Advances in Environmental Biology, 6(8): 2308-2314, 2012
ISSN 1995-0756

This is a refereed journal and all articles are professionally screened and reviewed **ORIGINAL ARTICLE**

Comparison of differenttillage methods and effects of using water (magnetic and usual) in tape and furrowirrigation on corn yield in north of Khuzestan

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ABSTRACT

In our country especially in Khuzestan province, the corn usually is irrigated in ridges and furrows way. Unfortunately, the high cost of performing the way of drip irrigation on the one side and not awareness of the farmers from the benefits of it on the other side caused that using from this way do not have the desirable growth for the row crops like corn. The present study was performed in small province of Shoushtar in order to proposing the suitable tillage way, more exact estimation of used water of this cultivation in everyhectare, proposing of effective using water with two kinds of usual water and magnetismin an experiment like split factorial in the pattern of complete accidental block in three repetitions. The main treatment contains the way of tillage (one time Cyclotiller, one time Rotivator) and secondary treatments contains two kinds of water irrigating (usual and magnetism) and two ways of irrigating (leaky, linear drip trickle which were selected. Magnetismwater because of high ability in solving the salts solves the salinity of the water to somehow. The results show that in all of the treatments the function of tillage and using magnetism water was calculated more than normal water. The most yield with 8800 kilogram in hectare is related to thetillage with cyclotiller and irrigating with magnetism water in using drip irrigating system than other treatments.

Key words: tillage, corn, magnetism water, Rotivator,Cyclotiller

Introduction

Corn after wheat is considered as a second cultivation in the country and spreading its agriculture level according to different uses and crucial need of the county is very important after the wheat. In the north of Khozestan two products in one year of crops are cultivated which the succession of wheat and corn is the most usual thing. The function of preparing the bed of the basic seed in the wheat and corn in the usual way (tillage with reverse plough + disc + buckboard) which is done after collecting or firing the remained, but cultivating wheat was cropped on the flat ground and corn in some places of the internal environment (because of limited water) and on the mound with 20-25 wheat and the distance of 75 centimeters. One of the most important factorsof not development of the corn in Iran is the low of the irrigating output (37 percent) in the common ways and finally the lack of accessible water resources for increasing the cultivating of this crop. By using from low tillage system and lack of tillage forming mound again and cultivating the next crop and reserving the remains of the plants are the recent studies in the way of cultivating corn on the mound. The furrows and continuous mounds with creating boundaries have caused reserving the rain water and improving the function and increasing the water output in the corn.

On the other hand the water resources of the country not only limited but also the underground water resources decreased. In facing with these realities the best use of water is an essential and inevitable factor. The increasing of the irrigating efficiency is one of the ways of saving in using water. This important factor can be achieved by using new irrigating ways. Drip irrigation can cause saving in using water for 50 to 70 percent. Therefore, the best use of the present water resources for cultivating crop plants in the agriculture part can be one of the most suitablechoices for finding a way for creating consistence agriculture. Low irrigating is one strategy for creating the products in the lack of water conditions which leads to decreasing the crops and is a case which specifies the limit level of using water and the function. The saving water has caused the increasing of the profit because of decreasing of

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the using it in the level unit, increasing of the products. Drip irrigation is one of the ways which is used as a new way in irrigating of crop products. In different countries with low water, using drip irrigation was started in the crops from 1975. According to the researches on the low irrigation of the corn, it has shown that low irrigation caused decreasing of the product. Also comparing the output of the using water in the drip, rainy, and furrowing ways for producing the corn in the American by Clork [5] has shown that 12, 11.5 and 11.9 tons in hectare of the yield of the product for every millimeters of using water for these ways were obtained and drip irrigation because of having shorter irrigation in comparison with the surface way and furrowing have increased the output of the using water to the 1.9 to 2.10 kilogram on millimeter on the hectare Asoodar, et al [1]. So daily development of using the drip irrigation and usinglinear drip irrigation in row and cash crops like beetroot, corn, potato, tomato, cotton and etc. have caused that broad research was done in the case of these ways in the different sides. Using these ways have improved in some areas of the country in the case of previous farmers in the present days but actually there is not much awareness for the way of using these methods between farmers and the agricultural researchers. So one of the most important of the saving ways in using water is the change of the irrigation way. Today using the new ways of irrigation which can help the decreasing of wasting water is very necessary.

As it was mentioned before, one of the important factor of the yield of the product is preparing the ground which not only is effective in the increasing of chemical analysis, but also has an effect on the balance of the alkaline and organic materials directly, in the way that if the amount of soil EC was between 3-4 mile mouse on the centimeters, 10-35 percent and 4-6 mile mouse on the centimeter will decrease 35-50 percent of the product. Soil as the place of putting the plant has a very important role and its salinity have caused creating basic problems. The magnetism water because of high abilities in solving the salts will solve the salty problem of the soil. Another problem of the salty soil is their water for irrigation. Salty soil has cause the salinity of the irrigation water. These waters are not appropriate in irrigation for two reasons. Firstly the hard salt are deposit in the soil and cause them to be uninfluenced, secondly the salinity of the water caused suction in the root partand caused the plant to be droughty. Actually irrigation with hard water has caused producing a white layer which contained carbonate calcium and bicarbonate calcium. Some of the carbonate calcium shape sediment on the root of the plant by the water which penetrates in the soil. These plants are suffocated slowly because of the sediment and produce extra roots for continued absorption. This process has caused decreasing in the natural growth of the plants. In the case that one of the most important effect of magnetism water on soil is removing the salinity of it, with installing the magnetismpart, we can decrease the salinity of water significantly and also using this water in draping system have caused preventing from shaping sediment in the irrigation pipe which this caused the long life of the pipes. Akhavan and Mostafazadefard [9] We should pay attention to this point that in the recent years the researchers always tried to that farmer have used the least common facilities of the country for mechanizing the agriculture and increasing the grounds. The priorities of using mechanize ways in producing the crops are specified according to the economical and social of every society. Generally the use of mechanization is for decreasing the costs but in developmental countries its application is accompanied by increasing the produce and the quality of the product. The daily improvement of using the micro line draping irrigation ways in the row and crash crops like beetroot, corn, potato, tomato, cotton and etc. have caused that broad research was done in the case of these ways in the different sides. Using these ways have improved in some areas of the country in the case of previous farmers in the present days but actually there is not much awareness for the way of using these methods between farmers and the agricultural researchers. So one of the most important of the saving ways in using water is the change of the irrigation way. Today using the new ways of irrigation which can help the decreasing of wasting water is very necessary. In Khuzestan province for irrigating the row and vegetables and crash products usually we have used normal ways, but according to the proper and best of the water recourses of the province and the high water needs of these products and their sensibility to the moisture stress it is necessary to pay attention to the new ways of irrigation.

Jamshidi (1388) has shown that the problem of the soil salinity is the destruction in the budding of the seed. This problem come from the case that often because of the vibration of the water, the concentration of the salt has increased in some centimeters of the soil level to somehow that the corn seed can not bud properly. In the study which has been done on the salty grounds of the Ahvaz province it has been specified that the more increasing the amount of the soil salinity because of decreasing the accessible water of the plant in the soil, the more nearer the amount of the proper soil moisture to the capacity of the crops and so the duration of irrigating become near together. Trajkoa and Papadantonaksi [17] were evaluated the effect of the different levels of soil salinity (2/35, 3/94, 4/4, 6/3, 6/35 decimeter) on the yield of the corn which the results show that the yield will decrease by increasing the amount of salinity level.Octom (2005) has shown that the salinity level of 3/5 des will

decrease the growth of corn plant to the 25 percent and the answer of controlling crop in the soil is guiding salt around the root with producing proper tillage and washing the soil with water and preventing from creation of hard layer.

Lagsedan and Carlen [7] for evaluating the tillage and its effect on the penetration and the special apparent weight of the soil has shown that the management of the tillage systems can play an important role in preserving the quality of the soil and production of the crops, Backingham and Dabilopaolly [15]. Zhela and Akbolat [6] with studying the tillage ways (low tillage with the remains, low tillage without remains, the common tillage with remains, common tillage without remains) have shown that there is not any special difference between the contraction in the tillage ways in the depth of 20-30 centimeters and the soil contraction in the depth of 30-50 centimeter in the treatments was 1.8-2.4, 2.3-3, 1.9-2.5, 2.25-3 megapixel and the special weight of the soil apparent in the depth of 0-10 centimeter in the way of low tillage with the remains of 1.2 gram on the cubiccentimeter was lower in comparison with the other treatments, Jamshidi et al [11] and Tarfi et al [17]. Lemporlance and Martins [7] were compared the effect of different ways of tillage (deep tillage (using Cheril), low tillage and not tillage (in deep soil and not deep) and management of the crop on the physical properties of the soil and they have shown that the special germ in the rotation and crop after rotation is less continuous. In these soils the way of not tillage has shown the most consistency of the soil. After that the ways of low tillage and tillage were considered. The consistency on penetration was also more the without tillage more than two other ways Backingham and Dabilopaolly [15].

Akhavan and his collages [9] have studied the effect of water of drip and furrow irrigation of potato product and they have shown that the least function is related to the furrow irrigation and the most function in the tillage irrigation way with using tillage pipe on the ridge and in the depth of 5 centimeter on the soil. Karimzademoghadam [18] So, the daily improvement of using the micro line draping irrigation ways in the row and crash crops like beetroot, corn, potato, tomato, cotton and etc. have caused that broad research was done in the case of these ways in the different sides. Using these ways have improved in some areas of the country in the case of previous farmers in the present days but actually there is not much awareness for the way of using these methods between farmers and the agricultural researchers. So one of the most important of the saving ways in using water is the change of the irrigation way. Today using the new ways of irrigation which can help the decreasing of wasting water is very necessary.

Therefore, according to the choosing the most suitable way of tillage and the necessity of correct management of water recourses by using different filters in the linear drip system for increasing the yield and decreasing of the economical product cost the necessity of performing such a design in the north of Khuzestan province has been felt.

Materials And Methods

In order to study the effect of tillage and irritation ways on the amount of using water and the yield of the corn an experiment was done in the form of split factorial in the pattern of accidental blocks in three repetitions in which the tillage is considered as a basic factor in two levels and the water of irritation in two levels as a secondary element and two ways of irritation in two levels as a secondary factor. For informing from the special apparent1 weight of soil in the depth of 0-15 and 15-30centimeter in the growing stages and in the time of pollination was sampled from the ridge and the bottom of the furrows. The percent of the soil moisture (in the weighting way) before every irritation was sample in the depth of 0-15 and 15-30 centimeters of the soil. The samples are transformed to the laboratory immediately in a special closed dish and after scaling will dry in the dish. Then the percent of the moisture soil will be calculated from the below formula. Formula (1) the weight of dry soil/ (the weight of dry soil-the weight of moisture soil) × 100 =the percent of the moisture One compound sample of the farmer soil was provided in the depth of 0-30, 30-60 and 60-90 was provided for determining the soil texture, airdate an the capability of conveying electricity in these cases and were analyzed in the laboratory of soil and water. For determining the organic materials of the soil from the depth of 0-15 and 15-30eas sampled before cultivating and after the harvesting. One sample of the irrigation was also provided.

Weed which was cultivated single cross 704 the distance of cultivating is 75×17 square centimeters. After planning the map design on the ground and doing the treatments of the tillage, weed cultivated by the rowing which has the most application in the area and then was done for installing the irrigation systems on the specified treatments (the main irrigation pipes, content contour, secondary branches and draping strips). The amount of needed fertilizer was done according to the soil experiment and the suggestion of the soil and water institutes. All of the crops applications was observed according to the suggestion of the research of seedling and weed part of the center including irrigation, cultivation, attacking with weeds and pests and diseases in the normal way and necessary noting in the growth season including the days number of greening after cultivating, the date of comingTagi flower, the date of coming Kakol and pests and diseases. The use of repeat fertilizer will be in the time of eight leaf steps and almost two weeks after cultivating. For calculating consistency we have used the soil

penetration in the process of greening and pollination from the cone pentameter of the soil, Sarmadnia [13].

Irrigation:

In the way of linear drip irrigation, the external pipe from the main pomp of the shaft is divided into two parts. On one of the pipe, we have installed magnetism filter and we specify the speed of the extract water according to the table of guidance filter. So we have prepared two kinds of irrigation pipes for the ground. First before the cultivation, different samples of the specified ground were provided in the depth of 0-30 centimeters and its EC will be measured and documented. For measuring the amount of input water in every part we have use the content contour. Irrigation for the common treatment according to the area will be performed with the cycle of seven days and dripping irrigation with the cycle of three days. In both of these two ways the amount of needed water will be used from weather counting. In this research the cycle of irrigation for drippingirrigation will be done for three in the week in the special days for example on Saturday, Monday and Wednesday.For estimating the water need of the plant we have used the weatherirrigation reports of the previous days, for example for Saturday we have used the reports of Wednesday, Thursday and Friday, for Monday we have used the reports of Saturday and Sunday an d for irrigating of the Wednesday we have used the reports of Monday and Tuesday. For the common way we have used the reports of seven day ago and the calculation like dripping way, For evaluating the water needs of the plant we have used the repaired Panman –Manit with the Fao and doing the plant amount (Kc) of the corn. The use of the water in treatments was calculated by the formula, Akhavan and Mostafazadefard [9].

$$ET = P + I - Rf - Dp \pm \Delta s \quad (2)$$

In this formula ET shoes the used water of the product (millimeter), P the amount of raining (millimeter), I the irrigation water (millimeter), RF the surface Ronab (millimeter), DP the deep penetration (millimeter) and s the change of the amount of water soil in the depth of the root (millimeter).

The impure amount of the needed water of every plant or tree in every day is also one of important parameters in choosing the drip Dobell which its amount is achieved from the following formula (3):

$$G=(K)(d/f)(Sp)(Sr) \quad (3)$$

In which:

G= the impure amount of needed water for every plant or every unit of the row cultivated length in the liter for day

K= the related coefficient to the kinds of the used unit which its amount on metric system equals one

f= the cycle of specified irrigation (day)

Sp= the distance of plants rows (meter)

Sr= the distance of the plants on the row (meter)

The amount of the water which is given in every time was calculated by the contour and according to the numbers of the connected rows to every contour the number of the plants on every row and the amount of the required content in every plant will be calculated.

$$V=a.m.n.G \quad (4)$$

In which:

V= the amount of required water which in every time of irrigation will be passed from every contour (liter).

n= the number of the plants on every row

m= the number of the cultivated row

G= the amount of required of every plant in every irrigation cycle (liter)

A= the number of the plot connected to the contour

So the amount of calculated water are given to the plant in every time of irrigation according to the achieved information

The output of water using was calculated from formula (5):

(5)The output of water using = yield / the amount of used water

Measurements:For specifying the moisture of the time of cultivation and the difference moisture between ridge and in the ditch from every plot with the depth of 0to 100 millimeters was sampled in the time of cultivating during five stages and was put on the autoclave and was dried for 48 hours in the temperature of 105 degree of centigrade. By using the formula 1, the amount of weight moisture was calculated

$$W_{od} \times 100 / W_w - W_{od} = \theta \quad (5)$$

In which: θ= the soil moisture (%),W_w= the weight of wet soil (kg), W_{od}= the weight of dry soil (kg) For the salt difference in the crops which were irrigated with the usual and magnetismwater we sampled from every plot in the depth of 0-100 millimeters and in the amount of 200 gram in three steps during the growth period and after sending to the water and soil laboratory we have specified the amount of salinity of the soil in the milimouse on the square centimeter.

Calculating Coefficient of Emergence Rate Indexes:

The coefficient of emergence rate indexes (cv) was calculated directly from counting plant daily to the end of greening period in every treatment. This

coefficient was calculated by using formula 2 and also the mean emergence times and the percent of emergence with the following formula

$$ERI = \frac{S_{te}}{MET}$$

1.Emergence Rate Indexes(ERI)

ERI: Emergence Rate Indexes (day/ number)

MET: Mean Emergence Times (day)

STE: The Total Number of the Emergence Seeds in Meter

2. Mean Emergence Times (MET)

$$MET = \frac{N_1T_1 + N_2T_2 + ... + N_nT_n}{N_1 + N_2 + ... + N_n}$$

ET: Mean Emergence Times (day)

N: the number of emergence seeds in the specified time

T: the number of the day after cultivation (day)

3. Percentage of Emergence (PE)

Percentage of the number of emergence seeds to the total of the cultivated seeds

PE: Percentage of Emergence

n: the number of Emergence seeds

N: the number of the total seeds which are cultivated as a name and seeds emergence. For measuring the yield of the corn after eliminating the lines and deleting one meters from the beginning and the end of every plant in the middle and after getting the weight of thousand seeds we will measure the number of the seeds in the row, the number of the rows in the maize, the height of the plant, the diameter of the stem, the height of the maize and the diameter of the maize.

Percentage and speed coefficient of greening corn:

The variance analysis shows the percentage of greening of the seeds in Table 1and the effect of the kind of tillage, the kind of irrigation and the kind of the water on the greening percentage. In tillage with the Cyclotiller device the percentage of the greening has increased meaningfully in comparison with the radiator. The less amount of greening with the mean of 60.1 percent is related to the common tillage and the high amount of greening was with the Cyclotiller machine with the mean of 83.4 percent related to the tillage.

Table 1: Analysis of variance for different characteristics at different growth stages under effects sowing

S.O.V	DF	Seeding emergence	Speed of emergence
Replication	2	31/33	0.0001
Sowing method (A)	1	193/29*	0.091**
Experimental error			
Row distance (B)	1	0.362	2
(A×B)	1	63**	6
Openers type (C)	1	0.24	160
(A×C)	1	109**	0.16
(B×C)	1	56**	35**
(A×B×C)	1	0.11	0.07**
Experimental error	2		
CV (%)		12.3	0.79

*, **: Significant at 5 and 1% probability levels, respectively ns: Not significant

Table 2: characterization of for Emergence speed under effects different sowing

Emergence speed	Emergence(%)	Planting type
Rotivator, Tape irrigation, Magnetic water	60/43^{e}	6/6^{c}
Rotivator, Tape irrigation, usual water	62/5^{d}	6/7^{c}
Rotivator, furrow irrigation, magnetic water	62/9^{d}	6/7^{c}
Rotivator, furrow irrigation, usual water	65/8^{c}	6/5^{d}
Cyclotiler, Tape irrigation, Magnetic water	67/9^{c}	7/3^{b}
Cyclotiler, Tape irrigation, usual water	66/3^{c}	7/6^{a}
Cyclotiler, furrow irrigation, magnetic water	83/4^{a}	7/8^{a}
Cyclotiler, furrow irrigation, usual water	77/93^{b}	7/4^{b}
Conventional planting	60/1^{e}	6^{e}
LSD	14/37	0.07

Table 3: Analysis of variance for different characteristics at different growth stages under effects sowing.

S.O.V	Df	Mealie in bush	Seed in mealie	Weight of thousand seeds	Biological Yield	Yield	Harvest index
Replication	2	21/792	15/770	4/286	20/117	0/247	1/824
Sowing method (A)	1	150	223/127*	78/844	94/010	0/770*	11/9
Experimental error		33/875	6/745	6/236	10/221	0/027	1/32
Row distance (B)	1	620/167**	2/160	114/844**	26/042	0/07*	75/20**
(A×B)	1	748/167**	426/72**	0/150	600	0/01	0/07
Openers type (C)	1	10584**	12/32	5/01	2/344	1/354**	16/82
(A×C)	1	912/66**	64/02	11/9*	1033/594	0/094*	8/52**

(B×C)	1	300	64/32	2/6	504/167	0/07*	4/08*
(A×B×C)	1	164/16**	51/62	31/97**	1/042	0/22**	2/34
Experimental error	2	27/13	16/01	2/26	9/440	0/011	0/63
CV (%)		12/4	7/95	4/35	2/35	2/4	2/59

*, **: Significant at 5 and 1% probability levels, respectively ns: Not significant

Results And Discussions

The cycle of the shorter irrigation and the amount of using water was lower and the given water was in the root and is accessible to the plant, the proper place for the seed and complete connection with the soil cause the quicker emergence and the proper growth of the plant.

The reduction of the tillage and saving with the remains with the dripping irrigation has an effect with the effect on the absorption of the heat, the increasing of the heat soil, the reduction of evaporation and absorption by the remained part, reduction of the wind speed and lower improvement on the growthof the plant, the reduction of the sol, the deep absorption of the root, keeping the wet soil and the reduction of then wasting water.

Also the different ways of tillage has a positive or negative effect through the effect of the physical andchemical characteristics of the soil and also the effect on the moisture of the soil on the growth of the plant. For this reason the achieved results in the case of the effect of the tillage ways is some times different on the yield of the plant. [4]

There is a linear relationship between the yield of the corn and the amount of the evaporation. Also there is a direct relation between the yield of the crops end the amount of using water.

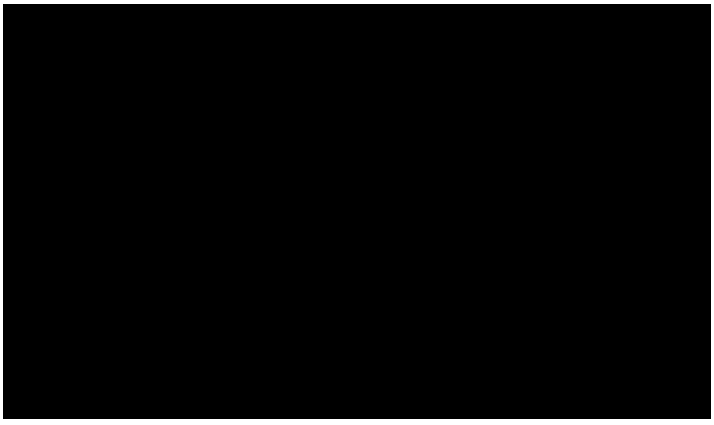

Fig. 1: effect of tillage different treatments on corn yield

Economic yield:

Figure 1 shows the mean comparison of the grain yield in different treatments. The most mean yield with 8800 kilogram in hectare is related to the treatment and using Cyclotiler and Tape irrigation with magnetic water.

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