



## THE EFFECT OF VARIOUS FERTILIZATION METHODS ON ADDITIONAL YIELD FORMATION IN SOYBEAN VARIETIES

Abduazimov Akbar Mukhtorovich

Karshi Institute of Irrigation and Agrotechnologies

PhD in Agricultural sciences

Khodiyeva Sitora Shohabbos kizi

Karshi Engineering-Economics Institute,

Doctoral degree student

<https://doi.org/10.5281/zenodo.14214799>

**Аннотация:** Ушбу мақолада Қашқадарё вилоятининг оч тусли бўз тупроқлар шароитида соянинг “Тошкент” ва “Мадад” навларини асосий экин сифатида етиштирилганда минерал ўғитлар меъёрларини ҳамда қўлланилган суспензияларни дон ҳосилдорлигига таъсири ўрганилган. Соя навларига илдиждан ташқари турли препаратларни қўллаганда ўсимликлар томонида қўшимча ҳосил шаклланиши ва сақланиб қолиши келтирилган.

**Калит сўзлар:** соя, агротехника, асосий экин, препарат, минерал ўғитлар, ҳосилдорлик, нав, суспензия, озиклантириш.

**Аннотация:** В данной статье изучено влияние минеральных удобрений и внесенных суспензий на урожайность зерна при выращивании сои сортов «Ташкент» и «Мадад» в качестве основной культуры на светло-сероземах Кашкадарьинской области. Дополнительное формирование и сохранение урожая на стороне растений при внесении различных препаратов, кроме корневых, к сортам сои.

**Ключевые слова:** соя, агротехника, основная культура, препарат, минеральные удобрения, урожайность, сорт, суспензия, подкормка.

**Abstract:** This article examines the effects of mineral fertilizer rates and the application of suspensions on grain yield when cultivating soybean varieties “Toshkent” and “Madad” as the main crop in light gray soil conditions of the Kashkadarya region. The study demonstrates the formation and retention of additional yields when various foliar preparations are applied to soybean varieties.

**Keywords:** soybean, agrotechnology, main crop, preparation, mineral fertilizers, yield, variety, suspension, nutrition.

Soybeans are cultivated on more than 70 million hectares worldwide. About 400 different products are obtained from it. It improves soil ecology by converting free nitrogen from the atmosphere into biological nitrogen. It has been proven that soybean yields change significantly when seeds are treated with nitratin and other preparations. A decrease in yield was observed when seeds were sown without nitratin. Additionally, foliar feeding along with seed treatment and sowing also led to a sharp increase in yield [2; P. 20, 5; P. 23-24].

Kh. Atabaeva and M. Sattarov noted that when growing soybeans using mineral fertilizers at a rate of 50 kg nitrogen, 100 kg phosphorus, and 70 kg potassium, an additional 6.2 centners per hectare of grain yield can be obtained compared to the control. On meadow-swamp soils, with the addition of 1.2 kg/ha of sulfur to mineral fertilizers, an additional 11.2-18.4 centners per hectare of yield was achieved compared to the control [1; P. 36].

In soybean cultivation, the application of mineral fertilizers at the rate of N50P100K70 activates the photosynthetic activity of soybeans. In soybean agrotechnology, foliar feeding

with the addition of mineral fertilizers and microelements increases soybean grain yield by 6.2-14.2 centners per hectare [3; P. 40].

D.S. Asilova, Z.Sh. Askarova, and D.S. Khalikova concluded that, like scientists, mineral fertilizer norms also influence the increase in protein content. In variants 4 and 5, with high fertilizer rates of N<sub>60</sub>P<sub>120</sub>K<sub>90</sub> and N<sub>60</sub>P<sub>120</sub>K<sub>120</sub>, the protein content in the Uzbek-6 variety was high (33.5-36.2%), while in the Uzbek-2 variety it was 33.2-36.0% [4; P. 23-24].

In our research conducted on light gray soils of the Kashkadarya region, it was found that the yield indicators of soybean varieties change under the influence of mineral fertilizer norms applied to the soil and various fertilizers applied as foliar feeding. According to the results obtained, the lowest yield for soybean varieties was 18.6 centners per hectare for the "Toshkent" variety in the control variant without the application of fertilizers and suspensions. The highest yield was 40.0 centners per hectare for the "Madad" variety with the foliar application of Caliphos against a background of mineral fertilizer application at a rate of N<sub>120</sub>P<sub>90</sub>K<sub>60</sub> (Table 1).

**Table 1**

**Formation of additional yield, c/ha (2022-2024 yy.)**

Fertilizer rate	Suspension	Variety name	Average yield, c/ha	In relation to fertilizer norms		
				Without fertilizer (control)	N <sub>60</sub> P <sub>45</sub> K <sub>30</sub>	N <sub>120</sub> P <sub>90</sub> K <sub>60</sub>
Control (without fertilizer)	Control (without fertilizer)	Toshkent	18,6		-9,7	-12,3
		Madad	19,9		-10,3	-11,6
	Carbamide (standard)	Toshkent	23,7		-12,2	-11,2
		Madad	23,2		-10,6	-12,4
	Caliphos	Toshkent	24,9		-14,0	-14,2
		Madad	25,4		-14,0	-14,6
	LNCF	Toshkent	24,5		-11,3	-12,3
		Madad	25,1		-11,0	-12,7
N <sub>60</sub> P <sub>45</sub> K <sub>30</sub>	Control (without fertilizer)	Toshkent	28,3	9,7		-2,7
		Madad	30,1	10,3		-1,3
	Carbamide (standard)	Toshkent	35,9	12,2		1,0
		Madad	33,7	10,6		-1,8
	Caliphos	Toshkent	38,9	14,0		-0,1
		Madad	39,4	14,0		-0,6
	LNCF	Toshkent	35,8	11,3		-0,9
		Madad	36,1	11,0		-1,7
N <sub>120</sub> P <sub>90</sub> K <sub>60</sub>	Control (without fertilizer)	Toshkent	30,9	12,3	2,7	
		Madad	31,4	11,6	1,3	
	Carbamide (standard)	Toshkent	35,0	11,2	-1,0	
		Madad	35,5	12,4	1,8	
	Caliphos	Toshkent	39,0	14,2	0,1	



		Madad	40,0	14,6	0,6	
	LNCF	Toshkent	36,7	12,3	0,9	
		Madad	37,8	12,7	1,7	

As can be seen from the obtained data, even when cultivating soybean varieties with various mineral fertilizers, foliar feeding is of great importance. Especially when using the Caliphos preparation for extra-root feeding, the yield of the "Toshkent" variety was 3.0-4.0 centners per hectare higher, while the "Madad" variety was 4.5-5.7 centners per hectare higher compared to other variants.

Analysis of the formation of additional grain yield in soybean varieties using different mineral fertilizer backgrounds and various foliar fertilizers revealed an additional yield of up to 14.0 centners per hectare between mineral fertilizer rates, up to 10.6 centners per hectare between foliar fertilizers, and up to 2.2 centners per hectare between varieties.

When applying mineral fertilizers to soybean varieties at a rate of  $N_{60}P_{45}K_{30}$  from the soil, compared to the background without mineral fertilizers (unfertilized), additional yield formation was observed in the control variant (without fertilization) for the "Toshkent" variety - 9.7 centners per hectare, for the "Madad" variety - 10.3 centners per hectare; in the variant fertilized with carbamide, for the "Toshkent" variety - 12.2 centners per hectare, for the "Madad" variety - 10.6 centners per hectare; in the variant fertilized with Caliphos, for the "Toshkent" variety - 14.0 centners per hectare, for the "Madad" variety - 14.0 centners per hectare; in the variant fertilized with LNCF, for the "Toshkent" variety - 11.3 centners per hectare, for the "Madad" variety - 11.0 centners per hectare.

Against a background of mineral fertilizer application at a rate of  $N_{120}P_{90}K_{60}$ , compared to a background without fertilizer application (unfertilized), extra-root fertilization in the control variant (without fertilization) resulted in an additional yield of 12.3 centners per hectare for the "Toshkent" variety, 11.6 centners per hectare for the "Madad" variety; in the variant fertilized with carbamide, 11.2 centners per hectare for the "Toshkent" variety, 12.4 centners per hectare for the "Madad" variety; in the variant fertilized with Caliphos, 14.2 centners per hectare for the "Toshkent" variety, 14.6 centners per hectare for the "Madad" variety; in the variant fertilized with LNCF, 12.3 centners per hectare for the "Toshkent" variety, 12.7 centners per hectare for the "Madad" variety.

Against a background with mineral fertilizer application at a rate of  $N_{120}P_{90}K_{60}$ , compared to the background with mineral fertilizer application at a rate of  $N_{60}P_{45}K_{30}$ , an additional yield was formed in the control variant (without fertilization) of 2.7 centners per hectare for the "Toshkent" variety, 1.3 centners per hectare for the "Madad" variety; in the variant fertilized with carbamide, -1.0 centners per hectare for the "Toshkent" variety, 1.8 centners per hectare for the "Madad" variety; in the variant fertilized with Caliphos, 0.1 centners per hectare for the "Toshkent" variety, 0.6 centners per hectare for the "Madad" variety; in the variant fertilized with LNCF, 0.9 centners per hectare for the "Toshkent" variety, 1.7 centners per hectare for the "Madad" variety.

In the variant where soybean varieties were fertilized with extra-root urea fertilizer against a background without fertilizers, compared to the variant without foliar feeding, the yield increase of the "Toshkent" variety was 5.2 centners per hectare, and the "Madad" variety was 3.3 centners per hectare. In the variant with foliar feeding using the Caliphos preparation, compared to the variant without foliar feeding, the yield increase of the "Toshkent" variety was 6.3 centners per hectare, and the "Madad" variety was 5.5 centners per hectare.



Compared to the variant fertilized with urea, the “Toshkent” variety showed an increase of 1.2 centners per hectare, and the “Madad” variety 2.3 centners per hectare. Compared to the variant fertilized with the LNCF preparation, the “Toshkent” variety showed an increase of 0.4 centners per hectare, and the “Madad” variety 0.3 centners per hectare. In the variant fertilized with the LNCF preparation, compared to the variant without foliar feeding, the “Toshkent” variety showed an increase of 5.9 centners per hectare, and the “Madad” variety 5.2 centners per hectare. Compared to the variant fertilized with urea, the “Toshkent” variety showed an increase of 0.7 centners per hectare, and the “Madad” variety 2.0 centners per hectare.

In the variant with the application of urea fertilizer against a background of mineral fertilizers at a rate of  $N_{60}P_{45}K_{30}$ , compared to the variant without foliar fertilization, the soybean variety “Toshkent” yielded an increase of 7.7 centners per hectare, and the variety “Madad” 3.6 centners per hectare. In the variant with foliar fertilization using the Caliphos preparation, compared to the variant without foliar fertilization, the “Toshkent” variety showed an increase of 10.6 centners per hectare, and the “Madad” variety 9.3 centners per hectare. Compared to the variant fertilized with urea, the “Toshkent” variety showed an increase of 3.0 centners per hectare, and the “Madad” variety 5.7 centners per hectare. Compared to the variant fertilized with the LNCF preparation, the “Toshkent” variety showed an increase of 3.1 centners per hectare, and the “Madad” variety 3.3 centners per hectare. In the variant fertilized with the LNCF preparation, compared to the variant without foliar fertilization, the “Toshkent” variety showed an increase of 7.6 centners per hectare, and the “Madad” variety 6.0 centners per hectare. Compared to the variant fertilized with urea, the “Toshkent” variety showed an increase of 0.1 centners per hectare, and the “Madad” variety 2.4 centners per hectare.

Soybean varieties on a background with a mineral fertilizer rate of  $N_{120}P_{90}K_{60}$  in the variant with foliar feeding of extra-root urea fertilizer, compared to the variant without foliar feeding, the yield increase of the “Toshkent” variety was 4.0 centners per hectare, and the “Madad” variety 4.1 centners per hectare. In the variant with foliar feeding using the Caliphos preparation, compared to the variant without foliar feeding, the “Toshkent” variety showed an increase of 8.1 centners per hectare, and the “Madad” variety 8.6 centners per hectare. Compared to the variant fertilized with urea, the “Toshkent” variety showed an increase of 4.1 centners per hectare, and the “Madad” variety 4.5 centners per hectare. Compared to the variant fertilized with the LNCF preparation, the “Toshkent” variety showed an increase of 2.3 centners per hectare, and the “Madad” variety 2.2 centners per hectare. In the variant fertilized with the LNCF preparation, compared to the variant without foliar feeding, the “Toshkent” variety showed an increase of 5.8 centners per hectare, and the “Madad” variety 6.4 centners per hectare. Compared to the variant fertilized with urea, the “Toshkent” variety showed an increase of 1.8 centners per hectare, and the “Madad” variety 2.3 centners per hectare.

In the conditions of light gray soils of the Kashkadarya region, the yield of the “Toshkent” soybean variety was higher than that of the “Madad” variety. Specifically, in the variant without the use of mineral fertilizers from the soil and without foliar feeding (control), the yield was 1.3 centners per hectare higher, with the use of urea fertilizer - 0.6 centners per hectare, with the use of the Caliphos preparation - 0.5 centners per hectare, with the use of the LNCF preparation - 0.6 centners per hectare. On the background of mineral fertilizers at a



rate of  $N_{60}P_{45}K_{30}$ , in the variant without foliar feeding, the yield was 1.9 centners per hectare higher, with urea fertilizer - 2.2 centners per hectare, with the Caliphos preparation - 0.5 centners per hectare, with the LNCF preparation - 0.3 centners per hectare. On the background of mineral fertilizers at a rate of  $N_{120}P_{90}K_{60}$ , in the variant without foliar feeding, the yield was 0.5 centners per hectare higher, with urea fertilizer - 0.6 centners per hectare, with the Caliphos preparation - 1.0 centners per hectare, with the LNCF preparation - 1.1 centners per hectare.

In conclusion, it can be noted that in the conditions of light gray soils of the Kashkadarya region, when applying mineral fertilizers in the ratio of  $N_{60}P_{45}K_{30}$  and feeding with the Caliphos preparation as an extra-root fertilizer, the yield of the "Toshkent" variety is 3.0-4.0 centners per hectare higher, while the "Madad" variety is 4.5-5.7 centners per hectare higher compared to other options.

Also, in the conducted research, the most significant factor influencing soybean yield is the application of mineral fertilizers at a rate of  $N_{120}P_{90}K_{60}$ , where the highest yield is achieved. Specifically, compared to a background without mineral fertilizers, a yield increase of 11.2-14.6 centners per hectare was obtained, while compared to the application of mineral fertilizers at a rate of  $N_{60}P_{45}K_{30}$ , a yield increase of 0.1-2.7 centners per hectare was obtained.

### References:

1. Atabayeva Kh., Sattarov M. The Influence of Mineral Fertilizers and Sulfur on the Growth and Development of Soybean Plants // *Agro Ilm Journal*, 2019. No. 4. - p. 36.
2. Yormatova D., Tangirova G. The Effect of Nitragin on Soybean // *Agriculture of Uzbekistan*, Tashkent, 2006. No. 7. - p. 20.
3. Umarova N., Saitkanova R., Idirsov Kh. The Influence of Microelements on the Photosynthetic Activity and Yield of Soybean // *Agro Ilm Journal*. 2013. No. 4. - p. 40.
4. Asilova D.S., Askarova Z.Sh., Khalikova D.S. "The Effect of Fertilizer Rates on the Protein and Oil Content in Soybean Seeds" // *Proceedings of the Republican Scientific-Practical Conference on the Current State and Development Prospects of Breeding and Seed Production at Tashkent State Agrarian University*. Tashkent - 2014. - pp. 23-24.
5. Kuldoshov B.Kh., Khalilov N., Hamzayev A.Kh. Effectiveness of Various Stamped Inoculants on Soybean Crops // *Proceedings of the International Scientific-Practical Conference on "Current Issues in the Cultivation of Agricultural Crops and Prospects for its Development."* Tashkent, 2020. - pp. 63-64.

