

THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH, DEVELOPMENT, AND PHYTOCHEMICAL COMPOSITION OF DATURA INNOXIA MILL RAW MATERIAL

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ANNOTATION

Due to the growing demand for natural medicines in world medicine, special attention is paid to research on increasing yields and improving product quality through the introduction of wild medicinal plants for cultivation in irrigated farming areas and the development of cultivation agrotechnologies. In particular, it is relevant to conduct research on the correct determination of mineral fertilizer application rates, particularly nitrogen fertilizers, and the development of feeding rates for the cultivation of *Datura innoxia* Mill.

Key words: *Datura innoxia* Mill, medicinal properties, agrotechnology, cultivation, fertilizer, N, P, K, alkaloid.

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INTRODUCTION

In our republic, 112 out of 1,200 species of medicinal plants are used in the pharmaceutical industry. Due to the fact that the distribution areas of medicinal plants in nature are

increasingly shrinking, it is of great importance to propagate them in cultivated conditions, study their biomorphological properties and chemical composition, introduce them, and develop scientifically grounded

agrotechnologies for their cultivation. The Development Strategy of the Republic of Uzbekistan for New Uzbekistan for 2022-2026 provides for "increasing the area of medicinal plant plantations on forest fund lands to 4,984 hectares." In this regard, scientific research on the introduction of the *Datura innoxia* plant for cultivation in various soil and climatic conditions of our republic, the correct determination of planting dates and rates, as well as irrigation regimes and feeding rates, is considered relevant.

This dissertation research serves, to a certain extent, to fulfill the tasks outlined in the Resolutions of the President of the Republic of Uzbekistan PF-4670 dated April 10, 2020, "On measures for the protection, cultivation, processing, and rational use of available resources of wild medicinal plants," PF-4901 dated November 26, 2020, "On measures to expand the scope of scientific research on the cultivation and processing of medicinal plants and the development of their seed production," PF-251 dated May 20, 2022, "On measures to organize the cultivation, processing, and use of medicinal plants" as well as other regulatory legal documents adopted in this field.

Despite the introduction of the *Datura innoxia* plant into the conditions of our republic, insufficient scientific research has been conducted on the development of agrotechnical measures for cultivation on irrigated lands. Conducting scientific research to solve this problem is considered relevant.

RESEARCH METHODS

The placement of field experiments, calculations, and

observations were carried out based on the methodological manuals "Methods for Conducting Field Experiments" soil and plant analyses "Methods of Agrophysical Research" and "Methods of Agrochemical Analysis of Soils and Plants" statistical analysis of the results was performed using Microsoft Excel software and B.A.Dospekhovs methodological manual "Methodology of Field Experiments" and economic efficiency was determined using the methodology of N.A.Baranov.

DISCUSSION OF THE RESEARCH RESULTS

In the typical sierozem soils of the Tashkent region, the optimal forms and application rates of nitrogen fertilizers were determined. Specifically, ammonium nitrate (NH_4NO_3), urea ($\text{CO}(\text{NH}_2)_2$), and ammonium sulfate ($(\text{NH}_4)_2\text{SO}_4$) were applied at a rate of 120 kg/ha against a background of $\text{P}_{90}\text{K}_{90}$ kg/ha mineral fertilizers.

It was established that the highest leaf and seed yields for *Datura innoxia* were obtained when applying a $\text{N}_{120}\text{P}_{90}\text{K}_{90}$ kg/ha fertilizer combination. The application of nitrogen in the form of ammonium sulfate resulted in a leaf yield of 10.83 c/ha, which was an additional 3.96 c/ha compared to the control group and 0.59 c/ha higher than the ammonium nitrate application. A seed yield of 17.4 c/ha was also achieved.

The highest concentration of alkaloids in the vegetative and generative organs of the *Datura innoxia* was obtained with the application of $\text{N}_{120}\text{P}_{90}\text{K}_{90}$ kg/ha. It was determined that the plant contained 0.39 % alkaloids in its roots, 0.26 % in the stem, 0.42 % in the leaves, 0.77 % in

THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH, DEVELOPMENT, AND PHYTOCHEMICAL COMPOSITION OF DATURA INNOXIA MILL RAW MATERIAL

the flowers, 0.96 % in the fruits, and 0.99 % in the seeds.

The application of ammonium sulfate ((NH₄)₂SO₄) at rates of 120-150 kg/ha, against a background of P₉₀K₉₀ kg/ha phosphorus and potassium fertilizers, had a positive effect on maintaining optimal agrophysical and agrochemical soil properties. Compared to the unfertilized control group, this improved soil bulk density by 0.012-0.013 g/sm³, and increased humus content by 0.078-0.082 %, total nitrogen by 0.019-0.023 %, and mobile phosphorus by 0.024-0.033 %.

The rates and types of mineral fertilizers used in the cultivation of *Datura innoxia* Mill. had varying effects on plant growth and development. Compared to the unfertilized control group, they resulted in an increase in plant height by 12.3–62.9 cm, the number of fruit-bearing branches by 2.9–10.7, the number of fruits by 4.0–20.0, and fruit weight by 8.3–490 g.

It was confirmed that applying nitrogen fertilizers at a rate of 120 kg/ha against a background of P₉₀K₉₀ kg/ha mineral fertilizers positively influenced the growth, development, and productivity of the *Datura innoxia*. Plant height increased by 12.3–62.9 cm, the number of leaves per plant by 2.9–10.7, and the number of fruits by 4.0–20.0.

Relatively high indicators for the number, surface area, and weight of the *datura innoxia* leaves were observed in the variants where nitrogen fertilizers were applied at rates of 120-150 kg/ha against a background of P₉₀K₉₀ kg/ha mineral fertilizers. Compared to the unfertilized control group, the number

of leaves per plant was 24.3–32.7 higher, the leaf surface area per plant was 1110.1 sm² greater, and the dry leaf mass was 7.9–12.4 g higher.

The applied rates and types of mineral fertilizers influenced the NPK content in the plant's leaves. The application of nitrogen fertilizers at rates of 120–150 kg/ha against a background of P₉₀K₉₀ kg/ha phosphorus and potassium fertilizers resulted in a leaf composition of 2.44–2.69 % nitrogen, 0.50–0.55 % phosphorus, and 2.60–2.74 % potassium.

The application of nitrogen fertilizers at a rate of 120-150 kg/ha against a background of P₉₀K₉₀ kg/ha of phosphorus and potassium fertilizers showed a positive effect on the yield of *Datura innoxia*, ensuring a leaf yield of 2.93-3.96 c/ha and a seed yield of 5.7-7.7 c/ha higher compared to the control variant without fertilizers.

It has been established that the alkaloids in the roots of *Datura innoxia* are 0.39 %, in the stems 0.26 %, in the leaves 0.42 %, in the flowers 0.77 %, in the fruits 0.96 %, and in the seeds 0.99 %.

The scientific significance of the research results lies in the scientific substantiation of the possibility of obtaining a yield of dry leaves and seeds with optimal doses of medicinal properties (alkaloids) due to the positive effect of the application of nitrogen fertilizers in the form of ammonium sulfate at a rate of 120 kg/ha against the background of the application of phosphorus and potassium fertilizers at a rate of P₉₀K₉₀ kg/ha in the conditions of typical sierozem soils of the Tashkent region.

THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH, DEVELOPMENT, AND PHYTOCHEMICAL COMPOSITION OF DATURA INNOXIA MILL RAW MATERIAL

The practical significance of the research results is determined by the fact that in the conditions of typical sierozem soils of the Tashkent region, the application of ammonium sulfate forms of nitrogen fertilizers at a rate of 120 kg/ha against the background of the application of phosphorus and potassium fertilizers at a rate of P₉₀K₉₀ kg/ha, the yield of dry leaves and seeds with optimal medicinal properties was obtained, high economic efficiency was achieved, and the results obtained were put into practice.

The field experiment consisted of 14 variants, arranged in 3 repetitions and 1 tier. The total area occupied by each variant was 140 m², of which the area of the calculated rows was 70 m². The total area of the experiment was 0.588 hectares.

To determine the initial agrochemical composition of the soil of the field where the research was conducted, soil samples were taken from the 0-30 and 30-50 sm soil layers at 5 points along the diagonal for analysis before the experiment.

According to the results of the preliminary analysis of the experimental field soil, the humus content in the 0-30 sm layer was 1.150 %, the total nitrogen content was 0.130 %, and the total phosphorus content was 0.148 %. The humus content in the 30-50 sm subsoil layer of the experimental field was 0.945 %, the total nitrogen content was 0.096 %, and the total phosphorus content was 0.117 %. According to the results of the analysis of mobile forms of nutrients in the soil composition, the amount of nitrate nitrogen in the arable (0-30 sm) layer was 24.8 mg/kg, in the sub-arable

(30-50 sm) layer 19.3 mg/kg, and the amount of mobile phosphorus in the 0-30 cm layer was 31.5 mg/kg, and in the 30-50 sm layer 24.6 mg/kg. The amount of exchangeable potassium in the 0-30 sm soil layer was 188 mg/kg, and in the 30-50 sm layer, it was 170 mg/kg.

It can be seen that the typical sierozems of the small educational experimental plot of the Tashkent State Agrarian University, where field experiments were conducted, are low in nitrogen, medium in phosphorus, and low in exchangeable potassium according to the classification.

In the study, mineral fertilizers such as urea (N-46 %), ammonium nitrate (N-34 %), ammonium sulfate (N-21 %), ammophos (N-11-12 %, P₂O₅-46 %), and potassium (K₂O-60 %) were used in the cultivation of the *Datura innoxia* plant.

The study examined the influence of mineral fertilizer types and rates on changes in soil agrophysical properties such as bulk density and porosity, as well as agrochemical properties such as humus, nitrogen, phosphorus, and mobile forms of nutrients.

As a result, the influence of nitrogen fertilizers such as ammonium sulfate [(NH₄)₂SO₄-20.5 % N], urea (CO(NH₂)₂-46 % N), and ammonium nitrate (NH₄NO₃-34.6 % N) at a rate of 60, 90, 120, and 150 kg/ha on the bulk density of the soil was determined.

According to the data obtained, in the conditions of typical sierozem soils of the Tashkent region, the application of nitrogen fertilizers in various forms and rates during the cultivation of *Datura innoxia* reduced the soil bulk density compared to the initial amount;

however, a relatively high density was observed when applying ammonium sulfate at a rate of 120–150 kg/ha, which is 0.012–0.013 g/sm³ less than in the control variant without fertilizers.

Soil porosity is inversely proportional to its bulk density, and as the bulk density decreases, its porosity increases.

The application of nitrogen fertilizers in various forms and rates during the cultivation of *Datura innoxia* reduced soil porosity compared to the initial level. However, a relatively higher porosity was observed when applying ammonium sulfate at a rate of 120–150 kg/ha, which was found to be 0.05–0.06 % higher than in the unfertilized control variant.

Although the amounts of humus, total nitrogen, and mobile phosphorus in the soil decreased in all variants by the end of the growing season compared to the initial amounts, the application of ammonium sulfate nitrogen fertilizer at a rate of 120-150 kg/ha against a background of phosphorus and potassium fertilizers applied at P₉₀K₉₀ kg/ha increased the humus content by 0.069-0.082 %, total nitrogen by 0.019-0.023 %, and total phosphorus by 0.024-0.033 % compared to the unfertilized control variant. The application of urea fertilizer at a rate of 120-150 kg/ha resulted in respective increases of 0.079-0.081 %, 0.017-0.021 %, and 0.026-0.32 %, while the application of ammonium nitrate at a rate of 120-150 kg/ha ensured increases of 0.078-0.080%, 0.015-0.019 %, and 0.024-0.031 %, respectively.

Experiments established that the types of nitrogen fertilizers used in the

cultivation of *Datura innoxia* affected seed germination and seedling density under field conditions. In the typical serozem soils where the research was conducted, seeds were sown on April 14, 2022, April 16, 2023, and April 19, 2024. Observations to determine seedling emergence rates began 6-7 days later and continued every two days.

According to data from the 2022 study, in the variants treated with various rates of ammonium sulfate [(NH₄)₂SO₄] against a background of phosphorus and potassium fertilizers at rates of P₂O₅-90 and K₂O-90 kg/ha, 22.8-23.5 % of seedlings had emerged by the first observation date (April 20). This figure reached 38.9-40 % by April 22. By the third observation date (April 24), field germination was 56.7–58.6 %, and by the fourth observation date (April 26), 76.4–77.3 % of seedlings had emerged. In these variants using ammonium sulfate [(NH₄)₂SO₄], the highest germination rate was observed in the variant with a fertilizer rate of N-120, P₂O₅-90, and K₂O-90 kg/ha, reaching 23.5 % in the first observation period, 40.2 % in the second, 58.5 % in the third, and 77.3 % in the fourth. Thus, it was determined that the optimal application of ammonium sulfate [(NH₄)₂SO₄] against a background of phosphorus and potassium fertilizers ensured a 4.1 % higher field germination rate compared to the unfertilized control variant.

Against a background of phosphorus and potassium fertilizers applied at a rate of P₂O₅-90, K₂O-90 kg/ha, in variants where different rates of urea [CO(NH₂)₂] were applied, 22.6-23.4 % of seedlings emerged by the

THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH, DEVELOPMENT, AND PHYTOCHEMICAL COMPOSITION OF DATURA INNOXIA MILL RAW MATERIAL

first observation date (April 19); by April 22, this figure reached 39.1-39.8 %. By the third observation date (April 24), field germination was 57.3-59.1 %, while by the fourth observation date (April 26), 77.1-77.7 % of seedlings had emerged. In these variants using urea $[\text{CO}(\text{NH}_2)_2]$, the highest germination rate was also observed in the variant with a fertilizer rate of N-120, P_2O_5 -90, and K_2O -90 kg/ha, reaching 23.4 % in the first observation period, 39.8 % in the second, 59.1 % in the third, and 77.7 % in the fourth. Thus, it was proven that the optimal application of urea $[\text{CO}(\text{NH}_2)_2]$ against a background of phosphorus and potassium fertilizers resulted in a 4.0 % higher field germination rate compared to the unfertilized control variant.

In the studies on the *Datura innoxia* plant, the effects of nitrogen fertilizers such as ammonium nitrate (NH_4NO_3 -34.6 % N), ammonium sulfate $[(\text{NH}_4)_2\text{SO}_4$ -20.5% N], and urea $[\text{CO}(\text{NH}_2)_2$ -46% N] at rates of 60, 90, 120, and 150 kg/ha were tested against a background of phosphorus and potassium fertilizers applied at a rate of $\text{P}_{90}\text{K}_{90}$ kg/ha, examining leaf formation and the NPK content within them.

According to the study data, in 2022, against a background of phosphorus and potassium fertilizers applied at a rate of $\text{P}_{90}\text{K}_{90}$ kg/ha, the application of ammonium sulfate at rates of 60, 90, 120, and 150 kg/ha ensured that the number of leaves per plant ranged from 81.5 to 95.9, which was 17.3 to 31.7 leaves more than the unfertilized control variant. In the variant where only phosphorus and potassium fertilizers were applied at

$\text{P}_{90}\text{K}_{90}$ kg/ha, the number of leaves per plant was 73.0.

It was demonstrated that, with a background application of phosphorus and potassium fertilizers at a rate of $\text{P}_{90}\text{K}_{90}$ kg/ha, the application of urea $(\text{CO}(\text{NH}_2)_2$ -46% N) at rates of 60, 90, 120, and 150 kg/ha resulted in 77.7-93.6 leaves per plant, which was 13.5-29.4 leaves more than the unfertilized control variant.

When applying ammonium nitrate (NH_4NO_3) at rates of 60, 90, 120, and 150 kg/ha, the number of leaves per plant was 77.5-91.8, which was found to be 13.3-27.6 leaves more than the unfertilized control variant.

When determining the dry weight of leaves per plant, the highest values were observed in the variant where ammonium sulfate was applied at a rate of 120 kg/ha, reaching 32.3 g. In contrast, this value was 20.5 g in the unfertilized control variant, and 23.0 g in the variant with only the $\text{P}_{90}\text{K}_{90}$ kg/ha application of phosphorus and potassium fertilizers. Against this background, in the variants where ammonium sulfate was applied at rates of 90 and 120 kg/ha, the total dry weight of leaves per plant was 27.2-32.3 g.

In the variants where $\text{CO}(\text{NH}_2)_2$ was applied at rates of 60, 90, 120, and 150 kg/ha, the dry weight of leaves per plant was 24.8-31.6 g. With this nitrogen fertilizer background, the highest values were also observed in the variant using urea at a rate of 120 kg/ha, which was found to be 11.1 g higher than the unfertilized control variant.

In the variants where NH_4NO_3 was applied at rates of 60, 90, 120, and

THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH, DEVELOPMENT, AND PHYTOCHEMICAL COMPOSITION OF DATURA INNOXIA MILL RAW MATERIAL

150 kg/ha, the dry weight of leaves per plant was 23.7-29.4 g. With this nitrogen fertilizer background, the highest values were observed in the variant using ammonium nitrate at a rate of 120 kg/ha, which was found to be 8.9 g higher than the unfertilized control variant.

Based on the data obtained, it can be concluded that the forms of nitrogen fertilizers used in the cultivation of *Datura innoxia* under the conditions of typical sierozem soils of the Tashkent region have a direct effect on the plant's number of leaves, leaf surface area, leaf weight, and dry leaf weight. It was determined that when ammonium sulfate ($(\text{NH}_4)_2\text{SO}_4$) was applied at a rate of 120 kg/ha against a background of mineral fertilizers at $\text{P}_{90}\text{K}_{90}$ kg/ha, the number of leaves per plant was higher by 32.7-35.4 compared to the control, by 2.2-2.7 compared to the urea application, and by 4.7-5.1 compared to the ammonium nitrate application. The leaf surface area was correspondingly higher by 1362.0-1387.1 sm^2 , 44.6-49.3 sm^2 , and 84.5-88.3 sm^2 ; leaf weight by 61.9-72.4 g, 9.0-9.7 g, and 16.0-17.6 g; and dry leaf weight by 12.4-13.7 g, 1.8-2.2 g, and 3.3-3.5 g, respectively. 9.0-9.7 g; 16.0-17.6 g; the dry leaf weight was 12.4-13.7; 1.8-2.2;

Furthermore, it was also determined that the types and rates of mineral fertilizers influenced the NPK content in the leaves of the *Datura innoxia*.

According to the research data from 2022, an analysis of the NPK content in the plant's leaves showed that, with a background application of phosphorus and potassium fertilizers at

a rate of $\text{P}_{90}\text{K}_{90}$ kg/ha, applying ammonium sulfate at rates of 60, 90, 120, and 150 kg/ha ensured a leaf nitrogen content of 1.99-2.69 %, a phosphorus content of 0.45-0.55 %, and a potassium content of 2.48-2.74 %. In the unfertilized control variant, the nitrogen content in the plant leaves was found to be 1.93 %, phosphorus content 0.35 %, and potassium content 1.99 %. In the variant where only phosphorus and potassium fertilizers were applied at the $\text{P}_{90}\text{K}_{90}$ kg/ha rate, these values were 1.99 %, 0.41 %, and 2.21 %, respectively. 0.41;

With a background application of phosphorus and potassium fertilizers at a rate of $\text{P}_{90}\text{K}_{90}$ kg/ha, the application of urea ($\text{CO}(\text{NH}_2)_2 - 46\% \text{N}$) at rates of 60, 90, 120, and 150 kg/ha resulted in a leaf nitrogen content of 2.20-2.59%, a phosphorus content of 0.42-0.54%, and a potassium content of 2.45-2.72%.

When applying ammonium nitrate (NH_4NO_3) at rates of 60, 90, 120, and 150 kg/ha, the nitrogen content in the leaves was 2.18-2.57 %, the phosphorus content was 0.42-0.53 %, and the potassium content was 2.45-2.71 %.

According to data obtained in 2016, an analysis of the NPK content in the plant's leaves showed that, with a background application of $\text{P}_{90}\text{K}_{90}$ kg/ha of phosphorus and potassium fertilizers, applying ammonium sulfate at rates of 60, 90, 120, and 150 kg/ha ensured a nitrogen content of 2.32-2.73 %, a phosphorus content of 0.48-0.60 %, and a potassium content of 2.51-2.79 %. In the unfertilized control variant, the nitrogen content in the plant leaves was found to be 1.98 %, and the potassium content was 1.99 %.

THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH, DEVELOPMENT, AND PHYTOCHEMICAL COMPOSITION OF DATURA INNOXIA MILL RAW MATERIAL

phosphorus content 0.39 %, and potassium content 2.01 %. In the variant where phosphorus and potassium fertilizers were applied at the P₉₀K₉₀ kg/ha rate, these values were observed to be 2.02 %, 0.43 %, and 2.25 %, respectively. 0.43;

2.61 %, the phosphorus content was 0.45-0.57 %, and the potassium content was 2.48-2.75 %.

From the data presented above, it can be concluded that when cultivating Datura innoxia Mill, increasing the rate of nitrogen fertilizers from N₆₀ kg/ha to

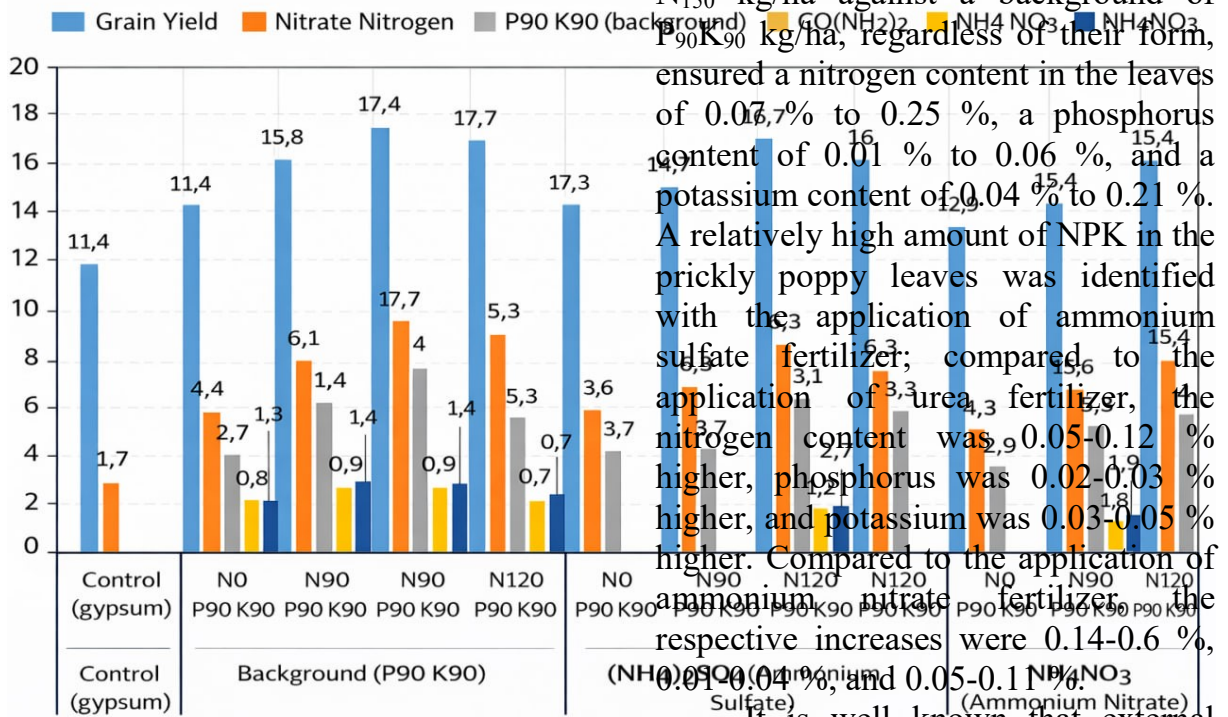


Figure 1. Nutrient content in the leaves, % per 100 g of dried leaves. 2024

When phosphorus and potassium fertilizers were applied at a rate of P₉₀K₉₀ kg/ha, the application of urea, a nitrogen fertilizer, at rates of 60, 90, 120, and 150 kg/ha was found to result in a leaf nitrogen content of 2.24-2.65 %, a phosphorus content of 0.46-0.59 %, and a potassium content of 2.49-2.76 %.

When ammonium nitrate, a nitrogen fertilizer, was applied at rates of 60, 90, 120, and 150 kg/ha, the nitrogen content in the leaves was 2.21-

N₁₅₀ kg/ha against a background of P₉₀K₉₀ kg/ha, regardless of their form, ensured a nitrogen content in the leaves of 0.07-0.25 %, a phosphorus content of 0.01 % to 0.06 %, and a potassium content of 0.04 % to 0.21 %. A relatively high amount of NPK in the prickly poppy leaves was identified with the application of ammonium sulfate fertilizer; compared to the application of urea fertilizer, the nitrogen content was 0.05-0.12 % higher, phosphorus was 0.02-0.03 % higher, and potassium was 0.03-0.05 % higher. Compared to the application of ammonium nitrate fertilizer, the respective increases were 0.14-0.6 %, 0.01-0.04 %, and 0.05-0.1 %.

It is well known that external environmental factors, as well as every agrotechnical measure applied in their cultivation, inevitably affect the proper growth, development, formation of yield elements, and productivity of crops. Our research has revealed that the rates and forms of mineral fertilizers applied also had an effect on the leaf and seed yield of the Datura innoxia Mill.

THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH, DEVELOPMENT, AND PHYTOCHEMICAL COMPOSITION OF DATURA INNOXIA MILL RAW MATERIAL

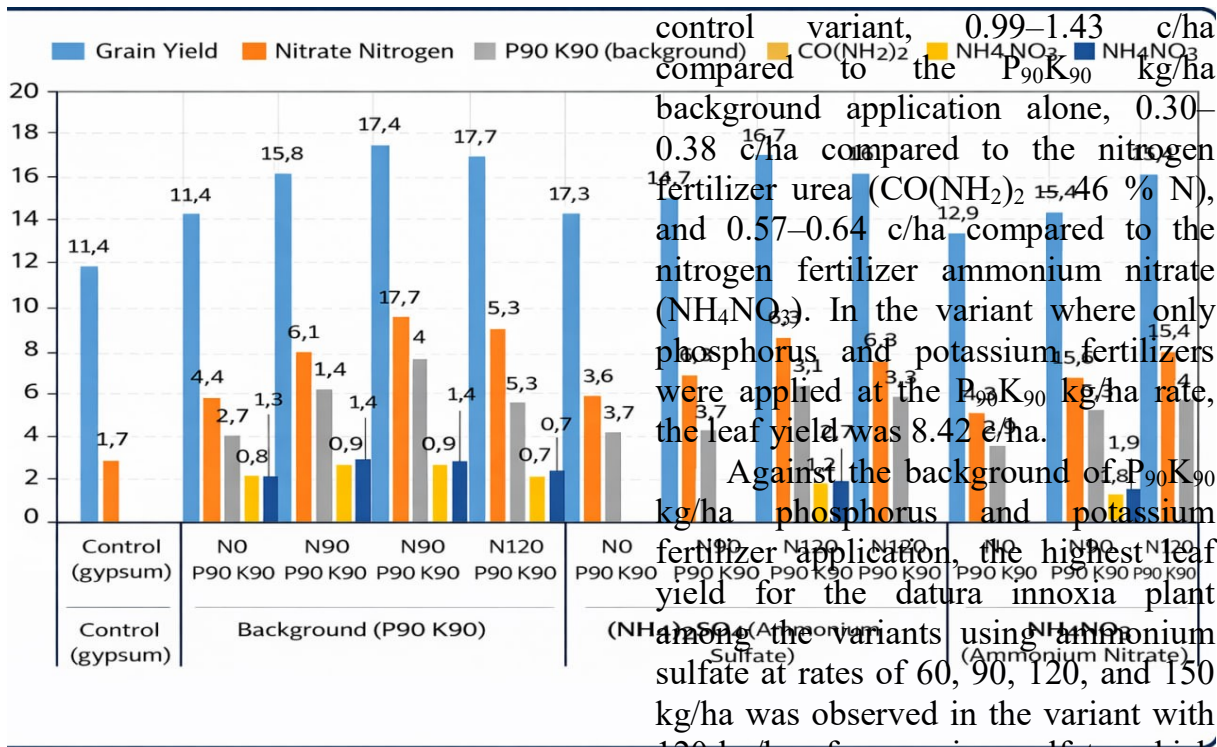


Figure 2. Datura innoxia seed harvest, t/ha, 2024.

According to research data, applying ammonium sulfate at rates of 60, 90, 120, and 150 kg/ha against a background application of phosphorus and potassium fertilizers at P₉₀K₉₀ kg/ha resulted in a leaf yield for the Datura innoxia plant of 9.41–10.83 c/ha. It was observed that this provided an additional leaf yield of 2.54–3.96 c/ha compared to the unfertilized

control variant, compared to the background application alone, 0.30–0.38 c/ha compared to the nitrogen fertilizer urea (CO(NH₂)₂ 46 % N), and 0.57–0.64 c/ha compared to the nitrogen fertilizer ammonium nitrate (NH₄NO₃). In the variant where only phosphorus and potassium fertilizers were applied at the P₉₀K₉₀ kg/ha rate, the leaf yield was 8.42 c/ha. Against the background of P₉₀K₉₀ kg/ha phosphorus and potassium fertilizer application, the highest leaf yield for the datura innoxia plant among the variants using ammonium sulfate at rates of 60, 90, 120, and 150 kg/ha was observed in the variant with 120 kg/ha of ammonium sulfate, which yielded 10.83 c/ha.

Against the background of P₉₀K₉₀ kg/ha phosphorus and potassium fertilizer application, the use of urea (CO(NH₂)₂ – 46 % N) at rates of 60, 90, 120, and 150 kg/ha resulted in a leaf yield for the datura innoxia plant of 9.05–10.53 c/ha, which was 2.18–3.66 c/ha higher than the unfertilized control variant.

1-table Influence of nitrogen fertilizer types and rates on the leaf yield of Datura innoxia Mill, 2022-2024, c/ha

№	Types of nitrogen fertilizers applied	Fertilizer rates	Medium	Additional harvest			
				Control from	P ₉₀ K ₉₀ (background)	CO(NH ₂) ₂	NH ₄ NO ₃
1	No fertilizer (control)		6,87	-	-	-	-
2	P ₉₀ K ₉₀ (background)		8,42	1,55	-	-	-
3	(NH ₄) ₂ SO ₄ (Ammonium sulfate)	N ₆₀ P ₉₀ K ₉₀	9,41	2,54	0,99	0,36	0,57
4		N ₉₀ P ₉₀ K ₉₀	9,85	2,98	1,43	0,33	0,64
5		N ₁₂₀ P ₉₀ K ₉₀	10,83	3,96	1,42	0,30	0,59
6		N ₁₅₀ P ₉₀ K ₉₀	10,44	3,57	1,03	0,38	0,64
7	CO(NH ₂) ₂	N ₆₀ P ₉₀ K ₉₀	9,05	2,18	-0,36	-	-

THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH, DEVELOPMENT, AND PHYTOCHEMICAL COMPOSITION OF DATURA INNOXIA MILL RAW MATERIAL

8	(Carbamide)	N ₉₀ P ₉₀ K ₉₀	9,52	2,65	0,11	-	-
9		N ₁₂₀ P ₉₀ K ₉₀	10,53	3,66	1,12	-	-
10		N ₁₅₀ P ₉₀ K ₉₀	10,06	3,19	0,65	-	-
11	NH ₄ NO ₃ (Ammonium nitrate)	N ₆₀ P ₉₀ K ₉₀	8,84	1,97	-0,57	-	-
12		N ₉₀ P ₉₀ K ₉₀	9,21	2,34	-0,20	-	-
13		N ₁₂₀ P ₉₀ K ₉₀	10,24	3,37	0,83	-	-
14		N ₁₅₀ P ₉₀ K ₉₀	9,80	2,93	0,39	-	-

NSR₀₅ =0,27 s/ha; NSR₀₅ =2,79 %

It has been proven that, against a background application of phosphorus and potassium fertilizers at a rate of P₉₀K₉₀ kg/ha, ammonium nitrogen fertilizer (NH₄NO₃) at rates of 60, 90, 120, and 150 kg/ha ensures a leaf yield for *Datura innoxia* of 8.84–10.24 c/ha, which is 1.97–3.37 c/ha higher than the unfertilized control variant.

From the data presented above, it can be concluded that to obtain high leaf and seed yields from *Datura innoxia*, applying ammonium sulfate at a rate of 120 kg/ha during its cultivation secures a leaf yield of 10.83 c/ha and a seed yield of 17.4 c/ha.

According to data from the research, in 2023, against a background application of phosphorus and potassium fertilizers at a rate of P₉₀K₉₀ kg/ha, the application of nitrogen fertilizer ((NH₄)₂SO₄) at rates of 60, 90, 120, and 150 kg/ha resulted in the following alkaloid content: 0.31–0.38 % in the plant's root, 0.19–0.24 % in its stem, 0.35–0.41 % in its leaves, 0.63–0.74 % in its flowers, 0.82–0.94 % in its fruits, and 0.85–0.97 % in its seeds.

2-table

*Influence of types and rates of nitrogen fertilizers on the amount of alkaloids in the vegetative and generative organs of *Datura innoxia*, %*

№	Types of nitrogen fertilizers applied	Fertilizer rates	Root	Stem	Leaf	Flower	Fruit	Seed
1	No fertilizer (control)		0,23	0,15	0,29	0,52	0,73	0,76
2	P ₉₀ K ₉₀ (background)		0,27	0,17	0,32	0,58	0,76	0,78
3	(NH ₄) ₂ SO ₄ (Ammonium sulfate)	N ₆₀ P ₉₀ K ₉₀	0,31	0,19	0,35	0,63	0,82	0,85
4		N ₉₀ P ₉₀ K ₉₀	0,33	0,21	0,37	0,66	0,85	0,87
5		N ₁₂₀ P ₉₀ K ₉₀	0,38	0,24	0,41	0,74	0,94	0,97
6		N ₁₅₀ P ₉₀ K ₉₀	0,36	0,22	0,39	0,72	0,91	0,93
7	CO(NH ₂) ₂ (Carbamide)	N ₆₀ P ₉₀ K ₉₀	0,30	0,19	0,34	0,61	0,80	0,81
8		N ₉₀ P ₉₀ K ₉₀	0,32	0,20	0,36	0,65	0,84	0,86
9		N ₁₂₀ P ₉₀ K ₉₀	0,36	0,23	0,40	0,73	0,92	0,95
10		N ₁₅₀ P ₉₀ K ₉₀	0,35	0,22	0,39	0,70	0,89	0,91
11	NH ₄ NO ₃ (Ammonium nitrate)	N ₆₀ P ₉₀ K ₉₀	0,29	0,18	0,33	0,60	0,78	0,80
12		N ₉₀ P ₉₀ K ₉₀	0,32	0,19	0,36	0,64	0,83	0,86
13		N ₁₂₀ P ₉₀ K ₉₀	0,35	0,22	0,39	0,73	0,91	0,93

THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH, DEVELOPMENT, AND PHYTOCHEMICAL COMPOSITION OF DATURA INNOXIA MILL RAW MATERIAL

14		N ₁₅₀ P ₉₀ K ₉₀	0,34	0,21	0,38	0,69	0,87	0,90
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Based on the data, it can be concluded that the application of ammonium sulfate fertilizer at a rate of 120 kg/ha against a background of P₉₀K₉₀ kg/ha in the cultivation of *Datura innoxia* yielded effective results for the high content of alkaloids in its organs. This can also be seen in the table below. When calculating the economic efficiency of agrotechnical measures used in the cultivation of the *Datura innoxia* plant, the price level of 2024 was taken into account. For example, the selling price of 1 kg of dry *datura innoxia* is 60,000 sum, and the selling price of 1 kg of seeds is 40,000 sum. The costs of mineral fertilizers, fuel, seeds, and labor were also taken into account.

Overall, it was established that the most economically efficient variant for growing *Datura innoxia* was cultivation using ammonium sulfate at a rate of 120 kg/ha against a background of P₉₀K₉₀ kg/ha mineral fertilizers, which ensured high economic efficiency with a conditional net profit of 33,050 million sum/ha and a profitability level of 90,4 %.

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