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The Effect of the Application of Composts with different Compositions on Soil Fertility and Cotton Yield

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Abstract--- *This article describes the effect of the use of composts of different compositions, prepared by mixing phosphogypsum in different proportions on cattle manure, poultry manure, rice and wood chips, on the agrophysical properties and fertility of the soil and cotton yield. At the same time, the volume mass of the soil decreased to 0.04-0.07 g / cm3, porosity increased to 2.2-2.7%, humus increased by 0.115%, total nitrogen by 0.010% and total phosphorus by 0.014%. As a result, in the variant where compost-2 (in the ratio 1: 1: 1.4: 0.6) was applied at 20 t / ha, it was noted that cotton grew rapidly and yielded an additional yield of 6.7 t / ha of cotton*.

Keywords--- *Compost, Cattle Manure, Poultry Manure, Rice and Wood Chips, Phosphogypsum, Soil Volume Mass, Porosity, Structure, Soil Humus, Nutrients, Cotton, Growth, Cotton Yield*.

I. INTRODUCTION

At present, composts together with mineral fertilizers are widely used in the Republic and around the world in the cultivation of ecologically clean products, increasing soil fertility, improving its water-physical and agrochemical properties and optimizing the nutritional regime of agricultural crops. High results have been achieved in countries around the world such as the USA, China, Japan, India and Australia on the effective use of composts of various components in agriculture.

Composts enrich the soil with humus and other nutrients and improve its agrophysical, water-physical properties, reduce environmental damage, as well as ensure high and quality yields from crops.

II. THE MAIN PART

In a number of countries around the world, the use of phosphogypsum and phosphogypsum composts as low-yielding and saline soils as ameliorants and fertilizers has been shown to increase the yield of winter wheat and vegetable crops by 10 to 15 percent. In this regard, research is needed to prepare composts in optimal proportions from phosphogypsum and various organic substances, to improve their soil fertility and plant nutrient uptake, and to determine the impact and subsequent impact on cotton yield.

Phosphogypsum is a waste of technology for the production of phosphorus fertilizers, which is currently accumulated in a large area around the plants that produce large amounts of phosphorus fertilizers in the country and

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is harmful to the environment. Therefore, the issue of elimination (utilization) of phosphogypsum containing 23-24% Ca, 17-18% S and 2-3% P_2O_5or its use in agriculture is urgent. Therefore, in low-yielding, degraded and degraded soils, the application of composts of different compositions made by mixing phosphogypsum in different proportions to cattle manure, poultry manure, rice and wood chips, to study the effect on soil agrophysical properties and productivity and cotton yield The research is topical.

Azimbaev S. and others [1] report that the application of composts prepared from various wastes in irrigated meadow soils in pure form or in combination with mineral fertilizers allows the accumulation of large amounts of organic matter in the soil. In the experiment, the reduction of harmful cations in the soil was also achieved due to the use of composts. This shows that the natural minerals and composts used have a positive effect on soil properties.

H.M. Mahsudov, N.B. Raupova, B.S. Kamilov [4] emphasize that special attention should be paid to the use of organic and mineral fertilizers. At the same time, it is important to use non-traditional fertilizers (bentonite, glauconite, vermiculite, river beds, coal and municipal wastes) and composts based on them, as well as phosphorite, phosphogypsum from raw materials and waste containing nutrients.

According to F.A. Scriabin [6], the use of organic fertilizers in combination with the use of mineral fertilizers improves the nutrient supply of crops and has a positive effect on increasing cotton yields.

According to K. Mirzajanov, Sh. Nurmatov [5], soil fertility depends on its physics, agrochemical, hydrothermal, reclamation, agrotechnical and many other properties. The abundance of humus in the soil indicates its fertility, as it contains nitrogen, phosphorus, potassium, carbon dioxide, macro-and micronutrients necessary for the plant in general.

Humus determines the macro and microstructure of water-resistant soils, their content (structure) increases where humus is rich, and the increase in structure optimizes the volume mass in the soil, improves water, air, microbiological conditions, which in turn lead to optimization of crop nutrient regime. Adding mineral fertilizers to organic fertilizers increases the amount of humus in the soil.

Regular use of organic fertilizers increases the amount of nutrients that plants can absorb in the soil and increases the amount of humus, which prevents it from decomposing quickly.

According to N.M. Ibragimov, D. Otakulova, B.I. Niyazaliev [2], the applied organo-mineral fertilizers facilitate plant nutrient uptake and, as a result, have a positive effect on increasing crop yields.

According to RK Kuziev [3], humus has a special place in soil fertility. To get a high and quality crop from crops, soil fertility must be high.

The composition of compost and its structure play an important role in increasing soil fertility. Properly prepared compost improves the structure of the soil and enriches it, organic and mineral substances are necessary for plant nutrition [7; 8; 9; 10].

Based on the above, composts of different proportions were prepared, and experiments on their effect on soil fertility and cotton yield were conducted in the conditions of typical gray soils of the research and experimental farm of Tashkent State Agrarian University.

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III. METHODS OF CONDUCTING EXPERIMENTS

Field experiments were carried out in 9 variants, 4 replicates, which were carried out in the following order: control variant mineral fertilizers $N_{200}P_{140}K_{100}$ kg / ha, in the second variant additional NPK + manure to mineral fertilizers 10 t / ha, option 3 NPK + manure 20 t / ha, Option 4 NPK + compost-1 (rice and wood chips-25%, cattle manure-25%, poultry manure-45%, phosphogypsum-5%) 10 t / ha, option 5 NPK + compost-1, 20 t / ha, option 6 NPK + compost-2 (rice and wood chips-25%, cattle manure-25%, poultry manure-35%, phosphogypsum-15%) 10 t / ha, option 7 NPK + compost-2 , 20 t / ha, 8-varaint compost-3 (rice and wood chips-25%, cattle manure-25%, poultry manure-25%, phosphorus gypsum-25%) was applied at the expense of 10 t / ha and option 9 NPK + compost-3, 20 t / ha.

The research was conducted on the basis of "Methods of conducting field experiments" (2007).

IV. RESEARCH RESULTS AND THEIR DISCUSSION

According to the results of the study, in the first year of the experiment in the control (NRK) variant at the beginning of the application period the volume mass in the 0-30 cm tillage layer was 1.33 g / cm^3, and at the end of the application period the volume mass in the 0-30 cm layer an increase of 0.05 g / cm^3 was observed.

It was also observed that under the influence of the application of compost norms from 10 t / ha to 20 t / ha, the volume mass of the soil decreased by 0.04-0.07 g / cm^3. At the beginning of the application period in the variant with 20 t / ha compost-2, the volume mass of soil in the 0-30 cm layer was 1.27 g / cm^3, compared to the control variant with 0.06 g / cm^3 and 20 t / ha of manure., was less than 01 g / cm^3? At the end of the application period, the volume mass in the upper soil layer was 1.31 g / cm3 and was found to be 0.07 g / cm^3 less than the control option and 0.01 g / cm^3 less than the 20 t / ha fertilized variant.

It was observed that the use of composts against the background of mineral fertilizers increases the porosity of the soil not only in relation to the options applied mineral fertilizers, but also manure.

Composts were found to have a positive effect on soil porosity when applied at a rate of 20 t / ha. In variant 5, where compost-1 was applied at 20 t / ha, the soil porosity was 53.3 and 50.4% in the 0-30 and 30-50 cm layers at the beginning of the application period, and 51.5 and 48.9%, respectively, at the end of the application period. These values were 2.2-1.9% and 2.2-1.8% higher than in the control option and 0.4-1.1% and 0.0-0.4% higher than in the case of 20 t / ha of manure.

In option 7 with 20 tons of compost-2 per hectare, the porosity in the 0-30 and 30-50 cm layers of soil at the beginning of the application period was 53.3 and 50.7%, respectively, which is 2.2 and 2 times higher than in control variant 1. , 2 percent, and 0.4 and 0.3 percent, respectively, compared to option 3, where 20 t / ha of manure was applied. This indicates that the water-physical properties of the soil improve when composts are prepared and applied only in relation to the application of manure. It should be noted that in the variant where compost-3 was applied at 20 t / ha, the porosity of the soil at the end of the application period was 51.1 and 48.5 percent, respectively. These values were 1.8–1.4% higher than the control, but were found to be approximately equal to the values of the variant in which 20 t / ha of manure was applied.

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In addition, the results of soil porosity analysis revealed that in the variants where composts were used, their effect would be maintained in subsequent years. At the end of 3 years, it was found that in the 7th variant, where the most optimal 20 t / ha compost-2 was applied; the porosity of the soil in the 0-30 and 30-50 cm layers was 2.4 and 1.4% higher than the control. Compared to the option where manure (20 t / ha) was used, these figures were 0.4 and 0.3% higher, respectively. In conclusion, in order to improve the agrophysical properties of soils in low-yielding soils, in addition to mineral fertilizers, it is advisable to apply compost-2 at 20 t / ha.

When we analyzed the aggregate condition of the soil in the experimental field, as a result of dry screening, the fractions of 10-0.25 mm in 10 t / ha of composted variants were 79.14% in the driving layer and 79.9% in 20 t / ha compost, compared to the control variant. was found to be 0.64–1.4% higher, respectively. It was observed that compost-1 was 79.19% in the 10 t / ha variant and 83.81% in the 5 t variant. Compost-2 was 79.48% at the 10 t / ha variant and 84.04% at the 20 t / ha variant.

It was found that the amount of aggregates was 5.54% higher compared to the control option (non-composted option) with 20 tons of compost-2 per hectare, 4.14% higher than with the composted option and 0.23% higher than with the composted-1 option. In the compost-3 10 t / ha variant, the figure is 79.28%, in the 9 variant with 20 t / ha it is around 81.91%, 0.78% and 3.41%, respectively, compared to the control, and in the variant where manure is applied. 0.14 and 2.01 percent, respectively. However, the results obtained from the 9th variant of compost-3 at 20 t / ha on the amount of aggregates were found to be less than the variants using 20 tons of compost-1 and compost-2 per hectare.

The optimal effect of different compost standards on changes in humus, total nitrogen and phosphorus content in the soil was observed in the variant using 20 t / ha compost-2. In this variant, the amount of humus increased by 0.115% compared to the control, total nitrogen by 0.010% and phosphorus by 0.014%, and compared to the variant with 20 t / ha of manure, 0.05; 0.003; Was found to be 0.005% higher (Figure 1).

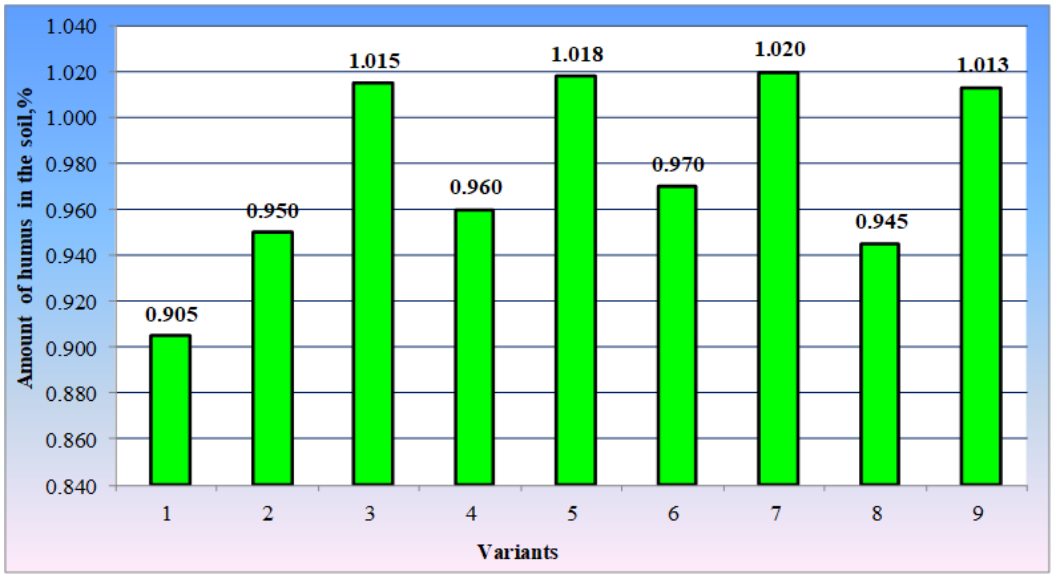

Figure 1: Effect of various composts on changes in the amount of humus in the soil,% (at the end of the application period)

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In the 3rd year of the study, high results were maintained compared to the control under the influence of various compost standards applied. This ensured that the composts increased soil fertility and were maintained.

It was observed that optimal conditions for plant nutrition were also created depending on the degree of influence of different compost standards applied to the soil fertility used in the experiments.

The most positive effect on the amount of mobile forms of nutrients in the soil was observed when compost-2 was applied at a rate of 20 t / ha per hectare. In this variant, mobile nitrogen in the 0–30 cm layer of soil was 3.3 mg / kg relative to the control, mobile phosphorus was 3.8 mg / kg and exchangeable potassium was 30 mg / kg, and manure was 0.9 relative to the 20 t / ha variant; 0.8 and 10 mg / kg were higher (Table 1).

Table 1: Effect of various composts on changes in the mobile forms of nutrients in the soil, mg / kg (at the end of 2010)

№	Variants	$N\text{-}NO_3$		P_2O_5		K_2O	
		Soil layers, cm					
		0-30	30-50	0-30	30-50	0-30	30-50
1	Control (FON)	21,2	12,3	29,8	21,3	265	220
2	FON +Manure10 t/ha	22,2	12,7	31,2	22,0	280	230
3	FON +Manure20 t/ha	23,6	13,2	32,8	22,5	285	240
4	FON +Compost-1, 10 t/ha	22,5	12,8	32,2	22,3	282	230
5	FON + Compost -1, 20 t/ha	24,0	13,5	33,2	22,7	290	240
6	FON + Compost -2, 10 t/ha	23,0	13,0	32,6	22,4	283	230
7	FON + Compost -2, 20 t/ha	24,5	13,8	33,6	23,0	295	240
8	FON + Compost -3, 10 t/ha	22,0	12,7	32,6	22,3	282	225
9	FON + Compost -3, 20 t/ha	23,5	13,2	33,7	22,8	285	240

Hence, it has been proved that it is expedient to mix different organic materials with phosphogypsum in different proportions and use it as compost in order to restore, maintain and increase soil fertility in low-fertility soils.

The effects of composts and their effects in subsequent years were evident in the growth and development of cotton. When compost-1 is applied at 10 and 20 t / ha, the height of the cotton stalk (1.08) is 100-105.2 cm, the number of harvest branches and the total and opened stalks is 13.5-14.9; 10.9-12.7 and 3.43-4.14 pieces and the weight of cotton in one stalk was 4.55-4.72 grams, which is 12.0-17.2 cm, 2.0-3, respectively. 4; 1.5-3.3 and 0.73-1.44 pieces and 0.35-0.52 grams, 2.0-0.5 cm, 0.3-0.5 compared to the variants used; 0.2-0.2 and 0.23-0.38 units and 0.1-0.07 grams higher, respectively. When compost-2 is used at the rates of 10 and 20 t / ha, these values are 99.8-105.9 cm, 13.7-15.2, respectively; 11.0-12.9 and 3.5-4.3 grains and 4.6-4.75 grams, 11.8-17.9 cm, 2.2-3.7, respectively, from the control; 1.6-3.5 and 0.8-1.6 pieces and 0.4-0.55 grams, 10 and 20 tons per hectare. 1.8-1.2 cm, 0.5-0.8 compared to fertilized options 2 and 3; 0.3-0.4 and 0.3-0.47 units and 0.15-0.1 grams higher, respectively. When compost-3 is used at 10 and 20 t / ha, it is 98.8-104.6 cm, 13.4-14.7 cm, respectively; 10.8-12.5 and 3.35-4.1 grains and 4.5-4.7 grams, 10.8-16.6 cm from the control, 1.9-3.2; 1.4-3.1 and 0.65-1.4 grains and 0.3-0.5 grams higher, respectively, and did not differ much compared to the variants applied.

Comparing the figures, it was found that among the composite ratios and norms of composts, the most optimal compost-2 was applied at 20 t / ha, while the cotton yield elements were higher than in other compost and fertilized variants. Data on the subsequent effects of compost standards applied in 2011-2012 were also obtained in accordance with the above legislation. Effects of different composts in the first year of the experiment (2010), when

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cotton produced 2-3 true leaves; it was observed that there were differences in the dry mass of cotton between the options. Hence, the effect of composts began from the time when the cotton seedlings began to sprout and was also manifested in their growth and accumulation of dry mass.

When it came to the flowering period of cotton, the dry weight of one plant in the control variant was 42.7 grams, while at the end of the application period it reached 114.6 grams, 33.0 in the leaves in proportion to the pieces; base 23.1; 26.5 grams in bowls and 32.0 grams in cotton.

In the control variant in which mineral fertilizers (MRCs) were applied, the cotton yield was proportional to 30.8 in the years of the study; 30.4 and 29.9 ts / ha, respectively, and an average of 30.4 ts / ha in 3 years (Figure 2). In variants 2 and 3, where 10 and 20 t / ha of manure was applied on the background of mineral fertilizers, their effects were 33.0-36.5 ct / ha, and the effects of 2011-2012 were 32.8-36.0 and 32.3-35. , 7 ct / ha, an average of 32.7-36.1 ct / ha of cotton in three years, or an additional yield of 2.3 and 5.7 ct / ha compared to control.

In the variants using 10 and 20 tons of compost-1 per hectare, the average cotton yield in 3 years was 32.9 and 36.6 ct / ha, compared to the control of 2.5 and 6.2 ct / ha, respectively, 10 and 20 tons of manure per hectare. An additional yield of 0.2–0.5 ct / ha was obtained compared to options 2 and 3. When compost-2 was applied to 10 and 20 t/ha, the average cotton yield was 33,2-37,1 ct /ha and additional yield was collected to 2,8-6,7 ct /ha compared to control and 0,5-1,0 ct /ha compared to manure standards and 0,3-0,5 ct / ha compared to compost-1 standards.In the compost-3 variants of 10 and 20 t / ha, the cotton yield was 32.5-35.9 ct / ha, or 2.1-5.5 ct / ha more than in the control variant.

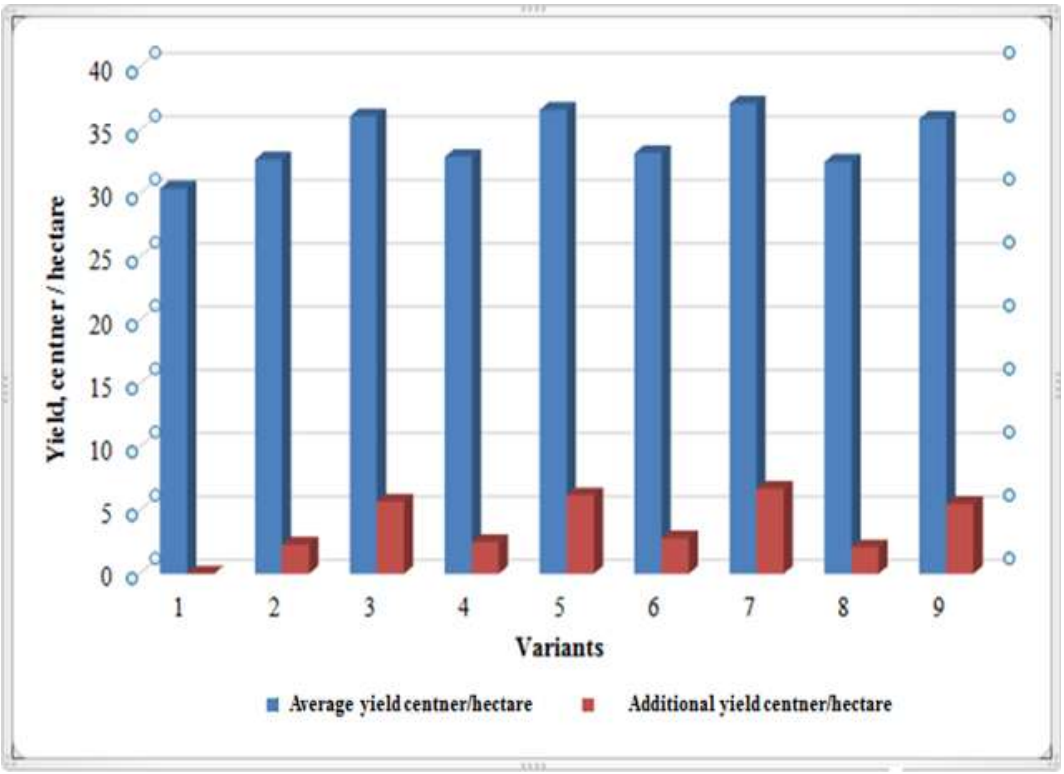

Figure 2: The effect of various composts applied on cotton yield

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At the same time, the best results were observed when compost-2 was applied at the rate of 20 ct / ha and high additional cotton yield was found to be 6.7 ct / ha when comparing the effects of different composts in low-yielding soils and the effects of subsequent years.

Also, in the control variant, the fiber consumption was 33.3%, length 34.2 mm, tensile strength 4.1 ha, metric number 6310, relative tensile strength 25.1 ha / space, micronaire 4.4. It should be noted that during the years of research, due to the good weather, all varieties were obtained I grade fiber.

In options 2 and 3, where manure was applied at 10 and 20 t / ha, fiber consumption was 33.5-33.9% and micronaire was 4.4-4.3% or 0.2-0.6%, respectively, compared to the control. the excess and micronaire index were almost equal.

Under the influence of various composts used and in subsequent years, it was found that the fiber length and micronaire index improved from the technological quality indicators of cotton fiber relative to the control. Positive values were obtained in the variants of composts used in the norm of 20 t / ha, relatively high values were obtained in variant 7 with compost-2 20 t / ha, fiber length 35.3 mm, tensile strength 4.4 g / force, relative tensile strength 27.6 ha / space and micronaire was 4.2, which is 1.1 mm higher than the control, 0.3 ha, 2.5 ha / space higher, and the micronaire was 0.2 lower, and 20 t / ha of fertilizer was applied, 0.8 mm, 0.1 ha, 0.6 ha / space.

This means that the composts used not only increased soil fertility and cotton yield, but also improved fiber quality.

V. CONCLUSION

1. In relatively low-yielding typical gray soils, only mineral fertilizers are applied, the soil fertility decreases from year to year, the soil structure is broken down into small particles, dispersed, and the use of organic composts increases soil fertility and increases macro and micro aggregates. It was found that the volume mass in the 30 cm layer decreased by 0.05-0.07 g / cm^3 and the porosity increased by 2.2-2.6%.
2. The optimum effect of the applied composts was observed at the rate of compost-2, 20 tons / ha, and the amount of humus, nitrogen, phosphorus and potassium in the soil in general and mobile forms was higher than the control.
3. The relatively high effect of various composts was observed when the standard compost-2 was applied to 20 t/ha, and the average cotton crop was 37,1ct/ha as a result of the rapid growth and development of the goose, and an additional cotton crop was obtained to 6,7 ct/ha compared to the control.
4. In order to maintain soil fertility, improve its agrochemical, water-physical properties in the conditions of typical burlap soils irrigated from ancient times of the Tashkent region, to produce high-quality cotton and to achieve economic efficiency, mineral fertilizersN-200, P_2O_5-140, K_2O-100 kg/ha against the background of the norms 1:1:1.4:0.6 from rice or wood shavings, cattle manure, poultry it is recommended to apply t/ha in the norm (3 times in 1 year).

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REFERENCES

[1] Azimboev S.A., Aliev J., Karimova L., Izbosarov B. Influence of natural minerals and composts on cotton yield in grassland-gray soils. // *Proceedings of the scientific-practical conference. – Bukhara:* - 2009.- p. 45-46.

[2] Ibragimov N.M., Otakulova D., Niyazaliev B.I. Influence of organic-mineral fertilizers on the nutritional regime and cotton yield. I International Scientific and Practical Conference "The Current Ecological State of the Natural Environment and Scientific and Practical Aspects of Environmental Management" *Collection of articles.* February 29, 2016. Salty Loan. - pp. 1216-1218.

[3] Koziev R.K. Current state of Irrigated Lands of the Republic of Uzbekistan. *Conference Proceedings, Part I. – Samarkand:* 2002. -pp. 7-11.

[4] Maxsudov X.M., Raupova N.B., Kamilov B.S. Soil fertility and conservation are the most pressing issues of the day. // *Republican scientific-practical conference "Issues of soil Fertility, Protection and Efficient use of Soils of Uzbekistan." – Tashkent:* 2013. 11-12 December. - pp. 21-27.

[5] Mirzajanov Q., Nurmatov Sh. Increase soil fertility. *Agroilm magazine. – Toshkent:* 2008. №4 (8),- p. 1-2.

[6] Scriabin F.A. Manure in the Cotton Fertilizer System under Irrigated Conditions in Central Asia. – *Tashkent: Fan,* 1970. -p. 376.

[7] Gianfranco G., Piero M., Luigi A., Carmen G. Integrated Waste Management in a Zone of Northern Italy: compost production and use, and analytical control of compost soil, and crop. B, 2006. 41, №7, -pp. 1203-1219.

[8] www.vyvezem.ru/kompostirovanie-tbo

[9] www.sianie1.ru/PZ/kompost.

[10] www.orgudobrenija.ru/udobrenie-ptichim-pometom/kompostirovanie-ptichego/pometa.

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