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Intensive Environmentally Safe Fertilizer Application Cotton Research Soil Fergana Valley

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Abstract: Plant nutrition depends on the soil moisture regime. Excessive moistening (at the PPW level) leads to irrational use of irrigation water and greater leaching of nutrients. Maximum nitrogen concentration in case of its concentration in the upper layer and penetration of 100 mm of precipitation into the soil is observed at a depth of 40 cm. A very small part of the applied nitrogen will remain in the arable layer, the rest will move to a depth of 70 cm.
Keywords: Soil, sand, fertilizer, cotton, tillage, conditions, root system, soil moisture, growth development, root shape.

1. Introduction

In our Republic during the years of independence large-scale measures on effective use of irrigated sand and sandy loam lands and improvement of ecological and reclamation condition of lands were carried out. As a result of these measures on sandy and sandy loam soils, in particular from each hectare of agricultural lands of Central Fergana, the increase of raw cotton yield by 2-3 centners and wheat yield by 4-6 centners was achieved. At the same time, due attention is not paid to the development of acceptable agro-technologies aimed at determining the genesis, morphogenetic properties of sandy and sandy loam lands with difficult ameliorative condition, prevention of erosion processes occurring in them. In this respect, research works on improvement of ameliorative condition of infertile, difficult to ameliorate sandy lands, development and introduction of modern water and resource saving agro-technologies are of great importance. In subsequent years, the influence of soil tillage, mineral nutrition, density of standing and schemes on the formation of root system was studied by A.I.Shleikher, T.P.Pirakhunov, M.Mukhamedjanov, S.Suleymanov. Substantial influence on root morphology is exerted by environmental conditions, causing certain changes in the shape of roots. Among the various factors that lead to such deviations in root morphology are soil density, which limits the advancement of roots into deep arable layers and narrows them in volume; inordinate soil moisture, close occurrence of groundwater, excessively high concentration of nutrient salts, soil salinization, and others. These factors peculiarly change the shape of roots - their length, number and volume. The results of our studies of cotton root system formation under the above conditions are presented. It should be noted that agrophysical properties of the soil and microclimate of the root system are reflected in its formation, which is clearly shown in the figures.

2. Materials And Methods: With balanced application of fertilizers and irrigation, plant roots absorb nutrients more efficiently, leaving few nutrients in the soil for leaching. The issues of nutrient elements migration in soil were studied by C.Varga, J.Sries. They believe that on plots without vegetation 83.3-91.7% of nitrogen is lost as a result of leaching, denitrification and, possibly, volatilization of NH_3. Nitrogen migration is less pronounced in sown plots. K.E.Saxton, C.E.Sehuman, R.E.Buruell note that nitrate leaching from 1.8 m soil layer is greater than their detection at the depth of 1.8-6.2 m. Research results show that losses of nitrogen in the form of nitrates are especially high in irrigated fields and largely depend on the mechanical composition of the soil and the rate, time of irrigation. The content of nitrogen, phosphorus and potassium in the soil undergoes changes during the growing season. As a rule, the greatest amount of them falls on the beginning and middle of vegetation, by the end of it it decreases due to intensive use by plants. In our experimental plot with artificial screen, the lowest amount of nutrient elements was detected in the control. With the application of fine soils, the nutrient element content of the entire profile increases significantly. The increase in this is directly proportional to the rate of fine sediment. The highest amount of nutrient elements was observed in the

variant with the application of 1000 t/ha of fine soils. It should be noted that the screen created was like a film that promoted the retention of nutrients. The greatest amount of nutrients was concentrated in the layer where the artificial screen was created. It was revealed that in the variant with the application of 400 t/ha of fine silt with 70 cm stocking on the 3rd day after irrigation the nitrate nitrogen content in the 60-70 cm layer was 12.2 mg/kg, while with the increase in the norm of fine silt up to 1000 t/ha this indicator was equal to 24.4 mg/kg. Migration of nutrient elements in the experimental plot with natural ground is similar. The minimum of nutrient elements in all phases of cotton development was revealed in the variant with application of N 250, P 150, K 170 kg/ha and sand thickness 0-110 (130) cm.

A.N.Rozanov, M.A.Belousovot note that irrigation in the upper layers reduces the content of basic nutrition elements - carbon, nitrogen, phosphorus, potassium, as well as trace elements. E. Högborg believes that easily soluble nitrogen in the form of nitrate (NO_3) moves with soil moisture moving to lower layers. At the same time, the author writes, the movement of nitrogen is faster in sandy soil than in clay soil. In sandy soil, N movement is 50% faster than in light clay for the same amount of moisture infiltrated into the soil. He found that the maximum concentration of nitrogen in case of its concentration in the upper layer and penetration into the soil of 100 mm of precipitation is observed at a depth of 40 cm. A very small part of the applied nitrogen will remain in the arable layer, the rest will move to a depth of 70 cm.

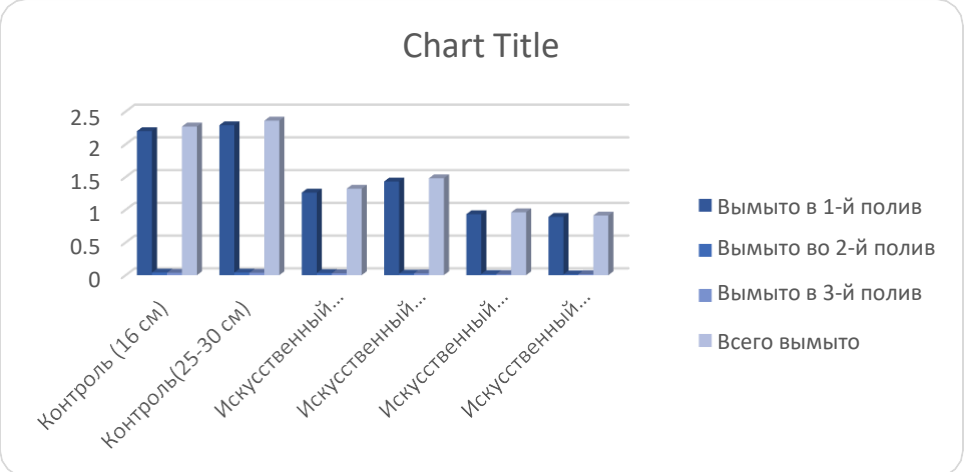
Losses of water and nutrient elements by plants depend on soil moisture regime. Excessive moistening (at the PPW level) leads to irrational use of irrigation water and greater leaching of nutrient elements. The effect of intensive fertilizer application on the migration of nitrogen compounds in soil was studied by K.Badowska, Szperlinski. In their opinion, nitrogen migration depends on fertilizer rates and precipitation and increases on soils of lighter mechanical composition. Based on the results of studies conducted on a light loamy soil, Yimprasert Suda, Blevins R.D. state that N- NO_3 is rapidly leached from the 0-15 cm layer and accumulates slightly in the 15-30 cm layer.

3. Results: Leaching of nutrient elements depending on the artificial screen created in laboratory conditions: It is known that as a result of irrigations soil moisture changes, groundwater movement becomes more intensive, salt movement in soil changes.

The results of our laboratory experiments on sands indicate that the greatest amount of nitrate nitrogen was taken up in the first irrigation. In the variant without screen, this index varied between 2.27-2.36 g/L. The lowest removal was noted in the variant with screen creation at a depth of 70 cm (Table 5.1.1) - 0.91 g/l. It should be noted that nitrate nitrogen content in irrigation water after II and III irrigations was insignificant. In the control it averaged 0.036 g/l, when the screen was created at a depth of 70 cm it decreased to 0.015 g/l. Hence, it can be seen that nutrient leaching occurs on the control.

4. Dıscussıon: In the world on the problem of improving the properties, genesis and productive capacity of sands, a number of studies are being conducted, in particular, in the following priority areas, research work continues: protection of sands and sand barchans from wind erosion; improvement of agrophysical, agrochemical properties, productive capacity of sandy soils; the use of intermediate plants as protective means in the improvement of agrotechnology to increase the productive capacity of sands and sandy soils; the development of resource and en.

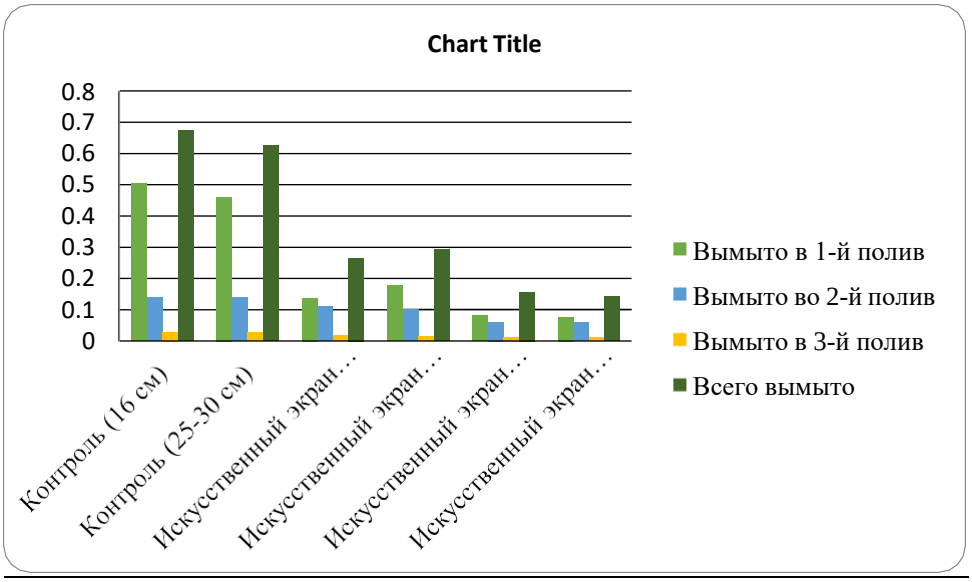
Amount of nitrate nitrogen leached after irrigation, g/L



Note. Hereinafter the depth of fertilizer application is given in brackets.

A similar pattern is observed for ammonia nitrogen removal with irrigation water, but the index is much smaller. It ranges between 0.673-0.143 g/L (Diagram 1).

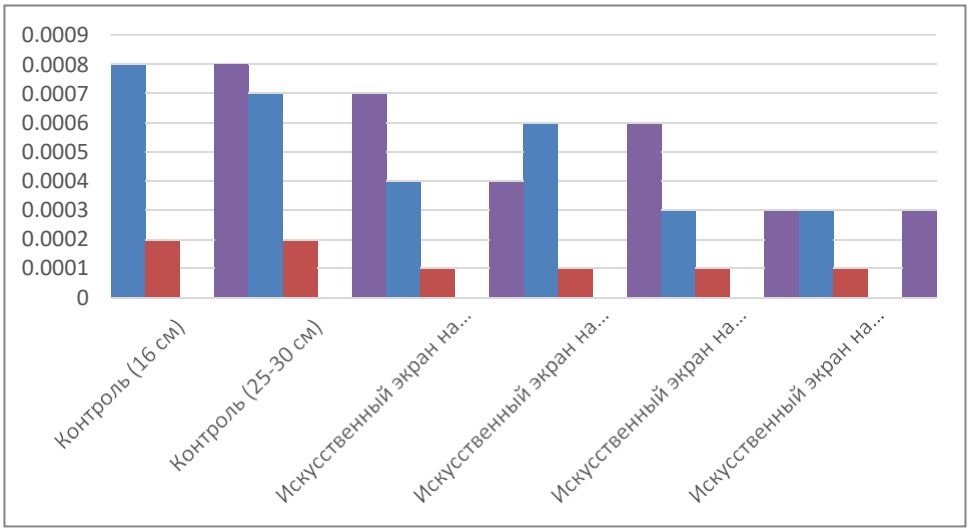
Amount of ammonia nitrogen leached after irrigations, g/L



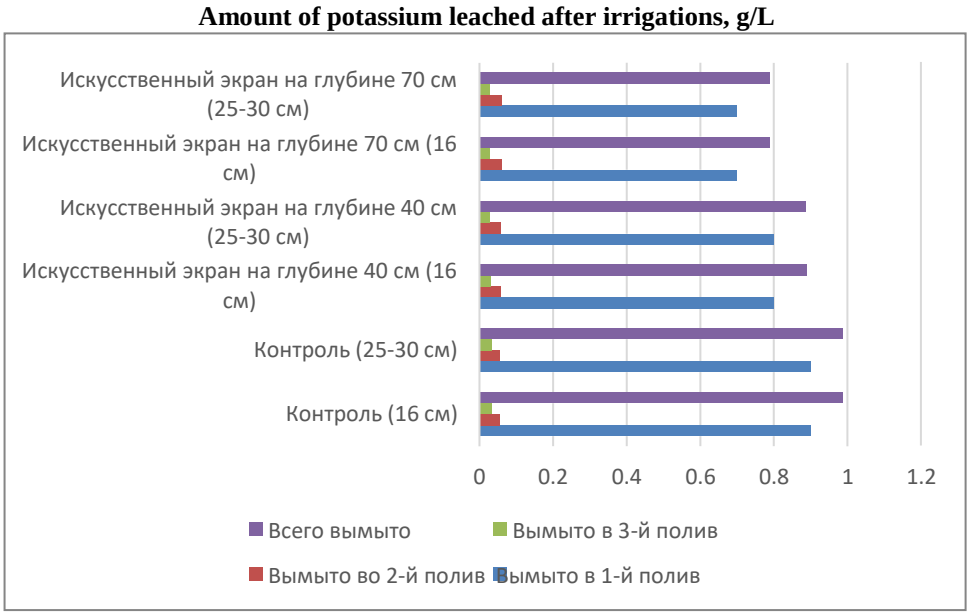
The content of mobile phosphorus was negligible. The highest removal of mobile phosphorus was observed in the control - 0.0008 g/l, the lowest - in the variant with rewetting of fine soils at 70 cm - 0.00028 g/l (Diagram 2).

This indicates the ability of phosphorus to change into more complex compounds in the soil.

Amount of mobile phosphorus leached after irrigations, g/L



The potassium content of irrigation waters ranged from 0.988-0.789 g/L (Diagram 3). It should be noted that the removal of nutrient elements increased with the increase of outflowing water.



5. Conclusions: With the creation of an artificial screen, raw cotton yield increases significantly, especially noticeable where the artificial screen is created from 1000 t/ha of fine soil at a depth of 75 cm. The yield increase compared to the control averaged 17.1 c/ha. The maximum yield of raw cotton on the plot with natural screen was obtained at its depth of 50(75) cm and fertilizer rates of nitrogen 350, phosphorus 250, potassium 170 kg/ha - 38.8 c/ha with yield on the control - 18.4 c/ha. The highest content of nitrate nitrogen, mobile phosphorus and exchangeable sand potassium was observed at application rates of N-200, P2O5 - 140, K2O -100 kg/ha + 40 t/ha of manure and 60 t/ha of lignin.

The best growth and development of cotton on the planned hilly-barchanic sands was noted in the variant with the joint application of N - 200, P2O5 - 140, K2O - 100 kg/ha + 40 t/ha of manure, as well as the application of 60 t/ha of lignin on the subploughs. The most effective rates of mineral fertilizers, positively affecting the yield of raw cotton on planned hilly-barchanic sands of Central Fergana, are: N -200, P2O5 -140, K2O - 100 kg/ha. Application of mineral fertilizers, 60 t/ha of lignin or 40 t/ha of manure on this background increases the average yield of raw cotton by 2.9-5.2 c/ha, respectively.

Application of optimal fertilizer rates N -200, P2O5 -140, K2O - 100 kg/ha plus 40 t/ha of manure or 60 t/ha of lignin along with increase in raw cotton yield improves technological properties of fiber. Changing the rates of applied fertilizers in one or another direction negatively affects these properties.

6. Acknowledgements: In order to increase the productivity of cotton on planned sands, depending on fertilizer rates, it is recommended to apply 40 t/ha of manure or 60 t/ha of lignin under the main tillage against the background of natural screen and cotton feeding with 200 kg/ha of nitrogen, 140 kg/ha of phosphorus, 100 kg/ha of potassium. Under plowing apply 100 kg/ha of phosphorus, 50 kg/ha of potassium, with sowing 30 kg/ha of nitrogen, 20 kg/ha of phosphorus, at 2-3 true leaves 50 kg/ha of nitrogen, in budding 60 kg/ha, at the beginning of flowering 60 kg/ha of nitrogen, 20 kg/ha of phosphorus and 50 kg/ha of potassium.

7. Recommendations: When sowing cotton and other row crops on planned sands, their surface should be protected by stubble of intermediate crops (rye) with a height of 12-14 cm and a standing density of 170-200 pieces/m2. Beneath the knobby, barchan and ridge sands lie horizons of heavier mechanical composition. During leveling, the thickness of sands above the hard horizon should not exceed 50-75 cm. At the same time, 250 kg/ha of nitrogen, 200 kg/ha of phosphorus and 170 kg/ha of potassium should be applied to cotton for growing cotton and obtaining normal yield of raw cotton with good technological properties. In order to increase the productivity of cotton on planned sands, depending on fertilizer rates, it is recommended to apply 40 t/ha of manure or 60 t/ha of lignin under the main tillage against the background of natural screen and cotton feeding with 200 kg/ha of nitrogen, 140 kg/ha of phosphorus, 100 kg/ha of potassium. Under plowing apply 100 kg/ha of phosphorus, 50 kg/ha of potassium, with sowing 30 kg/ha of nitrogen, 20 kg/ha of phosphorus, at 2-3 true leaves 50 kg/ha of nitrogen, in budding 60 kg/ha, at the beginning of flowering 60 kg/ha of nitrogen, 20 kg/ha of phosphorus and 50 kg/ha of potassium. Such an agro-ameliorative activity is profitable.

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