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THE INFLUENCE OF THE "O" TECHNOLOGY OF TILLAGE AND MINERAL FERTILIZERS ON THE WATER-FOOD REGIME AND YIELD OF CHICKPEAS IN THE BOGAR OF UZBEKISTAN

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Abstract:
The article presents the results of studies conducted in conditions of semi-moisture-rich bogara of Uzbekistan to study the influence of "O" technology, mineral fertilizers, biofertilizers on the dynamics of the water-food regime of the soil and the yield of a new variety of chickpeas "Gulistan". It has been established that a more favorable water-food regime of the soil for chickpeas during the growing season is formed by direct sowing of seeds with a stubble grain planter SZS-2.1.

Keywords: bogara, crop rotation, "O" technology, chickpeas, fertilizers, soil moisture, nutrients, biological product, pesticides, yield, increase.

INTRODUCTION

The relevance of the issue and its study. In the specific soil and climatic conditions of the bogary of Uzbekistan with insufficient and uneven distribution of atmospheric precipitation, chickpeas are the most important crop and a good precursor in the grain-steam crop rotation. It has long been cultivated as a heat-drought-resistant crop in the conditions of the Bogara republic. When creating a favorable water-food regime of the soil during the entire growing season, chickpeas contain a lot of proteins, essential amino acids, vitamins, macro- and microelements. Therefore, at present, the demand for chickpeas grown on the rain-fed lands of the republic in both domestic and foreign markets is increasing from year to year.
Studies of past years have revealed that the correct application of the tillage system in the arid conditions of Bogara is the most important and main means of accumulation, conservation and rational use of moisture in the soil. In addition, the use of moisture- and resource-saving soil protection systems of tillage can help reduce erosion processes to a minimum and preserve the deficiency-free balance of humus and elements of mineral nutrition of plants in the soil [1, 2, 3, 4, 5, 6].
In this regard, the study of the effectiveness of resource-saving and soil-protective technologies of tillage and sowing and the use of various doses and methods of applying mineral fertilizers, biologically active preparations, their influence on the dynamics of water

and food regimes in the soil is a very priority and urgent issue. Such studies on the rain-fed lands of Uzbekistan have not been carried out before.

Methods and conditions of conducting experiments.

Two-factor field experiments were conducted on medium-loamy and medium-eroded typical rain-fed serozems. The arable 0-20 cm soil layer of the experimental plot contains 0.60 – 0.95% humus, 0.06 – 0.85% nitrogen, 0.08 – 0.110% phosphorus and 1.2 – 1.4% potassium. Mobile nitrogen and phosphorus are insufficiently provided, and potassium is moderately provided.

The study of the dynamics of water and food regimes of the soil was carried out against the background of three methods and the depth of tillage: traditional with dump plowing with plows of 20-22 cm with subsequent pre-sowing treatments with disk tools in two directions. Sowing of chickpea seeds was carried out with SZS-3.6, "O" technology with a Brazilian seeder "No-Till" and direct sowing with a cultivator - grain seeder SZS-2.1 (Kazakhstan).

These sowing technologies were used to study the effectiveness of mineral fertilizers and the new organomineral fertilizer "Rokogumin", which contains amino acids, humates and fulvates, macro- and microelements. For integrated control of weeds, diseases and pests, a suspension of mineral fertilizers in a mixture of "Rokogumin" and herbicides and pesticides was sprayed during the chickpea branching phase. Mineral fertilizers according to traditional technology were applied in a scattered way for plowing, and in soil–protective ones – in a local (ribbon) way to a depth below the chickpea seedbed - 8-10 cm of soil.

The plot area is 100 m2 (2x50), the accounting area is 100 m2 (2x50). The repetition is 3-fold. Plots in the experiment were placed according to the method of split blocks. In the experiment, a new chickpea variety "Guliston" was sown with a norm of 80 kg / ha (250 thousand pieces /ha).

Results and their discussions

The dynamics of the water-food regime of the soil was studied before sowing chickpeas (before fertilizing) during the period of germination – branching, flowering – formation of beans and at full ripeness to a depth of 0-100 cm.

Weather conditions in the year of the research during the growing season, chickpeas were rainy and warm. The amount of precipitation for March – June was 34 mm more in comparison with the long-term norm (362 mm), the average monthly air temperature exceeded 2 oC, and the relative humidity of the air was at the level of the long-term norm - 62%.

The study of the dynamics of the water regime of the soil under chickpeas showed that the moisture reserves in the 0-100 cm soil layer before sowing were in the range of 1805 – 1959 m3 /ha or 76 – 83 % NV. The highest moisture reserves in the 0-100 cm soil layer were available in the chickpea branching phase in variants with traditional technology – 1816 – 2068 m3/ha, which is 77-87% of the HB. These humidity indicators in the variants with "O" technology amounted to 1117 – 1849 m3/ha (43-47% HB), 1334 – 1482 m3/ha (56-63% HB) in the variants of direct sowing of chickpea seeds with SZS – 2.1.

The growth and development of the root system and aboveground biomass of chickpeas on rain-fed lands depend on the physical, chemical, microbiological and many other properties of the soil. The main factor influencing these soil properties is the methods and depth of tillage, reserves of active moisture and the depth of soil soaking.

Chickpeas, like other legumes, have the ability to nitrogen-fix nitrogen from atmospheric air with the help of nodule bacteria Risobium, living in symbiosis with the host plant. Under favorable growing conditions, chickpeas accumulate 50-60 kg/ha of nitrogen available to plants in the soil. However, in many cases, in the early stages of chickpea ontogenesis, under the influence of winter and early spring rains, the soil is strongly compacted and oxygen access to the roots stops. At the same time, nodule bacteria are not formed in its roots and chickpeas turn into a consumer of nitrogen fertilizers.

The study of the dynamics of assimilated forms of nitrogen, phosphorus and potassium, depending on the norms and methods of applying mineral fertilizers and chickpea sowing technology, showed the following (Table 1.).

Table 1. Influence of sowing technology and mineral fertilizers on the dynamics of nutrients in the soil under chickpeas, mg/kg, 0 – 100 cm soil layer, Gallaral 2022 y

№	Fertilizer doses, kg/ha	Before sowing			Branching-flowering			Flowering-full ripeness		
		NO_3	P_2O_5	K_2O	NO_3	P_2O_5	K_2O	NO_3	P_2O_5	K_2O
Traditional technology										
1	Control – o	8,7	10,0	140	9,4	8,0	138	8,0	7,1	120
2	N_{20} P_{20} K_{20} до seeding	8,7	10,3	186	12,6	9,7	143	10,0	9,0	145
3	N_{20} P_{20} K_{20} + N_{20} in the top dressing	10,0	10,7	168	10,3	11,1	177	9,9	11,1	154
4	P_{40} K_{40} before sowing + N_{20} + РГ + pesticides	9,1	10,3	148	13,7	13,9	177	11,9	9,7	165
«O» technology (No-Till)										
1	Контроль – o	9,1	11,0	167	8,2	9,1	148	7,4	8,69	140
2	N_{20} P_{20} K_{20} before sowing	8,1	10,2	136	12,5	10,4	158	9,5	9,5	137
3	N_{20} P_{20} K_{20} + до seeding + N_{20} – branching	10,0	9,0	149	13,5	14,9	153	10,3	11,0	153
4	P_{40} K_{40} before sowing locally + N_{20} + РГ + pesticides	8,2	10,2	147	14,5	15,2	182	11,0	12,0	150
Direct seeding										
1	Control – o	9,4	10,6	140	8,9	8,2	142	7,0	9,2	140
2	N_{20} P_{20} K_{20} before sowing	8,6	10,7	143	12,4	13,8	177	10,1	14,2	152
3	N_{20} P_{20} K_{20} + before sowing – locally + N_{20} - branching	8,8	10,5	144	16,8	18,8	192	11,8	15,2	185
4	P_{40} K_{40} before sowing locally + N_{20} + РГ + pesticides	8,9	10,6	136	17,2	17,4	181	12,5	14,0	190

Note: 1) RG - Rocogumin, a new universal organomineral fertilizer; 2) in the branching – flowering phase of chickpeas, RG at a dose of 2.5 l/ha was sprayed with a suspension of nitrogen fertilizers mixed with a fungicide and an insecticide at the rate of 0.3 l/ha.

It can be seen from the table that, according to the content of available forms of nitrogen (N-NO3) and mobile P2O5, typical rain-fed serozems belong to low- and medium-potash-rich soils. So, in the meter layer of soil before the experiments, the content of nitrate nitrogen varied between 8.1 – 10.0 mg/kg of soil, mobile phosphorus – 9.0 – 10.9 and 136 – 186 mg/kg.

By the branching – flowering phase, the content of mobile forms of nitrogen, phosphorus and exchangeable potassium, depending on the sowing technology, dose and method of applying mineral fertilizers, increased significantly. At the same time, a relatively high content of assimilable forms of nutrients in the 0-100 cm soil layer was available in variants with direct sowing of chickpea seeds with SZS– 2.1 and the introduction of 40 kg/ha of phosphorus–potassium fertilizers by a local (ribbon) method, spraying with RG mixed with nitrogen suspension, and pesticides in the branching phase. In this version of the experiment, the NO3 content in comparison with the control version without fertilizers increased by 3.5 – 7.8 mg/kg, mobile P2O5 - by 3.5 – 9.4 mg/kg, and exchangeable K2O – by 4.0 – 4.3 mg/kg.

The superiority of direct sowing of chickpea seeds with SZS-2.1 and local application of phosphorus-potassium fertilizers at a dose of 40 kg / ha, spraying of RG mixed with pesticides over traditional and "O" technology remained until the flowering period – full ripeness.

Accounting for the chickpea grain harvest has shown that various sowing technologies and doses of mineral fertilizers have a significant impact on its yield (Table 2).

Table 2. The yield of chickpeas of the Gulistan variety depending on the technology of sowing and the dose of mineral fertilizers in the links of crop rotation at Bogar Gallaral 2022

№	Fertilizer doses, kg/ha	1			2			3		
		Yield, c/ha	Increase in control		Yield, c/ha	Increase in control		Yield, c/ha	Increase in control	
			+_ c/ha	%		+_ c/ha	%		+_ c/ha	%
1	control – o	6,3	-	100	5,5	-	100	6,2	-	124
2	N_{20} P_{20} K_{20} before sowing	7,5	+1,2	119	6,9	+1,4	125	7,7	+1,5	132
3	N_{20} P_{20} K_{20} + before sowing + N_{20} in the top dressing	7,1	+0,8	112	7,2	+1,7	131	8,2	+2,0	133
4	P_{40} K_{40} before sowing + N_{20} + in the top dressing	8,5	+2,2	138	7,6	+2,1	138	8,4	+2,2	143
5	P_{40} K_{40} before sowing + N_{20} + РГ +0,3 l/ha pesticides (spraying)	9,1	+2,8	144	8,2	+2,7	149	9,0	+2,8	138
6	P_{40} K_{40} before sowing + N_{20} + НК + pesticides (spraying)	8,5	+2,2	135	7,9	+2,4	144	8,7	+2,5	
	M, % НСР$_{05}$, c/ha	0,49 1,30	-	-	0,52 1,20	-	-	0,48 1,15	-	-

Note: 1. Traditional technology; 2. Zero technology; 3. Direct sowing with a cultivator – seeder SZS-2.1.

As can be seen from these data, the yield of chickpeas of the Gulistan variety on the natural background of soil fertility was 5.5 – 6.3 kg/ha. A slight decrease (0.8 c/ha) was noted when using the "O" technology with the Brazilian seeder "No-Till". The introduction of various doses of mineral fertilizers, spraying a suspension of a new universal organomineral fertilizer "Rokogumin" (RG) at a dose of 2.5 l/ha and 0.3 l/ha of the fungicide "Eurofol" and insecticide "Deltarin (2.5% EU) in the chickpea branching phase contributed to 2.7 – 2.8 c/ha of additional products. In this variant, the chickpea was fertilized with nitrogen at the rate of 20 kg / ha in the same phase. The yield of chickpea grain in the variant with the "O" technology was 0.8 – 0.9 c/ha lower than the traditional technology and direct sowing with the seeder – cultivator SZS-2.1.

Conclusion

1. In the conditions of the semi-secured plain-hilly zone of bogara in Uzbekistan, the yield of chickpeas depends on the moisture reserves in the meter layer of soil and the technology of tillage and sowing, the dynamics of the assimilable forms of elements of mineral nutrition of plants.
2. In wet years with sufficient deep moistening of the soil for the rational use of energy resources and the creation of a water-food regime of the soil favorable for chickpeas, direct sowing with a seeder – cultivator SZS-2.1 with local application of mineral fertilizers in a dose can be used N_{20} P_{40} K_{40} to a depth of 15-20 cm.

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