

Effect of conservation tillage and remains under the influence of drip irrigation on watermelon yield in the Bardsir Region

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ABSTRACT: Cultivation two products in one year, due to the limited opportunities to prepare the seed bed for the second crop after wheat harvest and loss of soil organic matter due to harvesting or burning of crop residues before and continuous cultures is one of the agriculture of problems in the city Bardsir. However, due to the use of machines such as conventional moldboard plow and disk tillage destruction of soil structure in this way, use of alternative tillage can be one of the best options to achieve sustainable agriculture. In order to test split plot in a randomized complete block design with triplicate in a sandy loam soil land with villages Dashtkar was implemented in 1391. Management and conservation tillage remains the main treatment includes: 1. Conventional tillage (moldboard plow + disk), 2. Strip tillage (heavy cultivator Cultivation online + disk 2 times) 3. minimum tillage (plow ink) 4. No tillage (direct sowing of seeds) and 4 leftover amount as subplots include: 90 percent, 60 percent, 30 percent and remains, were evaluated. Based on the results of this study, Simple effect of tillage treatments and the remains were significant at 1% level. So that the treatment reduced tillage 24,200 kg maximum performance and no tillage treatments assign minimal performance with 11,433 kg. Between conventional tillage and minimum tillage treatment were not significant differences. After analysis of variance results indicated that the minimum tillage treatments with 60% of the traffic remains lower agricultural machinery, maintain soil structure, crop yield and soil moisture had the best performance compared to other treatments.

Keywords: watermelon, conservation tillage, crop residue, performance

INTRODUCTION

Survey indicates that every year 5 to 7 million hectares of arable land in the world lost their fertility (Steiner et al, 1998). Application collection system as well so the soil functional conservation tillage as a method of sustainable agriculture, that can slowing land degradation and increasing the sustainability of agriculture. In this method, due to the remaining plant residue on the soil surface and also due to the minimum arrival soil disturbance during tillage and planting, in addition to reducing wind erosion and water loss due to evaporation and transpiration from the soil surface, soil moisture will increase and improve the soil structure will help (Swanton, C. J. and Weise, 1991).

Conventional tillage is a method of plowing over a long period and will be implemented in order to produce. In this system, crop residue on the soil surface, wipe it off with a life cycle of pests, diseases and weeds knives and provide good bedding for growing plants and breaking the impermeable layer of soil, the bed is ready to grow roots. Most conventional tillage using moldboard plow and disk runs. One of the most widely used agricultural tillage operations in terms of energy expenditure (Gupta et al, 1993). The indiscriminate tillage can be increase soil erosion, increased evaporation, decreased permeability, increased runoff and increased soil compaction. Methods of conservation plow, reduced plow or zero plow with crop residue on the soil surface amounts have left many parts of the world are common. In most cases, the performance of crops in conservation plow methods compared with conventional plow methods was similar or was higher (Anderson, 1990). Some of the researchers in

conservation plow resulted in soil water capacity, due to reduced evaporation from the soil surface as it approaches (Powell and Unger, 1998). One of the operations that are performed on the residue of our country's crop residue has been burning. Despite this operations have many loss and damage, such as Loss of alive micro-organisms and micro nutrients, reduce soil fertility, increased erosion by wind and water . It has, however, been used our country (Unname, 1383) so study on different methods of tillage crops in various parts of the country seems necessary. Consumption watermelon plants Consumption over in world is dark and 6.8% of the product is dedicated to vegetable production (Goreta and colleagues 1, 2005). Watermelon cultivation in the world, 1.8 million hectare (dry land and irrigated) with production of 29.9 million tons (Yesim and Yuksel, 2003). 50% of the watermelon product, by four countries, China, Turkey, United States of America, and is produced and its area under cultivation in about 120 thousand hectares with an average production is 26 tons per hectare (Huh et al, 2008). The highest watermelon production in the Kerman province is about 15,549 hectares of land under cultivation and the yield is 23 tons per hectare in the second crop (summer) is being cultivated in Bardsir (Khademian, 1384). Check the source of that Bahrani and colleagues (2007) Effects of soil tillage and residue management † corn grain yield were studied and reported, † no- till systems and crop residues compared with conventional tillage † soil, it can increases soil organic carbon content Lithourgidis and colleagues (2007) found that conservation tillage compared to conventional tillage cause to reduce erosion by water and wind will be followed. Bennett et al (1998) Effect of different tillage methods on sesame in Australia surveyed reported that seed germination in no-tillage methods compared with more conventional methods. Gray and colleagues (1996) in a three-year trial to assess the effect of three tillage systems (conventional, reduced tillage and no tillage) and three residue management (removal of remains, have been burning and mixing with the soil) in wheat cultivation after rice is done. Minimum tillage significantly increased the wheat yield (5.1 ton per hectare) compared to conventional tillage (4.6 tons per hectare) and no tillage (4.75 tons per hectare) was made. By mixing crop residue the highest yield (5.8 ton per hectare) in three years. Most wheat yield (6.1 ton per hectare) was related treatment and Minimum tillage with residue soil mixing.

MATERIALS AND METHODS

To evaluate the impact of conservation tillage and crop residue on watermelon yield a second crop in Bardsir Kerman the experimental design was split plot in a randomized complete block design with three replications was conducted in sandy soil with the cultivar Crimson Swift. In which the tillage as the main factor of four Level 1 - conventional tillage 2 - strip tillage 3 - 4 Minimum tillage - no tillage and rate of crop residue a ancillary factor in 4 levels: no crop residue, 30 percent, 60 percent and 90 percent covered by crop residue, runs. Tillage treatments included 1 - conventional tillage (moldboard + disk) 2 - strip tillage (75 cm intervals using a moving heavy cultivator just planting the watermelon) 3 - Minimum tillage (plow consisting of a move) 4 - no till (no-plow planting conditions). Treatments were applied in plots with dimensions of 6 x 20 meters, 3 meters away from each plot was taken from an adjacent plot. Measurements and cover with the crop residue of tillage before the fields sampled in multiple points of a square meter of the farm, and then they were weighed. Land preparation operations and tillage, according to the above treatments were done in such a way that all treatments are cultivated on 15 July.

For measuring soil bulk density at 0-15 cm depth using cylindrical samples, specimens were removed intact from the plots using the relation Bulk density

$$\rho = \frac{M}{V}$$

Treatments will be watered using drip irrigation. To measure the humidity (a week after each irrigation) during the growing season will have samples of all treatments. Sample will done by Ager in depth 0-5, 5-10, 10-20 cm . The sample is placed in a disposable plastic to reduce moisture evaporation from any initial laboratory to prevent the transfer to occur.

Then weighed and samples were weighed in aluminum pans for the Pre will be place and in oven was during at 105 ° C for 24 h, and then re-weighed containers of dry soil and at the end they were calculated by the moisture content formula .

$$\% \theta_m = \frac{W_w - W_s}{W_w} \times 100$$

Finally, by taking to determine yield of each plot and marginal effect product was weighing and removal.

The data analysis and statistical comparison and calculation of other parameters will be used of MSTATC and SPSS software.

RESULTS AND DISCUSSION

Effect of tillage and rate of crop residue on bulk density soil

Analysis of variance based on the data in Table (1), different methods of tillage various amount crop residue and their interactions, a significant effect ($P < 0.01$) on soil bulk density soil on the left.

Table 1. Analysis of variance based on the data

Sources changes	Degrees of freedom	Soil bulk density	Soil moisture content	Fruit yield
Repeat	2	0.00031633ns	0.0658333*	17.9508333**
Tillage	3	0.14784786**	90.4785417**	135.0502083**
Repeat xTillage	6	0.00218578**	0.0175	0.7258333
Crop residue	3	0.03549564**	5.4435417**	31.1646528**
Tillage x Crop residue	9	0.00571601**	0.0522083*	1.2009491**
Error	24	0.01052200	0.00043842	
Total	47	0.62574392		

**Significant at the level of 0.1* Significant at the 0.5 ns not significant

Tillage effects on soil bulk density

According to the chart, the lowest soil bulk density of conventional tillage treatment and 1.098 grams per cubic centimeter, and most treatments without tillage on soil bulk density 1.36 grams per cubic centimeter. Using conventional tillage with the moldboard produce hunk and returning topsoil too much, it cause large pores at this depth and decreased soil bulk density. These result also agreed with the findings Azim Zadeh et al (2002) and Trripathi et al (2007).

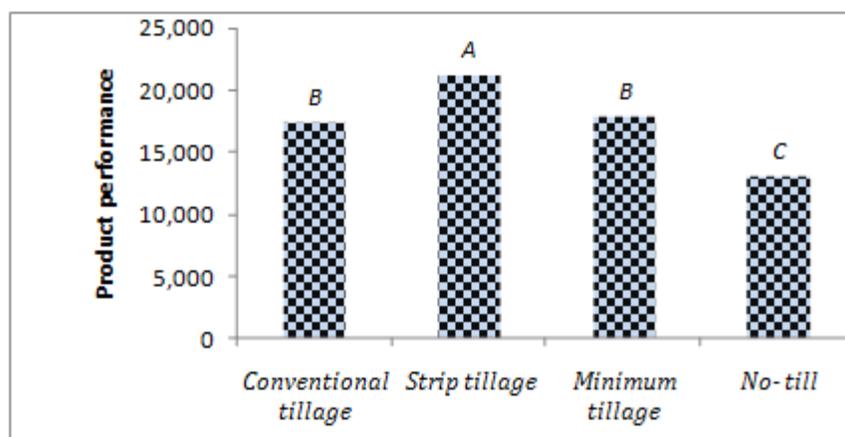


Figure 1. Effect of tillage methods on soil bulk density

As can be seen no till treatments with 1.36 grams per cubic centimeter is allocated

The highest bulk density and strip tillage and minimum tillage treatments were in a group. One of the reasons for increasing the soil bulk density in no till system is this system because of non-use of tillage machines will not also cause any upset. These results are compatible with findings Azim Zadeh et al (2002) and Mahboubi (1993).

Effect on the crop residue of the soil bulk density

According to the table of analysis of variance indicated that different levels of crop residues has a significant effect on reducing soil bulk density, So that amount of crop residue have minimal 60% and crop residue without cover treatments have the most devoted of soil bulk density. Decrease in soil bulk density is for impact of crop residues and impact on less compaction soil, these results is consistent with Cassel and colleagues (1995), Duiker and Curan (2005).

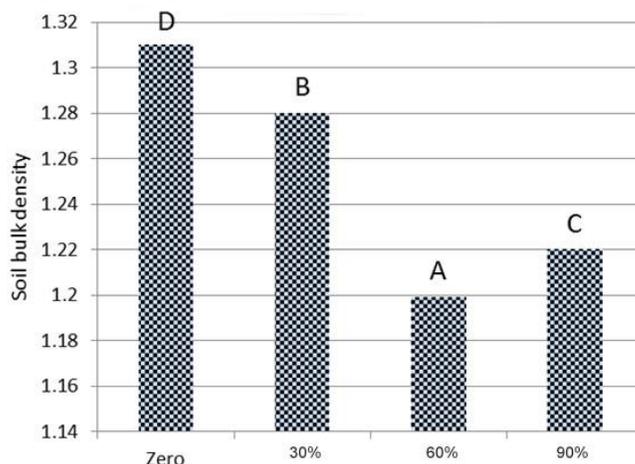


Figure 2. The rate of effect crop residue on soil bulk density

The interaction of different tillage methods and rate of crop residue on soil bulk density

The diagrams show that treatment with conventional tillage and no-cover crop residue, assigned to the lowest soil bulk density and treatments with no till and 60% covered with crop residue contain the highest bulk density among the treatments.

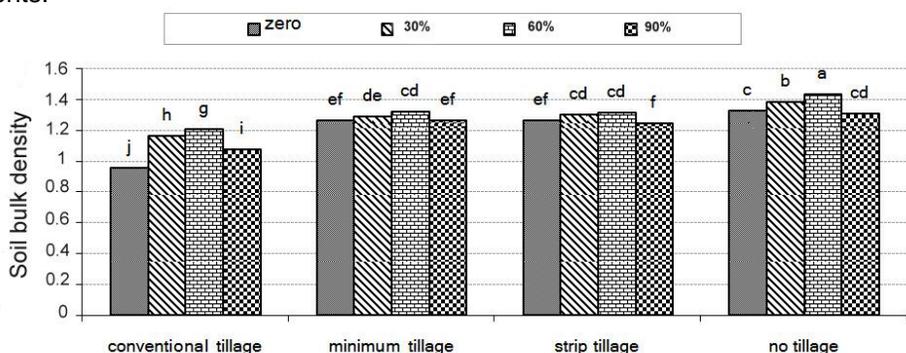


Figure 3. Interaction between the different rate crop residue and types of tillage on soil bulk density

Effect types of tillage on average of soil moisture content

Analysis of variance of soil moisture content Table (4-5) shows tillage is a significant effect on average of soil moisture content. As indicated in the chart that reduced tillage relative humidity 19.1 of the maximum and conventional tillage with moisture 12.53 percent had the lowest mean soil moisture content.

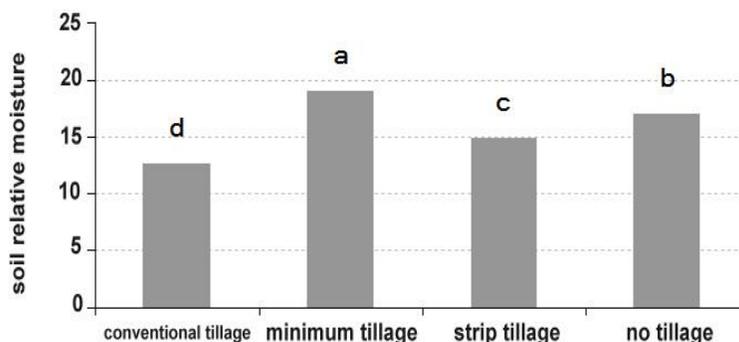


Figure 4. Effect types of tillage on soil relative moisture

Husnjak et al (2002) studied effect conventional tillage, minimum tillage and no till on moisture stored in the soil and observed that differences soil moisture content in the surface of soil in all treatments is statistically significant.

Effect of cover crop residue on the average of weighted moisture soil

Analysis of variance shows different levels crop residues have significant effect on the one percent probability. According to the diagram below, rate crop residue 90% with moisture 16.84 percent have maximum and crop residue treatment with no cover with 15.23 percent is allocated to the lowest relative moisture the soil.

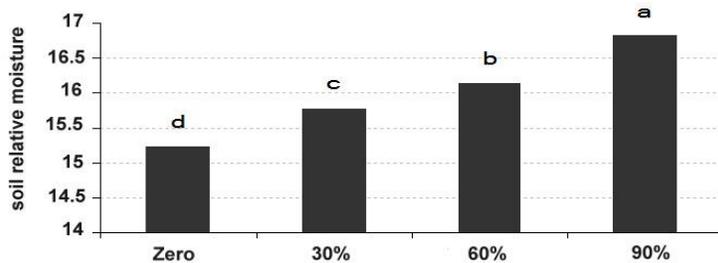


Figure 5. Effect of different cover crop residue on the soil relative moisture

Cavalaris And Gemtos (2002) known exist crop residue on soil is barrier to reach sunlight to soil surface soil that reduces evaporation and thus increase moisture stored in the soil. The interaction of various methods of different tillage and different cover crop residue on the average soil weighted moisture.

As shown in the analysis of variance table, Interaction of tillage and rate of crop residue is significant at the 1% probability level, Chart shows that the minimum tillage treatment + 90% residue cover with moisture 19.98 is devoted to maximum the content and conventional tillage + no residue cover treatments moisture 12.21, had the lowest.

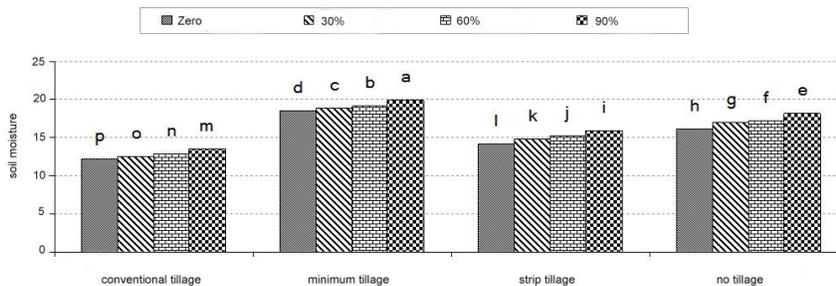


Figure 6. Interaction between of different rate of crop residue and types of tillage on average soil weighted moisture

In minimum tillage treatments rate of crop residue due to mixed with the soil surface remains have been better to save moisture. in conventional tillage treatments because mostly in crop residue were buried, Therefore, due to the lack of surface coating, has the lowest percentage moisture storage.in no-till treatments, because the crop residua have been on soil surface in compared with two treatments, minimum tillage and strip tillage that have been mixed with the soil crop residue and remain on the soil surface, lost their moisture sooner than the other. Crop residue on the soil surface acts as a barrier and reduces the runoff and greater penetration of water in the soil and thus increases the average moisture content of the soil (Ulger et al, 1993).

Effect of tillage methods on fruit yield

As seen in the chart below, in strip tillage treatments resulted the highest yield, conventional till and minimum tillage were in one group from statistical and no till with the lowest performance was in another band. This means that between the two methods, minimum tillage and conventional tillage are not found any difference in terms of performance. Tillage treatments with disk and cultivator have the most performance, with an average yield of 21. 220 kg per hectare and no-till treatments allocated the lowest performance with averaging 13,050 kg per hectare. The results of research till systems comparing and impact on product yield are varies and in some areas yield has been reported less, equal or more than conventional tillage.

Many of researchers have reported increased performance in minimum tillage methods that results obtained in this project is in line with the results reported.

One of the reasons for the low yield in no-tillage treatments than other treatments can be considered amount of seed germination treatments in this treatment. There crop residua in the soil cause problems during planting and seeds of inappropriate cover in effect of exist crop residua and is finally reduced seed germination percentage (Asadi, 2006).

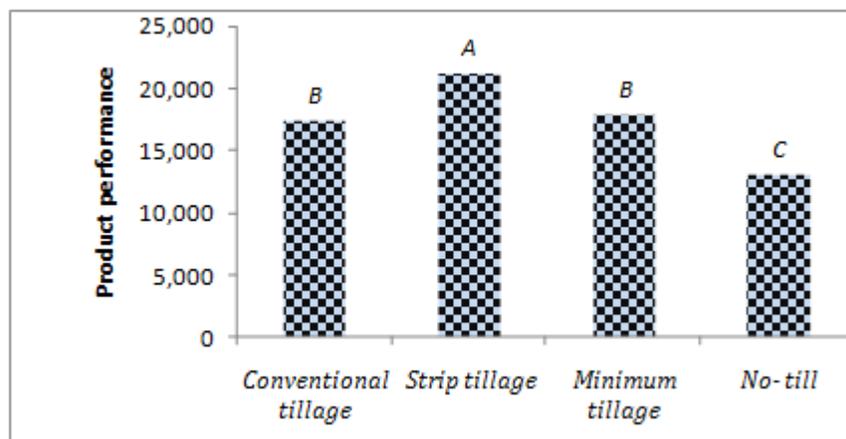


Figure 7. Effect of tillage methods on yield of watermelon

Most of studies, have reported the use of no tillage system increases the performance, but all these reports have emphasized the positive effects of no-till in the long term and they know short term no-till effects on causes reduced performance, That is consistent with the survey results (Zeliha, 2005).

Impact amount of crop residua on watermelon performance

According to the table, simply the effect in changing Amount of crop residua on fruit yield was very meaningful. According to the chart, the most fruit yield with 19,370 kg of per acre was obtained for 60 percent amount of crop residua treatment. The reason of performance increase in 60% amount of crop residua treatment due to increased soil organic matter, Increase soil moisture retention and reduce soil acidity is due to straw (Raeesi Sadat, 1389). Contrary to expectations that the crop yield should be increase with more crop residue, But this is not realized and view That treated with 90 percent remaining has been less product in compared treated with 60 percent of the remain. The reason is that by reducing plant density, increased weed knives and weed knives are more competition for water and nutrients from the main plant that results are in line with results (Zeliha and Akbolat 2005). The researchers expect that by increasing the amount of soil organic carbon and decomposition, resulting in increased nutrient availability, the product's yield will increase in no-till treatments. But seems to increase soil organic carbon in no-till treated in a crop year is not yet led to greater performance. It should be noted that rate of to increase soil organic carbon under no no-till treatments are not the same with speed changes of organic carbon and the effects of soil organic carbon need more time. For example, reducing the bulk density of soil and seeds soil stability occurs then and it seems to increase the crop yield would be enough time for soil organic carbon.

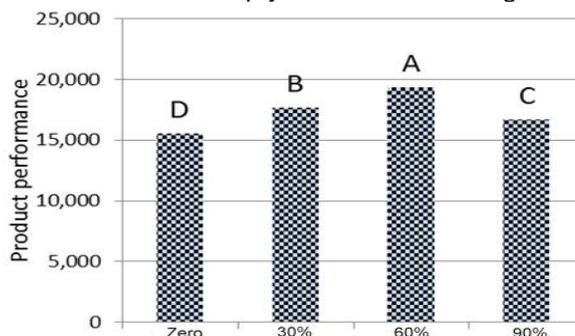


Figure 8. The effect of different Amount of crop residua on watermelon yield

Interaction of tillage methods rate of crop residue on fruit yield

According to the analysis of variance table interaction of tillage and irrigation treatments were significant at the 1% level on fruit yield, the tillage treatments and rate of crop residue have been effective with each other. So that the graph is found, the rate of crop residue 60% being under the influence of minimum tillage treatments and with an average yield of 24,200 kg per hectare is superior yield to other treatments and no-tillage treatments, with 11,433 kilograms per hectare, is allocated to the lowest yield.

Reduced tillage treatments better than others due to an appropriate seed, can be related to improve the speed of emergence and plant establishment in soil. Through the various methods of tillage effects on soil chemical and physical characteristics as well as influence of temperature and soil moisture on plant growth effects are positive or negative, therefore, the results concerning the effect of tillage practices on plant performance; it is sometimes different (Lal et al, 1994).

According to the results of the project, we understand that the crop residue of the 60% are increase in performance compared to the other treatments crop residue covered That this result is due to the positive effects of crop residue on the soil. Crop residue in the soil cause follow the soil, increase soil organic matter, improves the activity of microorganisms and It is better to keep the soil moisture. (Singer et al, 2004) found in their research, chopped crop residue along with mixed with soil causing to decay further and faster that substances in crop residue use earlier to plant and has reached good fertile soil that result is increased performance. Because yield losses in no-till treatments may be due to be increase soil compaction in No-till which resulted in reduced root development and reduced uptake of nutrients and water and resulting in yield is loss.

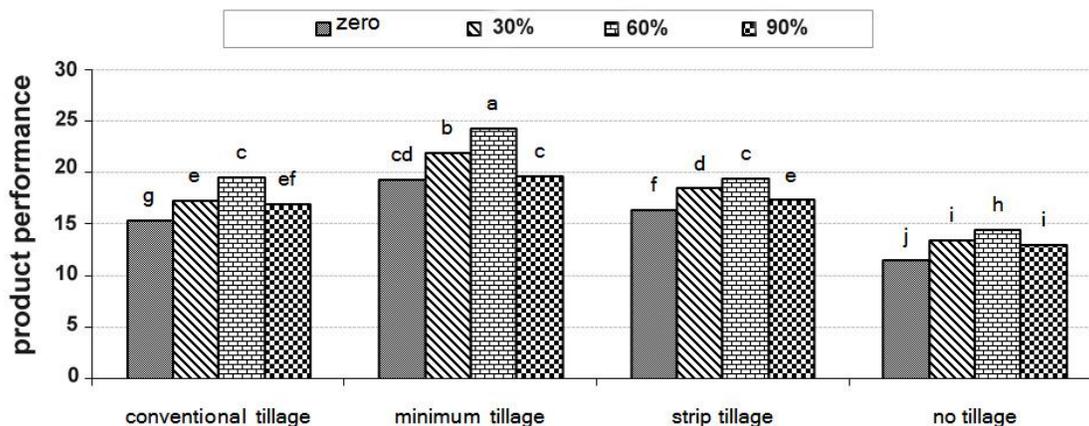


Figure 9. Interactions between the different amount of crop residue and types of tillage on watermelon yield

Suggestions

1. According to the harmful effects of burning crop residues, such as loss of live micro-organisms and micro nutrients, reduced soil fertility, increased erosion, and ... It is recommended to avoid.
2. According to the better soil moisture retention in minimum tillage methods and amount of crop residue above recommended this method used instead of conventional tillage, and remove the crop residue.

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