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The Effect of Previous Crops on Soil Water Permeability

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Abstract: The soils of the Southern Aral Sea region are characterized by salinity and low fertility. It is known that soils with low fertility have unsatisfactory water permeability. This, in turn, leads to insufficient soil moisture. In the study, the effects of previous crops and intercrops, as well as organic and non-traditional fertilizers, on soil fertility were investigated.

Keywords: Salinity, soils, yield, fertility, productivity, water permeability, moisture, previous and intercrops, organic and non-traditional fertilizers.

Introduction: Soil water permeability is directly related to its fertility. Soils rich in organic matter and with a well-developed structure have good water permeability. In such soils, favorable conditions are created for plant growth.

According to research findings, in cotton fields, the application of mineral fertilizers together with 10 and 20 t/ha of manure, as well as the incorporation of intermediate green manure (siderate) crops into the soil, improved soil water permeability by 68–87 m³/ha.

Under the conditions of meadow gray soils in the Jizzakh region, in increasing soil fertility and cotton yield, the crop rotation system of 1:1 (winter wheat + repeated crop + intermediate crop : cotton) improved soil water permeability by 104.0–133.0 m³/ha.

METHODS

In our experimental field, we determined the effect of cotton, winter wheat, previous and intermediate crops, as well as the application of 10 and 20 t/ha of manure and 2 t/ha of glauconite, on the water permeability of soils in fields where winter wheat was planted in subsequent years.

In the experiment, the following variants were studied: continuous winter wheat cultivation as the control (Variant 1); mung bean, sesame, and sorghum followed by winter wheat (Variants 2, 3, and 4); mung bean for grain + 2 t/ha glauconite + winter wheat (Variant 5); mung bean for grain + 10 t/ha manure + 2 t/ha glauconite + winter wheat (Variant 6); mung bean for grain + 20 t/ha manure + 2 t/ha glauconite + winter wheat (Variant 7); and mung bean for grain + intermediate crop (mung bean) + 20 t/ha manure + 2 t/ha glauconite + winter wheat (Variant 8). The effects of these treatments on soil water permeability were investigated.

RESULTS

In the spring of 2022, soil water permeability over 6 hours averaged 685.0–780.0 m³/ha across the variants. In the control variant, water permeability was 685.0 m³/ha. In variants 2, 3, and 4, where previous crops such as mung bean, sesame, and sorghum were grown followed by winter wheat, it ranged from 690.5 to 704.5 m³/ha. In Variant 5, it was 715.0 m³/ha; in Variant 6, 725.5 m³/ha. In Variant 7 (mung bean for grain + 20 t/ha manure + 2 t/ha glauconite + winter wheat), it reached 743.0 m³/ha, which is 58.0 m³/ha higher than the control. In Variant 8 (mung bean for grain + intermediate crop (mung bean) + 20 t/ha manure + 2 t/ha glauconite + winter wheat), it was 780.0 m³/ha, exceeding the control by 95.0 m³/ha.

By autumn, a decrease in soil water permeability was observed in all variants. The average soil water

permeability across variants ranged from 545.0 to 690.0 m³/ha. In variants 2, 3, and 4 (mung bean, sesame, and sorghum followed by winter wheat), it was 555.0–565.0 m³/ha; in Variant 5, 570.0 m³/ha; in Variant 6, 580.0 m³/ha. In Variant 7 (mung bean for grain + 20 t/ha manure + 2 t/ha glauconite + winter wheat), it reached 630.0 m³/ha, and in Variant 8 (mung bean for grain + intermediate crop (mung bean) + 20 t/ha manure + 2 t/ha glauconite + winter wheat), it reached 690.0 m³/ha, which is 145.0 m³/ha higher than the control variant.

CONCLUSIONS

Under the conditions of the Republic of Karakalpakstan, improving soil water permeability—and consequently increasing soil fertility—can be achieved through crop rotation. This includes incorporating grain crops, leguminous crops, oilseed legumes, intermediate crops, and cereal crops into the rotation system. The application of 20 t/ha of manure and 2 t/ha of non-traditional fertilizers, followed by the cultivation of winter wheat, significantly improves soil water permeability.

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