

УДК: 631.547.3

**THE EFFECT OF SEED SOWING RATES AND FERTILIZATION  
LEVELS ON THE FORMATION OF YIELD COMPONENTS IN  
CHICKPEA VARIETIES****Otaqulova Dilfuza Azamatovna,**

Junior researcher,

Southern Agricultural Research Institute, 180100, Karshi city, Kashkadarya  
region, Uzbekistan.

**Abstract.** This study investigates the effects of seed sowing rates and nitrogen fertilization on the yield components of chickpea varieties. The research focuses on the locally developed chickpea cultivars "Obod" and "Polvon". The findings enhance the understanding of how different agronomic practices influence the yield performance of these cultivars, providing valuable insights for optimizing chickpea production under local conditions.

**Keywords:** chickpea, variety, sowing rate, fertilizer, mineral fertilizer, legume, yield components, productivity, plant density, planting scheme, grain.

**Аннотация:** Данное исследование изучает влияние норм высева семян и азотного удобрения на компоненты урожая различных сортов нута. Исследование сосредоточено на местных сортах нута «Обод» и «Полвон». Полученные результаты углубляют понимание того, как различные агрономические практики влияют на урожайность этих сортов, предоставляя ценные данные для оптимизации производства нута в местных условиях.

**Ключевые слова:** нут, сорт, норма высева, удобрение, минеральное удобрение, бобовые, компоненты урожая, продуктивность, плотность посадки, схема посева, зерно.

**Introduction.** Crop yield is one of the most complex quantitative traits and is considered one of the main indicators in evaluating and selecting varieties, as well as in developing agronomic practices. Its complexity is explained by its dependence on soil fertility, sowing rate, timing, water and nutrient regimes, and the biological characteristics of the varieties. One of such factors is the sowing rate and the amount of fertilization.

One of the productivity indicators of chickpea cultivation is the number of pods. Research indicates that the number of pods per plant is a variable trait, and productivity indicators depend on the number of pods. In chickpea cultivation, the potential for budding, flowering, and pod development is very high, but its retention is inherently linked to implementable agronomic practices, variety characteristics, and external environmental factors [1].

Cultivating chickpea in irrigated lands not only affects plant height and the number of pods but also influences the weight of the grains. [2]

The quantitative traits that directly affect the yield of chickpea varieties—such as the number of branches per plant, position of the first pod, number of pods per plant, number of grains per plant, grain weight per plant, and the weight of 1,000 grains—were comparatively analyzed for variations according to sowing rates and fertilization amounts. Before harvesting the crops, samples consisting of 25 plants were taken from each replication of each variant without selection. The samples were analyzed under laboratory conditions, and average indicators were presented as data.

With an increase in sowing rate, the number of pods per plant and the weight of 1,000 seeds decrease. This is explained by the insufficient nutrient area and strong competition among plants. As a result, plants branch less and seeds do not fully mature [3,4].

**Research Materials and Methods.** Field experiments were conducted at the experimental field of the Southern Agriculture Research Institute. The experiment consisted of 24 variants, arranged in a single tier with three replications. In the experiment, the chickpea cultivars "Obod" and "Polvon," registered in the State Register, were sown. The chickpea varieties were planted at three different planting densities—333,333 plants/ha, 166,666 plants/ha, and 111,111 plants/ha—using three systems (60×5-1 cm, 60×10-1 cm, 60×15-1 cm). During the growth period, they were fertilized with mineral fertilizers at rates of  $N_0P_{90}K_{60}$ ,  $N_{30}P_{90}K_{60}$ ,  $N_{45}P_{90}K_{60}$ , and  $N_{60}P_{90}K_{60}$  kg/ha.

**Research Results.** In the experiment, the "Obod" variety was studied under a sowing density of 333,333 seeds per hectare using a 60×5×1 cm planting scheme. The following results were obtained:

Number of branches per plant: In the variant sown with a fertilizer ratio of  $N_0P_{90}K_{60}$ , the number of branches per plant was 2.2. For the  $N_{30}P_{90}K_{60}$  variant, it was 2.5 branches (0.3 more than the control); for  $N_{45}P_{90}K_{60}$ , 2.7 branches (0.5 more than the control); and for  $N_{60}P_{90}K_{60}$ , 3.1 branches (0.9 more than the control). Height of the first pod: In the  $N_0P_{90}K_{60}$  variant, the first pod appeared at a height of 24.3 cm. This increased to 24.8 cm in the  $N_{30}P_{90}K_{60}$  variant (0.5 cm higher than the control), 25.3 cm in  $N_{45}P_{90}K_{60}$  (1.0 cm higher), and 26.4 cm in  $N_{60}P_{90}K_{60}$  (2.1 cm higher). Number of pods per plant: The  $N_0P_{90}K_{60}$  variant produced 33.8 pods per plant. This increased to 35.4 pods in  $N_{30}P_{90}K_{60}$  (1.6 more than the control), 37.9 pods in  $N_{45}P_{90}K_{60}$  (4.1 more), and 37.0 pods in  $N_{60}P_{90}K_{60}$  (3.2 more).

Number of seeds per plant: The  $N_0P_{90}K_{60}$  variant yielded 34.1 seeds per plant. The counts were higher in the other variants: 40.0 seeds in  $N_{30}P_{90}K_{60}$  (5.9 more than the control), 42.1 seeds in  $N_{45}P_{90}K_{60}$  (7.9 more), and 39.6 seeds in  $N_{60}P_{90}K_{60}$  (5.4 more).

Weight of 1000 seeds: At this planting density, the  $N_0P_{90}K_{60}$  variant had a 1000-seed weight of 298 grams. This increased to 311.4 grams in  $N_{30}P_{90}K_{60}$  (13.4 grams more than the control), 322.1 grams in  $N_{45}P_{90}K_{60}$  (24.1 grams more), and 322.4 grams in  $N_{60}P_{90}K_{60}$  (24.4 grams more).

**Table-1**

**The effect of seeding rates and fertilization rates on the formation of yield elements of chickpea varieties (Karshi, 2023)**

№	Varieties of chickpeas	Seed planting schemes	Annual rates of mineral fertilizers, kg/ha	Number of branches on each bush	The initial leguminous	Number of pods per	The number of grains in one bush	Grain weight per bushel
1	Obod	60x5x1	St. $N_0P_{90}K_{60}$	2,2	24,3	33,8	34,1	10,2
2			$N_{30}P_{90}K_{60}$	2,5	24,8	35,4	38,6	12,9
3			$N_{45}P_{90}K_{60}$	2,7	25,3	37,9	42,1	14,6
4			$N_{60}P_{90}K_{60}$	3,1	26,4	37,0	40,9	13,8
5		60x10x1	St. $N_0P_{90}K_{60}$	2,6	25,6	36,6	39,2	13,4
6			$N_{30}P_{90}K_{60}$	3,1	26,4	38,4	44,1	15,8
7			$N_{45}P_{90}K_{60}$	3,6	27,1	42,1	48,8	18,3
8			$N_{60}P_{90}K_{60}$	4,1	28,4	40,6	47,1	17,2
9		60x15x1	St. $N_0P_{90}K_{60}$	3,7	26,5	39,0	40,5	15,3
10			$N_{30}P_{90}K_{60}$	4,4	27,5	41,1	45,2	17,7
11			$N_{45}P_{90}K_{60}$	4,4	28,4	45,5	50,8	20,5
12			$N_{60}P_{90}K_{60}$	5,5	29,2	43,6	48,8	19,0
13	Polvon	60x5x1	St. $N_0P_{90}K_{60}$	2,1	24,1	34,2	34,5	10,8
14			$N_{30}P_{90}K_{60}$	2,3	24,7	35,5	39,2	13,5
15			$N_{45}P_{90}K_{60}$	2,5	24,8	38,2	42,9	15,4
16			$N_{60}P_{90}K_{60}$	3,1	25,4	37,1	41,4	14,6
17		60x10x1	St. $N_0P_{90}K_{60}$	3,4	25,5	36,8	39,7	14,0
18			$N_{30}P_{90}K_{60}$	3,9	26,3	38,7	44,5	16,4
19			$N_{45}P_{90}K_{60}$	4,3	26,7	42,7	49,5	19,2
20			$N_{60}P_{90}K_{60}$	5,1	27,4	40,8	47,6	18,0

21			St. N <sub>0</sub> P <sub>90</sub> K <sub>60</sub>	4,3	26,6	39,4	41,1	15,8
22			N <sub>30</sub> P <sub>90</sub> K <sub>60</sub>	5,0	27,6	41,5	45,8	18,3
23			N <sub>45</sub> P <sub>90</sub> K <sub>60</sub>	5,6	27,5	46,0	51,6	21,2
24			N <sub>60</sub> P <sub>90</sub> K <sub>60</sub>	5,9	28,8	43,9	49,2	19,5

In the variants where this variety was sown at a density of 111,111 seeds per hectare (using a 60×15×1 cm planting scheme), the following observations were made:

Number of branches per plant: In the variant sown with a fertilizer ratio of N<sub>0</sub>P<sub>90</sub>K<sub>60</sub> kg/ha, the number of branches per plant was 3.7. In the N<sub>30</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant, it was 4.4 branches (0.7 branches more than the control). The N<sub>45</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant also had 4.4 branches per plant (0.7 branches more than the control). In the N<sub>60</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant, the number increased to 5.5 branches (1.8 branches more than the control).

Height of the first pod: The initial pod height was 26.5 cm in the N<sub>0</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant. In the N<sub>30</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant, it increased to 27.5 cm (1.0 cm higher than the control). The N<sub>45</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant showed a height of 28.4 cm (1.9 cm higher), and the N<sub>60</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant reached 29.2 cm (2.7 cm higher).

Number of pods per plant: The N<sub>0</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant had 42.7 pods per plant. In the N<sub>30</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant, there were 42.6 pods (1.2 pods fewer than the control). The N<sub>45</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant had 46.5 pods (3.8 pods more than the control), and the N<sub>60</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant had 45.0 pods (2.3 pods more).

Number of grains per plant: In the N<sub>0</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant, there were 49.5 grains per plant. The N<sub>30</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant had 52.4 grains (2.9 grains more than the control). The N<sub>45</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant showed 58.1 grains per plant (8.6 grains more than the control), and the N<sub>60</sub>P<sub>90</sub>K<sub>60</sub> kg/ha variant had 54.5 grains (4.9 grains more). In the variants where the "Polvon" variety was sown at a density of 333,333 seeds per hectare (using a 60×5×1 cm planting scheme), the following observations were made:

Number of branches per plant: In the variant fertilized with N<sub>0</sub>P<sub>90</sub>K<sub>60</sub>, the number of branches per plant was 2.1. In the N<sub>30</sub>P<sub>90</sub>K<sub>60</sub> variant, it was 2.3 branches (0.2 more than the control); in the N<sub>45</sub>P<sub>90</sub>K<sub>60</sub> variant, 2.5 branches (0.4 more than the control); and in the N<sub>60</sub>P<sub>90</sub>K<sub>60</sub> variant, 3.1 branches (1.0 more than the control).

Height of the first pod: In the N<sub>0</sub>P<sub>90</sub>K<sub>60</sub> variant, the first pod appeared at a height of 24.1 cm. This increased to 24.7 cm in the N<sub>30</sub>P<sub>90</sub>K<sub>60</sub> variant (0.6 cm higher than the control), 24.8 cm in the N<sub>45</sub>P<sub>90</sub>K<sub>60</sub> variant (0.7 cm higher), and 25.4 cm in the N<sub>60</sub>P<sub>90</sub>K<sub>60</sub> variant (1.3 cm higher).

Number of pods per plant: The  $N_0P_{90}K_{60}$  variant had 34 pods per plant. The  $N_{30}P_{90}K_{60}$  variant also had 34 pods. In the  $N_{45}P_{90}K_{60}$  variant, the number increased to 37.5 pods (3.5 more than the control), and in the  $N_{60}P_{90}K_{60}$  variant, it was 41.4 pods (7.4 more than the control).

Number of grains per plant: In the  $N_0P_{90}K_{60}$  variant, there were 34.3 grains per plant. This increased to 38.4 grains in the  $N_{30}P_{90}K_{60}$  variant (4.1 more than the control), 39.4 grains in the  $N_{45}P_{90}K_{60}$  variant (5.0 more than the control), and 37.3 grains in the  $N_{60}P_{90}K_{60}$  variant (2.9 more than the control).

At the same planting density, it was determined that the weight of 1,000 grains was 348.2 grams in the variant sown with  $N_0P_{90}K_{60}$ ; 358.6 grams in the variant sown with  $N_{30}P_{90}K_{60}$  (10.4 grams higher than the control); 361.3 grams in the variant sown with  $N_{45}P_{90}K_{60}$  (13.1 grams higher than the control); and 372.6 grams in the variant sown with  $N_{60}P_{90}K_{60}$  (24.4 grams higher than the control).

**Conclusion.** Based on the obtained results, it was observed that in the cultivar "Obod", varying planting densities and nitrogen fertilization rates led to significant changes in yield components. Specifically, the number of branches per plant varied by 0.3–1.8 units; the height of the first pod on the stem varied by 0.5–2.8 cm; the number of pods per plant varied by up to 4.1 units; the number of grains per plant varied by 3.8–10 units; the grain weight per plant varied by 1.9–4.8 grams; and the 1,000-grain weight varied by 6.4–30 grams.

In contrast, the cultivar "Polvon" exhibited a greater variation in some of these traits. The number of branches per plant ranged from 0.2–1.7 units; the height of the first pod on the stem varied by 0.6–2.2 cm; the number of pods per plant varied by up to 7.4 units; the number of grains per plant varied by 1.3–9.8 units; the grain weight per plant varied by 1.8–4.2 grams; and the 1,000-grain weight varied by 10.4–34.4 grams.

Notably, the "Polvon" variety demonstrated a higher number of branches per plant compared to the "Obod" variety, whereas the "Obod" variety showed a higher position of the first pod on the stem. The superior 1,000-grain weight of the cultivar "Polvon" resulted in its biological yield being 0.8–3.4 centners higher than that of the cultivar "Obod". Additionally, decreasing the sowing rates positively influenced the full maturation of the grains. Specifically, in variants sown using the  $60 \times 10 \times 1$  cm scheme, grain weights increased by 20.2–27.2 grams compared to those sown using the  $60 \times 5 \times 1$  cm scheme, and in variants sown using the  $60 \times 15 \times 1$  cm scheme, grain weights increased by 35.3–50.3 grams.

These findings highlight the significant impact of planting density and nitrogen fertilization on the morphological and yield traits of chickpea varieties.



Understanding these relationships allows for the optimization of agronomic practices to enhance crop productivity and achieve higher yields under local growing conditions.

#### References:

1. K.A.Nurgashev, F.I.Matkarimov, O.E.Holliyev, S.K.Baboev. "Comparative analysis of valuable farm characteristics in autumn chickpea samples" // Academic research in educational sciences 2021. №4. C-556-560.
2. I.Hamdamov, Z.Bobomurodov, G.Suvonova, M.Djumaev. "Chickpea: both food and medicine". Agriculture of Uzbekistan. . 3. 2009. B-18.
3. G.Mirsharipova. "Effect of planting period on yield of chickpea varieties in the conditions of Syrdarya region". "Agro science-Uzbekistan agriculture". No. 4(32), 2014. B-21-22.
4. A.V.Fedyushkin, S.V.Pasko. Chickpea productivity depending on the seeding rate and mineral nutrition background. International Journal of Humanities and Natural Sciences. 2019. No. 2-1. B-29-31.