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EFFECTS OF MULCHING ON COTTON PLANT DEVELOPMENT IN SALINE AREAS OF SYRDARYA REGION

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Annotatsiya. Ma’lumki, qishloq xo'jaligida yaxshi hosil olish uchun tuproq namligini normal darajada ushlab turish muhim ahamiyatga ega. Ekin qoldiqlari tuproqdan bug'lanishni kamaytirib, o’simliklar uchun zarur bo’lgan namlikni saqlab turishga yordam beradi. O'rim-yig'imdan keyin qoldiqlarni dalalarda saqlash tuproq kuchsizlanishini kamaytiradi, tuproqni eroziyadan himoya qiladi va tuproqqa organik moddalar qo'shadi. Tuproq tarkibini o'simlik qoldiqlari bilan yaxshilash ekinlarning rivojlanishiga ta’sir qiladi. Tadqiqotimizdan maqsad ham - mulchalashning g’o’za o’simliklarining rivojlanishiga ta'sirini o’rganishdir. Bundan tashqari, tadqiqotlar doimiy pushta va uch xil tekislangan dalalarda olib borildi.

Kalit so’zlar: resurs tejamkor qishloq xo’jaligi, mulchalash, laserli tekislash, doimiy pushta, g’o’za, fenologiya

Аннотация. Известно, что для получения хорошего урожая в сельском хозяйстве важно поддерживать влажность почвы на нормальном уровне. Остатки урожая уменьшают испарение, почва остается влажной, а урожай требует меньше воды. Хранение растительных остатков на полях после сбора урожая снижает потери почвы, защищает почву от эрозии и добавляет в почву органическое вещество. В свою очередь, улучшение содержания в почве пожнивных остатков повлияет на развитие сельскохозяйственных культур. Цель исследования - выявить влияние мульчирования на развитие хлопчатника. Кроме того, исследования проводились на полях с постоянными грядками и тремя видами планировок.

Ключевые слова: ресурсосберегающее земледелие, мульчирование, лазерная планировка, постоянные грядки, хлопчатник, фенология

Annotation. It is known that in order to get a good yield in agriculture, it is important to keep the soil moisture at a normal level. Crop residue reduces evaporation, and the soil stays wet and the crop requires less water. Keeping the residues in fields after harvest reduces soil losses, protects the soil from erosion and adds soil organic matter to the soil. In its way, improving the soil content with crop residues will affect the development of crops. The aim of the research is to screen the effects of mulching on the development of cotton plants. Besides, researches were conducted in the fields with permanent beds and three types of leveling.

Key words: conservation agriculture, mulching, laser leveling, permanent beds, cotton, phenology

Introduction. Various factors effect on plant development, such as air, soil, water, sunlight, temperature, and etc. For cotton plant higher temperature and more soil moisture is required. But when the soil is wet and temperature is higher and the land is bare, more water evaporates and this increases soil salinity. However the soil

is wet, in any way, salt doesn't give plant the required water. And also land degradation and erosion is caused by conventional tillage technologies. There are useful technologies of reducing soil salinization all over the world. Mostly these methods are about conservation agriculture. Conservation agriculture is a concept for resource-saving agricultural crop production that strives to achieve acceptable profits together with high and sustained production levels while concurrently conserving the environment [1].

According to FAO, conservation agriculture is "a concept for resource-saving agricultural crop production that strives to achieve acceptable profits together with high and sustained production levels while concurrently conserving the environment. Conservation agriculture is based on enhancing natural biological processes above and below the ground. Interventions such as mechanical soil tillage are reduced to an absolute minimum, and the use of external inputs such as agrochemicals and nutrients of mineral or organic origin are applied at an optimum level and in a way and quantity that does not interfere with, or disrupt, the biological processes." Conservation agriculture consists of different crop cultivation practices such as zero tillage, sowing of crops on permanent beds, strip tillage, plant residue management, adequate crop rotation management, and others [2].

According to the Conservation Technologies Information Center (ATIC) in conservation agriculture in fields after harvest at least thirty percents residue must be left. And farmers leave different amount of crop residues, who deals with conservation agriculture. Conservation technologies don't bother the soil environment [3].

Material And Methods. The study area is situated in old irrigated hungry steppe of Syrdarya with irrigation period of more than 100 years. It is situated in the centre of Uzbekistan on the left bank of the Syrdarya river, and has a total area of 5100 km^2. This Province borders with Tashkent and Jizzakh Provinces. The economy is based on agriculture, especially cotton and cereal growing. The climate is typically arid continental climate with extreme differences between winter and summer temperatures. There are thousands of hectares of virgin soil and mostly desert, with the hungry steppe taking up a significant part of the Province's area.

During the long irrigation period, due to irrigation regimes and extra pressure the ground water level lift up till 1-2 m. This formation is the consequence of increase of irrigated territory in hungry steppe of Syrdarya. Saline ground water causes repeated salinization of soil. This characterized by high content of total dissolved solid and the presence of gypsum which requires realization of engineering and agrotechnical activities for improvement of cotton crop production.

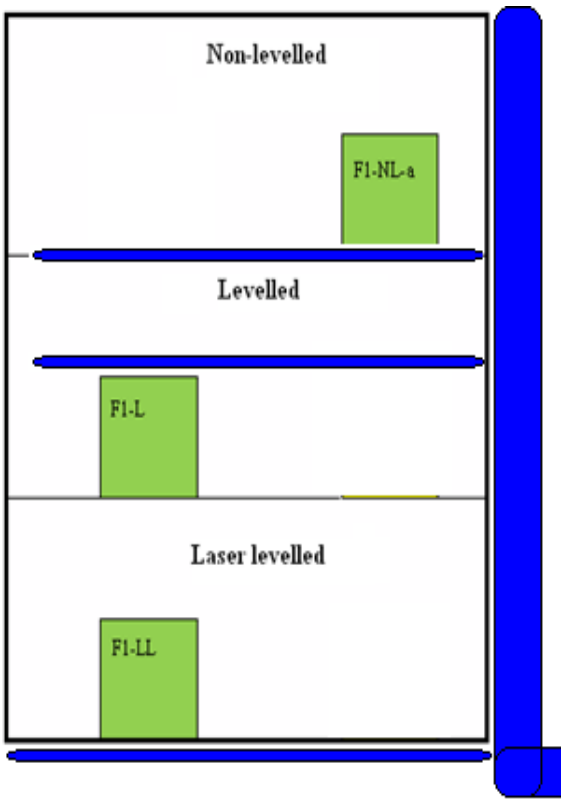

Figure 1. Experimental plots in Pakhtakor farm

Experiments were conducted in Pakhtakor farm in Bobur WUA. There are 3 plots delivered for experiments of Minimal Tillage Technology. The size of each plot is 86x100m, total area is 2.58 ha. The experiments were carried out in three kinds of field leveling: laser leveling (LL); traditional leveling (TL); and non-leveled (NL) (fig. 1).

Experimental design. The randomized complete block design is used for the experimental plots. The randomized complete block (RCB) design is one of the most widely used experimental designs in agricultural research. The design is especially suited for field experiments where the number of treatments is not large and the experimental area has a predictable productivity gradient. The primary distinguishing feature of the RCB design is the presence of blocks of equal size, each of which contains all the treatments [4].

The primary purpose of blocking is to reduce experimental error by eliminating the contribution of known sources of variation among experimental units. This is done by grouping the experimental units into blocks such that vary ability within each block is minimized and variability among blocks is maximized. Because only the variation within a block becomes part of the experimental error, blocking is most effective when the experimental area has a predictable pattern of variability. With a predictable pattern, plot shape and block orientation can be chosen so that much of the variation is accounted for by the difference among blocks, and experimental plots within the same block are kept as uniform as possible [5].

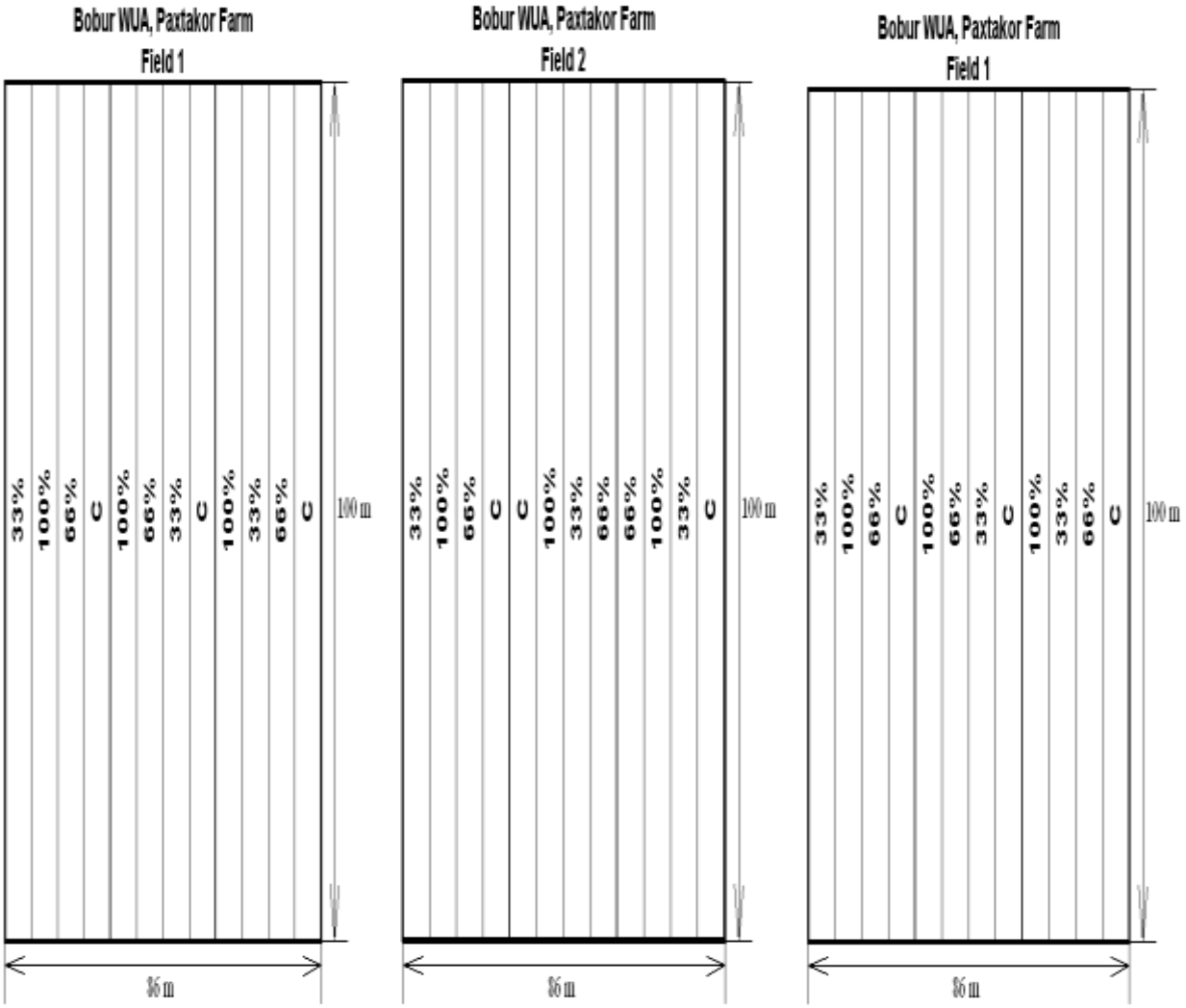

Figure 2. Randomization of treatments

In our experiment there are three blocks in every plot – A, B and C. Each has 4 treatments including control plot. 1st experiment is mulching with 6 tons of straw (M-100), 3888 kg straw required for the experiment; 2nd experiment is mulching with 4 tons of straw (M-66), 2592 kg straw required; 3rd experiment is mulching with 2 tons of straw (M-33) 1296 kg straw required, and the last one is the control plots. For the total experiment 7776 kg straw mulch is required. Each treatment's size is 7.2x100 m^2 and there are 12 experimental in every plot (fig. 2).

Phenological observations. Phenological observation carried out in 4 middle rows from the 8 rows of the plot. 1st and 2nd rows, 7th and 8th rows are excluded, they are buffering rows. The plant phenology begins from 10 meter of row 3 and ended before 10 meter of row 6. The beginning and the end must be marked with stakes and every plant that is observed must be also marked with paper or ropes, because every time the same plant must be observed. In Pakhtakor farm the plot length is 100 m. and 10 meter from the beginning and 10 meter from the end is out and there is left 80 meters. On each of middle 4 rows step by step 20 meters are chosen and 1 plant in each meter is observed. It will be 80 plants in one treatment (fig. 3).

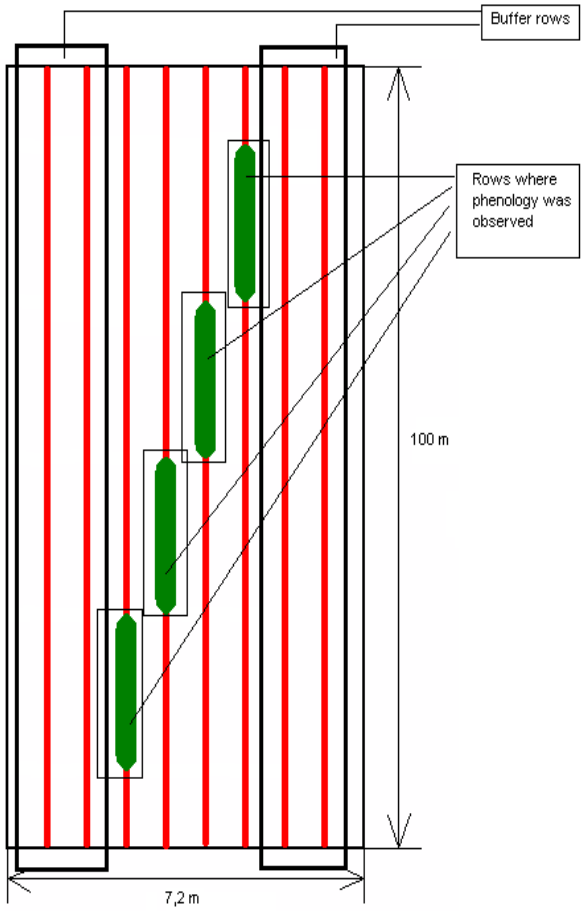

Figure 3. Rows of phenological observation

Results And Discussion. ***Plant height***

Plant height characteristics well differentiated at non-leveled and laser leveled systems. But non-leveled and traditional leveled systems have almost similar values. Also mulching concentration impacts do not influence to height of cotton plants. Only control and M-100 concentration values have significant differences (fig. 4).

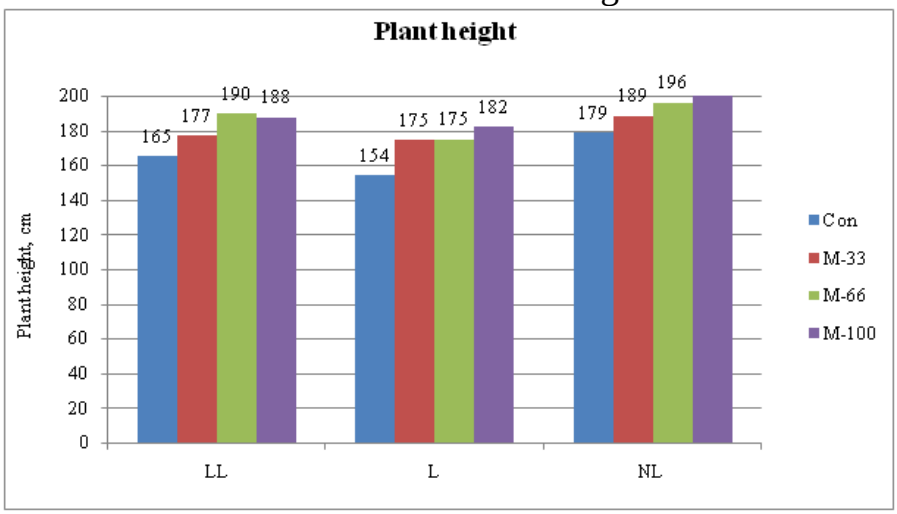

Figure 4. Cotton plant height in Pakhtakor farm, Syrdarya region

Cotton root depth

Root developed better in the laser leveled plot. The root length is shorter in M-

33 treatments, the average is 31.1 cm and the longer root system developed in M-100 treatments with the average 39.1 cm. The results show that, the effect of mulching affected approximately 10 cm (fig. 5).

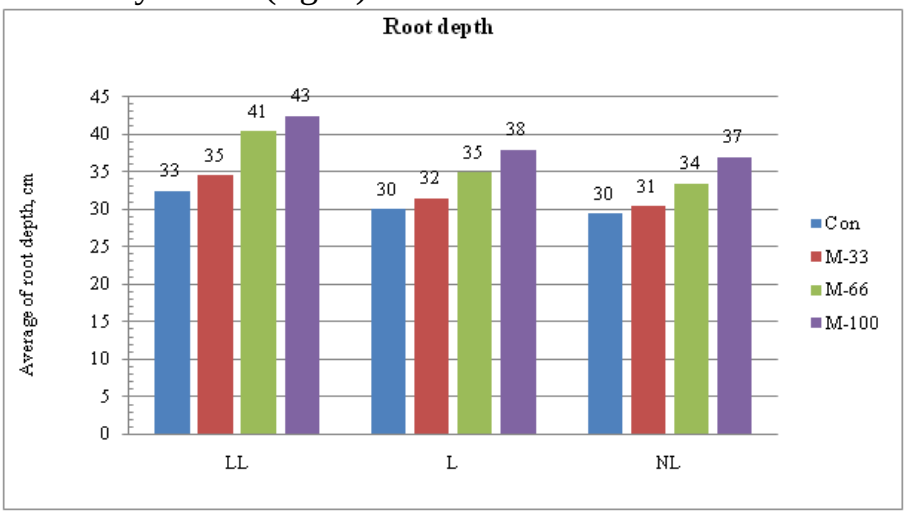

Figure 5. Cotton plant root depth in Pakhtakor farm, Syrdarya region

Cotton sympodial branches

Amount of cotton sympodial branches also were increased due to laser leveling and larger mulch concentration. The highest indicator was determined in the experiment M-66 with average amount of sympodial branches 15.8 per plant. This value increased to approximately 2-3 due to mulch concentration and leveling system. The results show that impacts of mulching concentration and leveling system is not largely affect to sympodial cotton branches (fig. 6).

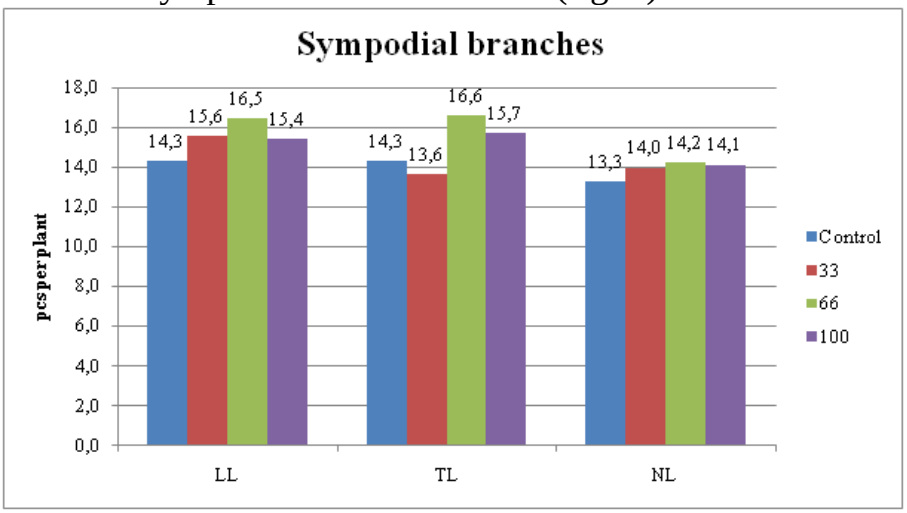

Figure 6. Sympodial branches of cotton in Pakhtakor farm, Syrdarya region

Cotton bolls

Amount of cotton bolls changed due to impact of laser leveling and mulch concentration. Average amount of cotton bolls in control group is 19 per plant. This value increased approximately from 2.0 to 3.5 units due to mulch concentration and leveling system. The best value can be seen at M-33, M-66 mulch concentration in laser leveling system and M-100 mulch concentration in non-leveling system. The results show that, impacts of mulching concentration and leveling system affect to amount of cotton bolls (fig. 7).

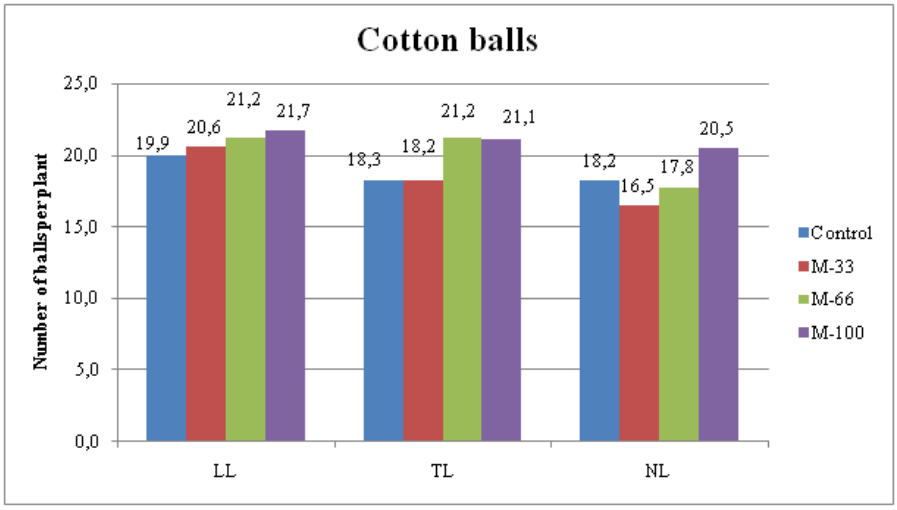

Figure 7. Cotton balls per plant in Pakhtakor farm, Syrdarya region

Crop yield measurements

Crop yield values indicate that mulching concentration and leveling system significantly affect to amount of crop yield. Average cotton crop yield is 2993 kg/ha in control groups with different leveling systems. This value increased from approximately 300 kg due to mulch concentration and leveling system. The best value was seen at M-66 mulch concentration in laser leveling system and M-66 mulch concentration in leveling system. The results show that M-66 mulching concentration and laser and ordinary leveling system have good impacts to cotton crop yield (fig. 8).

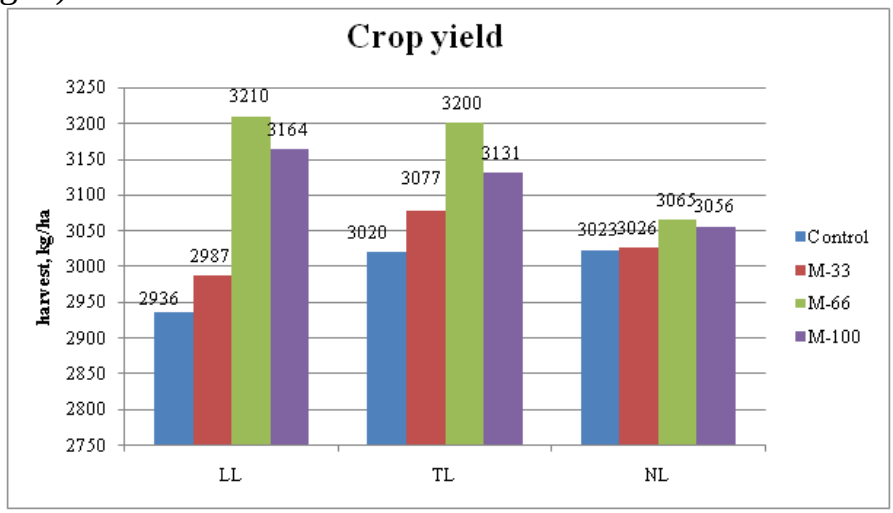

Figure 8. Raw cotton yield height in Pakhtakor farm, Syrdarya region

CONCLUSION

Most of the results indicate that, land leveling systems differ significantly. Mulching treatments also showed significant difference but not in all measures. Higher results were obtained mostly in the treatment M-66 (4 tons mulching).

From the experiment it was defined that ***plant height*** got higher in the non-leveled field up to 13cm. higher than laser leveled field and 8cm. higher than traditional leveled field. Within the mulching experiments M-66 and M-100 treatments were to 6cm. higher than control plot and 1.5cm. higher than M-33

treatment. According to the analysis of variance land leveling and also mulching treatments showed difference at 1% level of significance.

Root length developed well in laser leveled plot, the root got longer in laser leveled field to 5-6cm. than traditional and non-leveled fields. It was determined that, among the mulching experiment in M-100 treatments the root system got longer to 10 cm. in Control plots, 7-8cm. in M-66 treatments and 3-4cm. in M-66 treatments. Statistical analysis showed that the land leveling and also mulching treatments showed high significant difference (1% level of significance).

Higher amount of ***Sympodial branches*** was observed in laser leveled field. Number of sympodial branches was to 1.3 times more in laser leveled field than in traditional and non-leveled fields, and from the statistical analysis we can see the difference is at 1% level of significance. Among the mulching experiment number of sympodial branches was more in M-100 treatments, but there isn't any significant difference according to the analysis of variance.

Cotton bolls also couldn't show any significant difference, neither within the land leveling nor within the mulching experiments. Better results can be seen in traditional leveled field with a bit more cotton bolls and within the mulching in M-100 treatment 1.07 times more than in control plot.

Amount of ***crop yield*** was higher in traditional leveled field and within the mulching experiment in the M-66 treatment. Raw cotton in traditional leveled field is to 64kg more than non-leveled field and 33kg more than laser leveled field. Within the mulching experiment in the M-66 treatment amount of raw cotton is more up to 165kg than control plots, 128kg than the M-33 treatments and 41kg than the M-100 treatments. But the statistical analysis show that there is no any significant difference, neither in land leveling, nor in mulching treatments.

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