

## Effect of mulching in the cotton field in Uzbekistan

ウズベキスタンにおけるマルチの綿花畑への影響について

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### Introduction:

There are two main rivers in Uzbekistan, and these rivers are shared by 5 neighbor countries. Uzbekistan only utilizes 12% of water, for that reason economizing water is especially relevant. Moreover, fertilizer is applied in the norm of 200-250 kg/ha for cotton crop, however, according to research cotton crop is able to utilize only 40% of this amount, another part of fertilizer were lost into the atmosphere or sinks the deeper layer of the soil. For that reason, mulching is the best way in order to improve fertilizer use efficiency and water use efficiency.

**Material and methods:** Research was carried out in Uzbekistan's condition where the farmers were facing water scarcity problems, this region is called Syradrya region. There were two treatments in this research: mulched soil and bare soil. Mulched soil covered soil surface by film or other materials (Fig. 1). Polyethylene film was used as mulching material. The research was conducted in cotton field to see how mulching effects to the soil moisture and cotton yield. Before setting out the field research, bulk density and water permeability were determined so as to compare difference of the effect of mulching between before research and after research (Fig. 2). Soil moisture sensors were used in order to determine soil moisture. Pan evaporation was used to measure evaporation. 50 crops of cotton were selected to establish calculations and observations on growth and development of cotton. On the first of June height and leaves of the cotton crop were determined. On the first of July height, harvest branches and flower buds of cotton crop were determined. On the first of August height, harvest branch, buds and bolls of cotton crop were determined. Finally, on the first of September rolls of the cotton crop were



Fig. 1. Mulched cotton field



Fig. 2. Measurement of water permeability

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determined. Apart from that the weight of rolls was measured as well in two treatments. In the end of the vegetation period cotton yield measured, then economic analysis was conducted.

## Result and discussion:

Water permeability of the soil or the process of water infiltration is also important for the cultivation of agricultural crops. Because, the higher the porosity of these soils, the greater speed of the infiltration of irrigation water. And higher permeability helps to create good conditions for the growth and development of crops. In the autumn data, water permeability of the soil is slower than spring. The main reason for this is that the upper layer of the soil (0-40 cm) is compacted in the soil from the spring to the autumn because of the tractor and irrigation. Tractor cultivated 12 times in bare soil, in contrast in mulched soil 7 times. For that reason, water permeability has decreased in bare soil. Here, the water permeability of the bare soil for 6 hours was 0.26 mm / min and the mulched soil was 0.28 mm / min. It is known that the growth and development of agricultural crops depends heavily on soil bulk density. In the irrigated farming, the bulk density of the soil plays an important role as this indicator serves to determine irrigation standards. According to the data for the end of research, bulk density of bare soil was 1.32 g/cm<sup>3</sup>, but in mulched soil, it was about 1.26 g/cm<sup>3</sup>. In the polyethylene film area, this figure was less than 0.06 g/cm<sup>3</sup> compared to the bare soil (Fig. 3).

The growth and development of all agricultural crops is related not only to the biological properties of the varieties, but also to the applied agrochemicals and to the technology used. There was no change in the treatment for cotton growth and development until June 1 and July 1. Starting in July, difference between bare soil and Mulched soil treatments in growth and development of cotton crop began to be strongly observed. Because mulching kept soil moisture and improved fertilizer use efficiency. On August 1, the height of the cotton was 78.2 cm in bare soil, whereas in the cotton fields on the polyethylene film, this figure increased by 14.8cm. It is also appeared in the number of harvest branches, flowers, and the bolls (Fig. 4).

## Conclusions:

Bulk density of mulched soil was reduced to 0.06 g/cm<sup>3</sup> compared to the bare soil. After research in bare soil water permeability was 0.26 mm/min, and in mulched soil it was 0.28 mm/min. The process of growth and development of cotton crop grew rapidly in mulched treatments and gained 15% more height of cotton crop than in bare soil.

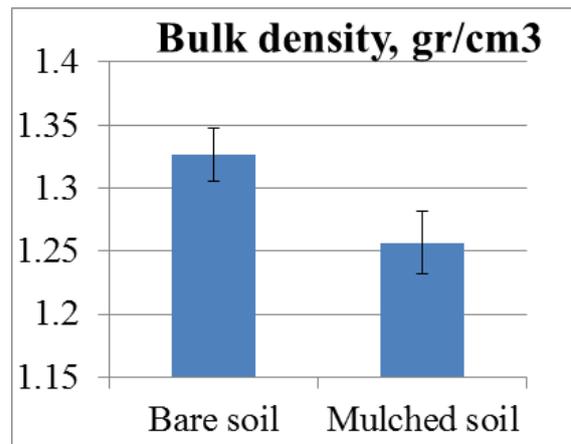


Fig. 4. Bulk density of the cotton



Fig. 3. Growth of Cotton crop in mulched field