one corn cob is 304.7 grams, the grain yield is 83.4% and the weight of 1000 grains is 356.2 grams; In the 160 kg applied variant, the height of the plant was 346.2 cm, the weight of corn cobs from one plant was 336.7 grams, the weight of the grain from one corn cob was 254.9 grams, the grain yield was 76.3% and the weight of 1000 grains was 342.8 grams.

100 kg per hectare $(NH_4)\ 2SO_4$ + $(NH_4)\ 2HPO_4$ + K_2SO_4 Amophoska - in the applied variant, the height of the plant is 331.3 cm, the weight of corn cobs from one plant is 338.9 grams, the weight of the corn cob from one plant is 268.4 grams, grain yield 80.2% and the weight of 1000 grains is 346.5 gram .The height of the plant in the applied version of 120 kg is 348.6 cm, the weight of corn cobs from one plant is 342.3 grams, the weight of the grain from one corn cob is 310.4 grams, the grain yield is 83.7% and the weight of 1000 grains is 367.9 grams, in the applied variant of 140 kg, the height of the plant is 354.2 cm, the weight of corn cobs from one plant is 356.7 grams, the weight of the grain from a corn cob is 319.6 grams, the grain yield is 85.3% and the weight of 1000 grains is 356.2 grams; in the applied variant of 160 kg the height of the plant is 365.2 cm, the weight of corn cobs from one plant is 342.8 grams, the weight of the grain from one corn cobs is 387.5 grams, the grain yield is 81.1% and the weight of 1000 grains is 352.7 grams.

Different doses of complex fertilizer rates on options had different effects on corn yields.

The average yield in the non-fertilizer control variant is 56.0 cent/ha, 100 kg per hectare $(NH_4)\ 2HPO_4$ -Diammophos - in the applied variant 68.8 cent / ha, in the variant where the fertilizer norm was applied 120 kg is 71.2 cent / ha, 66.0 sen / ha in the variant with 140 kg fertilizer norm, 64.6 cent / ha in the variant with 160 kg fertilizer norm.

100 kg of ammophos $(NH_4)\ 2SO_4$ + $(NH_4)\ 2HPO_4$ + K_2SO_4 per hectare - average yield 71.6 sent / ha in the applied variant, average yield 74.7 sent / ha in the applied variant of 120 kg, 65.9 cent / ha in the variant applied 140 kg fertilizer norm, 160 kg fertilizer norm was 64.8 cent / ha in the applied variant.

Table.1 Influence of complex fertilizer norms on structural elements of corn product

Name of the variety	Fertilizer norms, kg / ha	Height of a plant, in cm	The mass of corn cobs from a plant, in grams	The mass of a grain from one cob corn, in grams	Grain yield, in%	Weight of 1000 grains, in grams
"ASAU-80"	Non-fertilizer control	282,4	297,3	224,8	70,3	302,6
	$(NH_4)_2HPO_4$ -Diammofos-100 kg	325,6	324.6	262.6	74.1	321.2
	$(NH_4)_2HPO_4$ Diammofos -120 kg	333,7	331.8	293.5	80.0	344.0
	$(NH_4)_2HPO_4$ -Diammofos -140 kg	336,1	348.6	304.7	83.4	356.2
	$(NH_4)_2HPO_4$ -Diammofos -160 kg	346,2	336.7	254.9	76.3	342.8
	$NH_4)_2SO_4$+$(NH4)_2HPO_4$ +K_2SO_4 Ammofoska -100 kg	331,3	338.9	268.4	80.2	346.5
	$(NH_4)_2SO_4$+$(NH4)_2HPO_4$ +K_2SO_4 - Ammofos -120 kg	348,6	342.3	310.4	83.7	367.9
	$(NH_4)_2SO_4$+$(NH4)_2HPO_4$ +K_2SO_4 - Ammofos -140 kg	354,2	356.7	319.6	85.3	372.5
	$(NH_4)_2SO_4$+$(NH4)_2HPO_4$ +K_2SO_4 Ammofos -160 kg	365,2	342.8	317.5	81.1	352.7

Table 2. Influence of complex fertilizer norms on corn yield

Name of the variety	Fertilizer norms, kg / ha	Grain yield, c / ha						
		Repetitions				Average	Yield growth	
		I	II	III	IV		Cent/ha	%
"ASAU-80"	Non-fertilizer control	54.6	56.4	55.9	57.3	56.0	-	-
	$(NH_4)_2HPO_4$ Diammofos-100 kg	68.6	66.9	70.1	69.6	68.8	12.8	22.8
	$(NH_4)_2HPO_4$ Diammofos -120 kg	67.5	72.4	75.2	69.7	71.2	15.2	27.1
	$(NH_4)_2HPO_4$ Diammofos -140	66.4	67.3	65.8	64.7	66.0	10.0	17.8
	$(NH_4)_2HPO_4$ Diammofos -160	62.5	66.4	64.7	65.1	64.6	8.6	15.3
	$(NH_4)_2SO_4$+$(NH4)_2HPO_4$ +K_2SO_4 Ammofoska -100 kg	71.3	74.5	69.8	73.2	71.6	15.6	27.8
	$(NH_4)_2SO_4$+$(NH4)_2HPO_4$ +K_2SO_4 - Ammofos -120 kg	72.8	73.6	75.5	77.0	74.7	18.7	33.4
	$(NH_4)_2SO_4$+$(NH4)_2HPO_4$ +K_2SO_4 - Ammofos -140 kg	65.7	67.1	63.4	67.5	65.9	9.9	17.6
	$(NH_4)_2SO_4$+$(NH4)_2HPO_4$ +K_2SO_4 Ammofos -160 kg	63.5	66.4	62.6	66.8	64.8	8.8	15.7

Productivity decreased slightly when the norm of both compound fertilizers was higher, i.e. 140 kg / a and 160 kg / ha. That is, as a result of the research, the productivity in the variants applying 120 kg of fertilizer norms per hectare was 10-15 cent / ha higher than in the other variants.

According to the results of the study, fertilizers applied options compared to non-fertilizer control options, productivity increased from 8.6 quintals to 15.6 quintals, ie from 15.3% to 27.8% of the applied variants (Bahmanli & Seyidaliyev, 2020; pp.58-62).

The effect of compound fertilizers on green mass productivity of corn is given in Table 3.

Corn is the main fodder plant used in animal husbandry, 1.34 feed units per 1 kg of grain and 78 gr. contains digestible protein. The grain is low in lysine and tryptophan, and high in low nutritional value. Cereals are an indispensable component for the feed industry, as well as a valuable raw material for the food industry and other industries.

The corn plant plays a crucial role in creating a strong fodder base. Thus, it is used in the form of a green mass (because it is high in carotene). It is also used as fodder after being harvested from the stem, leaves and stalks. There are 21 feed units per quintal of green mass and 37 feed units per quintal of straw.

The main purpose of the research is to study the green mass productivity of corn and product quality indicators by applying different norms of complex fertilizers in the intercropping.

Different doses of complex fertilizer rates according to the options had a different effect on the green mass yield of corn.

Average productivity in the non-fertilizer control variant is 429.6 cent / ha, 100 kg of diammophos (NH_4) $2HPO_4$ per hectare - 506.4 cent / ha in the variant with fertilizer norm, yield increase is 77.3 cent / ha or 17.9%, in the variant with 120 kg fertilizer norm - 583.8 cent/ha , yield increase 154.2 cent/ha, ie 35.8%, 140 kg fertilizer rate applied in the applied variant 626.7 cent / ha, yield increase 197.1 cent/ha ie 45.8% 160 kg fertilizer applied in the applied variant 652.7 cent/ha, yield increase 213.1 cent/ha was 49.6%.

100 kg of ammophos (NH_4) $2SO_4$ + (NH_4) 2HPO4 + K_2SO_4 per hectare - average yield in the applied variant 541.5 cent / ha, yield increase 111.9 cent / ha or 26.0%, in the applied variant 120 kg average yield 652.8 cent/ ha, yield increase 223.2 cent/ha ie 51.9%, average productivity in the applied variant of 140 kg 693.4 cent / ha, increase in yield 263.8 cent / ha or 61.4%, average productivity in the variant applied 160 kg 712.9 cent / ha, increase in yield 283.3 cent / ha or 65.9% organized.

Productivity decreased slightly when the norm of both compound fertilizers was higher, ie 140 kg/ha. That is, as a result of the research, the productivity in the variants applying 120 kg of fertilizer norms per hectare was 150-280 cent/ha higher than in the other variants.

Productivity increas when the norm of both compound fertilizers was higher, ie 140 kg/ha. Grain yield was higher compared to non-fertilizer variants,was observed in the variants applying a compound fertilizer rate of 120 kg per hectare. Green mass yield was higher in the variants of both fertilizers applied to 140-160 kg per hectare.

4. Conclusion

As show the conducted investigations different norms have different effects depending on the method of application of complex fertilizers. According to experiments, in the variants with 120 kg of fertilizer norms per hectare, the yield was more than 4-9

cents/ha compared to other variants. Growth-fertilizer norms increased from 3 quintals to 12.5 quintals, i.e. from 5 percent to 20.9 percent and the variants of both complex fertilizers, we applied 120 kg and 140 kg per hectare were higher. Green mass yield growth - fertilizer norms increased from 97.4 quintals to 364.9 quintals, i.e. from 26.1 percent to 100.1 percent in the applied variants compared to non-fertilized variants. Grain productivity was observed in the application of 120 kg of complex fertilizer per hectare.

Table 3. Influence of complex fertilizer norms on green mass production of maize

Name of the variety	Fertilizer norms, kg / ha	Green mass product, cent / ha						
		Repetitions				Average	Green mass product, cent / ha	
		I	II	III	IV		With centner	With %
"ASAU-80"	Non-fertilizer control	410.6	422.2	409.6	476.1	429.6	-	-
	$(NH_4)_2HPO_4$ -Diammofos-100 kg	497.8	503.4	507.6	518.9	506.4	77.3	17.9
	$(NH_4)_2HPO_4$ Diammofos -120 kg	537.8	596.1	588.9	612.6	583.8	154.2	35.8
	$(NH_4)_2HPO_4$ -Diammofos -140 kg	625.7	638.2	568.5	674.6	626.7	197.1	45.8
	$(NH_4)_2HPO_4$ -Diammofos -160 kg	645.4	631.6	656.5	667.6	652.7	213.1	49.6
	$NH_4)_2SO_4$+$(NH_4)_2HPO_4$ +K_2SO_4 Ammofoska -100 kg	497.1	522.8	579.4	566.7	541.5	111.9	26.0
	$(NH_4)_2SO_4$+$(NH_4)_2HPO_4$ +K_2SO_4 - Ammofos -120 kg	635.1	642.4	677.9	655.8	652.8	223.2	51.9
	$(NH_4)_2SO_4$+$(NH_4)_2HPO_4$ +K_2SO_4 - Ammofos -140 kg	656.7	733.2	671.4	712.6	693.4	263.8	61.4
	$(NH_4)_2SO_4$+$(NH_4)_2HPO_4$ +K_2SO_4 Ammofos -160 kg	725.4	748.2	746.5	741.6	712.9	283.3	65.9

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