The American Journal of Agriculture and Biomedical Engineering
ISSN 2689-1018 | Open Access

TYPE Original Research
PAGE NO. 39-42
DOI 10.37547/tajabe/Volume07Issue09-07

The Effect Of Organo-Mineral Composts On The Growth And Development Of Cotton

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OPEN ACCESS

SUBMITED 31 July 2025
ACCEPTED 28 August 2025
PUBLISHED 30 September 2025
VOLUME Vol.07 Issue09 2025

CITATION

Zinatdinov Kamalatdiyin Mnajatdin uli. (2025). The Effect Of Organo-Mineral Composts On The Growth And Development Of Cotton. The American Journal of Agriculture and Biomedical Engineering, 7(09), 39–42. https://doi.org/10.37547/tajabe/Volume07Issue09-07

Abstract: The article studies the effects of organo-mineral compost, manure, and mineral fertilizers on the growth and development of cotton. The use of different types of compost and amounts of manure increased soil fertility and had a positive effect on the growth and development of cotton. In this study, the effect of organo-mineral composts on the growth and development of cotton under saline soil conditions was investigated. The experiment involved the application of various rates of organic fertilizers (10, 15, and 20 t/ha), composts (12, 14, 20, 22, and 24 t/ha), and a 25% reduced dose of mineral fertilizers in combination. Key growth indicators such as main stem height, number of fruiting branches, and number of bolls were analyzed. In the control variant, the number of fruiting branches was 11.8, and the number of bolls was 8.3 per plant. In the treatments where organo-mineral composts were applied, these indicators increased significantly. Specifically, in the variant treated with 22 t/ha of compost, the number of fruiting branches reached 15.1 and bolls 11.5 per plant, which is 3.3 and 3.2 higher, respectively, compared to the control. The results of the study demonstrate that organo-mineral composts can enhance the vegetative growth phases of cotton, increase yield components, and reduce the need for mineral fertilizers. This, in turn, contributes to environmentally sustainable and efficient use of land resources.

Keywords: Soil, cotton, organo-mineral compost, manure, mineral fertilizers, stem, leaf, branch and crop elements.

Introduction: The use of composts in agriculture can solve a number of problems, because when composts are used, they improve soil fertility and also ensure the rapid growth and development of planted crops. For the

growth and development of cotton, it is important to provide them with a certain amount of nutrients. In this case, of course, the use of mineral fertilizers and the widespread use of organic fertilizers is necessary.

S.Boltaev [2; p. 55-56] states that in order to prevent the decline in soil fertility, scientifically based recommendations require the application of 20-30 tons of manure or organo-mineral compost per hectare of land once every two or three years.

Scientists have noted that an excess or deficiency of nutrients negatively affects the growth, development and productivity of agricultural crops [1; 5;].

According to A. Sayimbetov [6; p. 10], the use of organic fertilizers, mainly composts, in addition to mineral fertilizers, in addition to increasing soil fertility, in increasing the growth and productivity of cotton has been proven in many studies. In addition to mineral fertilizers, the application of compost prepared in a ratio of 1:1:1.4:0.6 at a rate of 20 t/ha resulted in an additional cotton yield of 6.7 t/ha compared to the control option.

According to S. Boltaev and A. Normamatov [3; pp. 18-19], under conditions of moderately saline solonchak soils, the application of an unconventional organo-mineral compost ameliorant at a rate of 21.0 t/ha (composed of 15.0 t semi-decomposed cattle manure + 6.0 t bentonite clay) resulted in a more rapid growth and development of cotton during the later stages of the growing season compared to other treatments.

Methods

The experiment was conducted using the field method. The growth and development of cotton were determined using the methodological manual "Methods of conducting field experiments (Tashkent, 2007)" [4].

The research consisted of 4 replicates of 9 options, and the options were arranged in a systematic manner. In the control variant, the full annual rate of mineral fertilizers was applied at N250, P175, and K125 kg/ha. In the other variants, the rates of mineral fertilizers were reduced to N185, P130, and K90 kg/ha. In variants 2 to 4, organic fertilizer (well-decomposed cattle manure) was applied under plowing at rates of 10, 15, and 20 tons per hectare, respectively.

In variants 5 to 9, organo-mineral composts were prepared by mixing well-decomposed cattle manure, glauconite agro-ore, and licorice processing waste in different proportions and applied under plowing. Specifically:

- Compost-1 was applied at 12 t/ha (6 t manure + 3 t glauconite + 3 t licorice waste),
- Compost-2 at 14 t/ha (6 t manure + 5 t glauconite + 3 t licorice waste),
- Compost-3 at 20 t/ha (16 t manure + 1 t glauconite + 3 t licorice waste),
- Compost-4 at 22 t/ha (16 t manure + 3 t glauconite + 3 t licorice waste), and
- Compost-5 at 24 t/ha (16 t manure + 5 t glauconite + 3 t licorice waste).

These treatments aimed to evaluate the combined effects of organic and mineral components on soil fertility and cotton development under saline soil conditions.

Results And Discussions

In our experiments, phenological observations were made on the growth and development of cotton during the growing season, and the results of phenological observations in the field experiments conducted are shown in Table 1.

In the experiment, according to the data obtained from phenological observations on August 1, in the control variant where only mineral fertilizers were used, the height of the main stem of cotton was 87.6 cm, the number of yield branches (1.09) was 11.8, and the number of total (1.09) was 8.3 grains.

In variants 2-3-4, where 10, 15, 20 tons of manure were applied per hectare in combination with a reduced rate of mineral fertilizers, the results were 94.2-95.0-96.1 cm, 9.6-10.3-10.9 grains, respectively, and 6.6-7.4-8.5 cm, 1.3-2.2-2.6 more than the control.

When we analyzed the variants where organo-mineral composts were used in different proportions, the growth and development of cotton differed depending on their proportions and rates. In addition to the reduced rates of mineral fertilizers, compost-1 12 t/ha and compost-2 14 t/ha were applied (in varianties 5-6), as of August 1, the height of the main stem of cotton was 96.1-95.3 cm, the number of yield branches (1.09) was 13.8-13.6, the number of bolls was 10.0-9.8. These indicators were 7.7-7.3 cm, 2.0-1.8; It is higher by 1.7-1.5.

Thus, in variant 7, where compost-3 was applied at 20 t/ha, the height of the main stem of cotton as of August 1 of the observation was 97.8 cm, the number of yield branches, total bolls (1.09) was 14.9 and 11.3, which was 10.2 cm, 3.1 and 3.0 grains higher than the control, and 1.7 cm, 0.2 and 0.4 grains higher than the varianty where fertilizer was applied at 20 t/ha. When compost-4 was applied at 22 t/ha, the height of the main stem of cotton was 98.5 cm, 15.1 and 11.5 grains, which was 10.9 cm, 3.3 and 3.2 grains higher than the control, and 2.4 cm, 0.4 and 0.6 grains higher than the fertilizer applied at 20 t/ha. When Compost-5 was applied at 24 t/ha, it was 96.4 cm, 14.8 and 11.1 grains higher than

the control, and did not differ much from the fertilizer applied at 20 t/ha.

Based on these indicators, the most favorable composition and application rate among the compost variants was Compost-4 applied at 22 t/ha, where the accumulation of yield components in cotton was higher compared to other compost and manure treatments. It was found that the optimal ratios in the compost prepared by mixing manure, glauconite, and red mud waste showed greater effectiveness, which also depends on the field soil properties and the availability of nutrients.

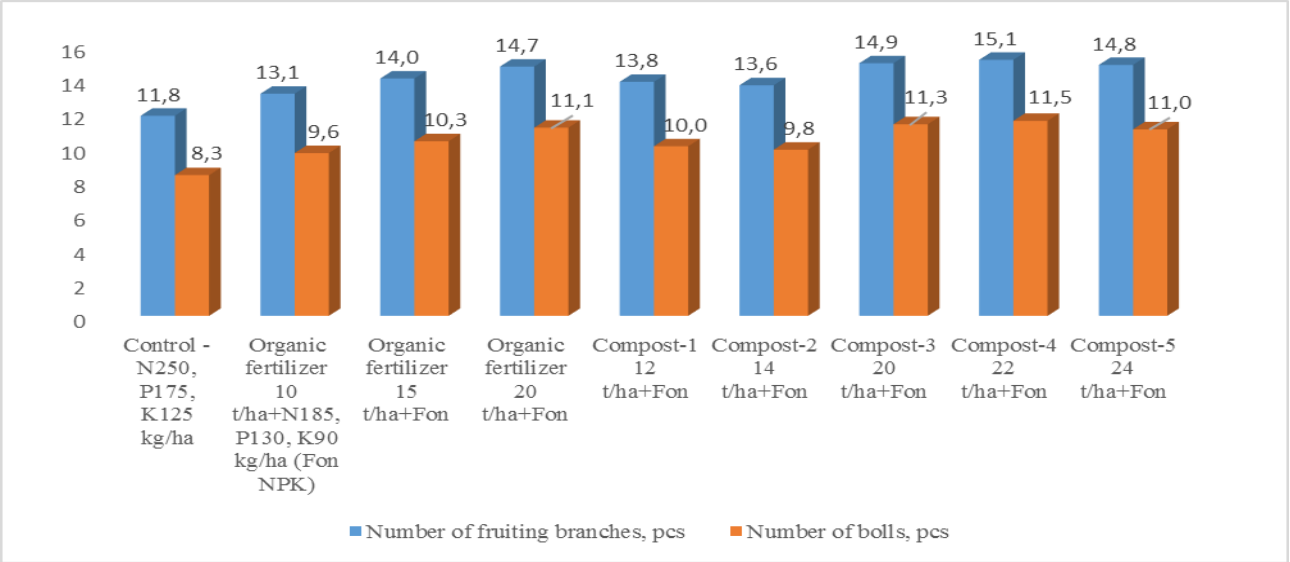

Figure 1. Effect of applied composts on the number of fruiting branches and total bolls of cotton.

According to the research results, the number of fruiting branches in the control variant was 11.8, and the number of bolls was 8.3. In variants 2–4, where organic fertilizers were applied at doses of 10, 15, and 20 tons, with an additional 25% reduction of the annual norm, the number of fruiting branches ranged from 13.1 to 14.7, and the number of bolls ranged from 9.6 to 11.1. In variants 5–9, where composts of various doses combined with additionally reduced mineral fertilizers were used, the number of fruiting branches ranged from 13.8 to 15.1, and the number of bolls ranged from 10.0 to 11.5. The best results indicated in the data were observed in variant 8, where 22 tons of compost per hectare were applied. Compared to the control variant, the number of fruiting branches increased by 3.3, and the number of bolls increased by 3.2 per plant. Additionally, compared to the variant with 20 tons of organic fertilizer per hectare, the number of fruiting branches and bolls increased by 0.4.

Conclusion

The results of the conducted field experiments confirmed the positive effects of organo-mineral composts on the growth and development of cotton under moderately saline soil conditions. The findings demonstrated that the application of composts prepared from organic fertilizer (well-decomposed manure), glauconite, and licorice processing waste significantly improved key growth parameters such as main stem height, number of fruiting branches, and number of bolls.

Especially, the best indicator in our experiment was found in option 8, that is, when compost-4 was applied at a rate of 22 t/ha, the height of the main stem of cotton was 98.5 cm, 15.1; 11.5 and 3.8 grains and 3.75 grams, which was 10.9 cm, 3.3; 3.2 and 1.2 grains and 0.55 grams higher than the control.

Moreover, the use of these composts in combination with a 25% reduced rate of mineral fertilizers also yielded effective results. This indicates their agronomic efficiency and highlights their relevance from both economic and environmental perspectives. The study shows that organo-mineral composts can serve as an important tool for increasing cotton productivity and expanding sustainable cultivation practices in saline-affected soils.

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