J. Agric. Sci. Mansoura Univ., 34 (3): 2085 - 2096, 2009

EFFECT OF IRRIGATION INTERVALS AND ROW DISTANCES ON YIELD AND ITS ATTRIBUTES OF FLAX (*Linum usitatissimum* L) UNDER CONDITIONERS AND SANDY SOIL.

El- Azzouni, A. M. A, and S. Z. A. Zedan
Fiber crops Res. Section, Field crops Res. Institute, Agriculture Research Center, Giza, Egypt.

ABSTRACT

The present investigation was conducted at Ismailia Agric. Res. Station Farm, Ismailia Governorate Egypt, during : 2004 / 05 and 2005 / 06 seasons, to study the influence of sprinkler irrigation intervals (1, 2, 3 days), row distances (15 and 20 cm) and Agar Agar as soil conditioner on the yield and yield components as well as their interaction on yield of new flax variety Giza 10 and its attributes. A split - split plot design with three replication was used. The results could be summarized as follows:

1- Irrigation intervals (I) had significant effect on plant height cm, technical stem length, straw yield / plant, number of capsules / plant, seed yield /plant, seed yield fad, fiber yield / plant, fiber yield / fad, and straw yield fad ton in both seasons whereas technical stem length did not reach the level of significance in the first season. The highest values of this characters were obtained by three days as sprinkler irrigation intervals.
2 – Row distances (D) 20 cm. produced the highest values of straw yield / plant, number of capsules / plant and seed yield / plant, while the highest plant height, technical stem length, seed yield / fad. , fiber yield / plant and per faddan and straw yield / fad were produced by row spacing 15 cm. in both seasons.
3 – Agar Agar as soil conditioner (C) significantly affected all characters under study in both seasons compared with control.
4 – All interaction between the studied factors were not significant except IxC for plant height, technical stem length, number of capsules / plant, seed yield / plant, seed yield / fad, fiber yield / plant and fiber yield / fad. as well as DxC for plant height, fiber yield / fad and straw yield / fad Also IxD for number of capsules / plant, seed yield/plant, seed yield /fad and fiber yield /plant finally IxDxC for number of capsules /plant, fiber yield/ plant and per faddan.

It can be concluded that under sandy soil condition its recommended to cultivate flax crop and irrigated every three days for two hour time instead two and one days with 15 cm as row spacing under soil conditioner (Agar Agar) to availability water and increased nutrient in root zoon to obtained highest yield of straw and seed and its attributes

INTRODUCTION

Cultivate flax crop in reclamation sandy soil is feasible solution for the competition between flax and other winter crop (wheat and forage) which sowing in valley soil. Hence improve agriculture practice such as irrigation, distances between rows and enhancement soil structural by using soil conditioners to increased water holding capacity in sandy soil stile target for many investigators. Optimum irrigation regimes is a very important process. It

studied by many researchers such as Pontoppidan ((1958), El – Farouk *et al*. (1982), El – *kady (1985), El –Shimy et al. (1988), Miadenova (1998), El – sabbagh et* al. (1998), singh et al (2000), Moawed (2001), Al - Thabet (2003), Atta et al (2007) and Abo – kaied *et al*. (2007), they indicated that straw, seed yield of flax and most of its related character were increased by increasing number of irrigation or available soil moisture in root zone of plants.

The row spacing for flax plants also studied by many investigators. They reported that narrow row distances increased straw, fiber and seed yield / fad, Momtaz and Shalaby(1981), El-Farouk *et al*. (1982) Abd Alla et al (1989) , Moawed (2001) AL kaddoussi and Moawed(2001), Zedan (2004) and Hussein et al (2007).

Agar Agar as soil conditioner which studied by many researchers like Wallace *et al*. (1986), Khadr *et al.* (1988), EL-Aggory Eglal *et al.* (2002) and Abo–Khaied *et al*. (2007) which found that a small amount of polyacrylamide (Agar Agar) or mycorrhizal inoculation would accomplish the same amount of aggregation that a large amount of organic mater can do. Applied at the concentration of 0. 01 kg m3 (0. 1 %) in irrigation water during the entire season had an amendatory effect on infiltration.

Also increase water holding capacity, enhance nutrient efficiency and encourage soil micro flora in sandy soil (Azzam *et al*. 1987).

Therefore, the present investigation was carried out to study the effect of irrigation intervals, row spacing and Agar Agar as soil conditioners and their interaction on the yield and yield components of both straw and seed of flax productivity using the local Egyption variety Giza 10 during winter season of 2004 / 2005 and 2005 / 2006 at Ismailia Agric. Res. Station, Agricultural Research Center (A. R. C) Egypt.

MATERIALS AND METHODS

The present research work was conducted in sandy soil at Ismailia Agric. Res. Station, Ismailia Governorate, during 2004 /2005 and 2005 / 2006 winter seasons to investigate the effect of irrigation intervals, row spacing and using Agar Agar as soil conditioner and their interaction on yield of flax crop and its attributes.

Chemical and physical analysis of experimental soil is given in Table (1). New flax variety Giza l0 was used. Irrigation intervals were 1, 2, 3 days and the time of Irrigation period is two hour / interval under sprinkler irrigation system. Two row spacing through seeds/m were investigated including (20 cm) between rows (1500seeds/m^2) and(15cm) between rows (2000 seeds/m^2). In this study Agar solution of 0. 1 % were sprayed under the growing plants after one month from sowing while the soil was still wet by the rate 1000 L / fad. foliar / fertilizer were used to all plots. One g. from Agar with 2. 5 g /L from foliar x, A control treatment was included and sprayed with water only. Foliar x was locally produced by El Naser co. for pesticides and chemicals, Cairo. It contains 10 % N, 7%P, 8 % k, 2500 ppm of each of chelated Fe ,Zn and 3000 ppm of chelated Mo in addition to tracs of Mg, S, B and Cu.

Table 1: Physical and chemical analysis of the soil before the sowing

1- Mechanical analysis	
Coarse sand (%)	68.52
Fine sand (%)	35.71
Silt (%)	3.5
Clay (%)	2.41
Textural class	Sandy
2- Chemical analysis:	
PH	7.63
E.C (mm hos Cm^{-1} (1:5)	0.099
Organic Matter (%)	0.061
Available N (ppm)	7.13
Available P (ppm)	1.30
Available K (ppm)	49.80

Experimental design.

A split – split plot design with three replication was used. Irriagation intervals were randomly distributed in main plots, while row spacing was randomly occupied the sub plots, sub – sub plots allocated by soil conditioner (Agar – Agar), plot area was 6 m^2 (2x3 m). Seed were broadcaste on November 15^{th} and 20^{th} in 2004 / 2005 and 2005 / 2006 winter seasons, respectively. The preceding crop, was peanut in the two seasons Agricultural practices were applied as recommended for the region.

Collected data

A: Single plant observations :

At harvest time, ten quarried plants were taken at random from each sub – sub plot to measure the following characters:

1- Plant height (cm), was measured from soil surface to the highest point of plant.

2-Technical stem length (cm) was determined from soil surface to the first branches.

3 – Straw yield g./plant average yield of ten plants.

4 – Seed yield g./ plant average yield of ten plants.

5 – Number of capsules / plant.

6– Fiber yield gm/plant was estimated as an average of fibers extracted from 10 plants.

B: Unite area observations:

7 –Straw yield ton/ fad was calculated from the whole plot area basis.

8 – Fiber yield Kg/ fad was calculated from the whole plot area basis.

9 – Seed yield Kg / fad was calculated from the whole plot area basis.

Statistical analysis:

The collected data were statistically analyses according to Sendecor and Cochran (1981). Differences among means were tested by using least significant difference test (L. S. D) at 5 % level of significant.

RESULTS AND DISCUSSION

Mean values of plant height, technical length and straw yield / plant for flax as affected by irrigation intervals, row spacing and Agar Agar as conditioner soil in the two successive seasons are presented in Table 2.

Analysis of variance showed significant differences in all studied characters for the three engine except with the average of technical stem length as affected by irrigation intervals in the first season, which did not reach the level of significance.

Table 2: Mean values of plant height cm , technical stem length cm and straw yield plant gm. as affected by irrigation intervals , row distances and soil conditioner in 2004 / 2005 and 2005 / 2006 seasons .

Main effects And interaction	Plant height cm		Technical stem length cm		Straw yield gm/plant	
	2004/2005	2005/2006	2004/2005	2005/2006	2004/2005	2005/2006
I – Irrigation regimes (I)						
One day	61.21	58.22	49.89	41.61	1.14	1.05
Two days	64.4	60.11	50.42	43.82	1.38	1.22
Three days	65.07	62.52	51.83	47.75	2.32	2.14
F. Test	*	*	N.S	*	*	*
L.S.D	1.01	1.23	N.S	0.717	0.211	0.304
II – Row distances (D)						
15 cm between rows	66.71	63.19	54.07	48.58	2.31	1.37
20 cm between rows	60.41	57.09	47.36	40.21	2.53	1.57
III – Soil conditioner (C)						
Control	59.91	58.00	51.21	47.21	2.37	1.40
Agar Agar	67.21	62.58	50.22	41.58	2.47	1.54
IV – Interaction						
IXD	N.S	N.S	N.S	N.S	N.S	N.S
IXC	*	*	*	*	N.S	N.S-
DXC	*	*	N.S	N.S	N.S	N.S
IXDXC	N.S	N.S	N.S	N.S	N.S	N.S

1 - plant height (cm) :

Regarding plant height character, data revealed that three days as irrigation intervals ranked first with the mean values of 65. 07 and 62. 52 cm, followed by two days which recorded (64. 4 and 60. 11 cm) and the shortest plant height obtained by one day which recorded (61. 21 and 58. 22 cm) in the first and second seasons, respectively. In this respect the shortest in plant height by increasing ones of irrigation intervals (one day) may be due to nutrient irrigate far from plants by ininfiltration which ability of sand soil to retention by nutrient is few Azzam *et a*l (1987).

Opposite ranked were obtained under clay soil condition thus organic matter improvement soil structure, soil fertility and increases water- holding capacity by EL-Farouk *et al* (1982), EL-Shimy *et al.* (1988), Maowed (2001), Abo- Kaied et al (2007) and Atta et al (2007),.

Results illustrated that the narrow distance between rows (15cm) produced taller plants with the mean values of 66. 71 and 63. 19 than obtained by the wide space(20cm) with mean values of 60. 41 and 57. 09cm in both seasons, respectively. These results are in agreement with those obtained by Momtaz and Shalaby (1981), EL-Sweify *et al*. (1996), and Hussein et al (2007).

Agar Agar as soil conditioner affected significantly plant height. The tallest plant was obtained when adding Agar Agar 67. 21 and 62. 58 cm in both seasons, respectively. Meanwhile, the shortest plant height was obtained under control (without Agar) 59. 91and 58. 00 cm in both seasons, respectively. This findings are in line with those of Wallace *et al.* (1986), Khadr *et al*. (1988), EL- Aggory Eglal *et al*. (2002), and Abo- Kaied *et al.* (2007)

The interaction between irrigation intervals and soil conditioners (IxC) had significant effect on plant height in both seasons, but the interaction between irrigation intervals and row distances (IxD), row distances and soil conditioner (DxC) and (IxDXC) did not reach the level of significance in both seasons.

2 - Technical stem length (cm) :

Concerning technical stem length character, data obtained indicated similar trend with plant height behavior, by means that three days as irrigation intervals recorded highest technical stem length 51. 83 and 47. 75 cm, followed by two days which recorded 50. 42 and 43. 82 cm, while the shortest obtained by one day which mean values 49. 89 and 41. 61 cm in both seasons, respectively. opposite finding were obtained by many researchers under clay soil condition like El-kady (1985), Mladenova (1998), El– Sabbagh et al (1998), meanwhile Abo– Kaied et al (2007) confirm this finding.

The narrow rows distance (15 cm) encourage technical stem length with average 54. 07 and 48. 58 cm when compared with the wide one (20 cm) which recorded 47. 36 and 40. 21 cm in both seasons, respectively. These results similar with those obtained by El- Farouk *et al.* (1982), Abd Alla et al (1989) and Moawed (2001).

Concerning technical stem length character, data obtained similar trend with plant height by using Agar Agar as soil conditioner.

The interaction between (IxC) had significant effect on technical stem length in both seasons. Meanwhile the interaction (IxD), (DxC) and (IxDxC did not reach the level of significance in both seasons.

3 - Straw yield / plant :

Regarding straw yield/plant, data revealed that three days as irrigation intervals reached maximum estimates with the mean values of 2. 32 and 2. 14 g. followed by two days (1. 38 and 1. 22 g.) and the lowest straw yield / plant obtained by one day which recorded 1. 14 and 1. 05 gm in the first and second seasons, respectively. In this respect the increment of straw yield / plant due to three irrigation intervals may be due to increase nutrient in root zone because the infiltration is few. This finding are agreement with those obtained by Azzam *et al*. (1987), El– shimy *et al.* (1988) and El –

Aggory Eglal *et al.* (2002). Results showed that the narrow distance between rows (15 cm) gave the lowest straw yield / plant with the mean values of 2. 31 and 1. 37 gm, while the highest estimates values of 2. 53 and 1. 57 gm. in the first and second seasons, respectively. These results are in agreement with those obtained by Al Kaddoussi *et al.* (2001) and Zedan (2004).

Analysis of variance showed increased in this trait by using Agar Agar as soil conditioner, which highest straw yield plant 2.47and 1.54 gm, while the control gave lowest 2.37and1.40gm in the first and second seasons, respectively.

The interaction between (IxD), (IxC), (DxC) and (IxD xC) had insignificant effect on straw yield /plant g in both seasons. Demonstrating that each studied factor act independently straw yield / plant.

Mean Values of number of capsules / plant, seed yield / plant and per fad. for flax plants as affected by irrigation intervals, row spacing and Agar Agar as soil conditioner in two successive seasons are presented in Table 3.

Analysis of variance showed significant differences in all studied factors for number of capsules / plant, seed yield / plant. and seed yield / fad. in the two successive seasons.

4 - Number of capsules /plant :

Irrigation intervals three days recorded the highest number of capsules / plant (4. 73 and 4. 13) followed by two days (3. 89 and 3. 41) while, the lowest obtained by one day (3. 28 and 3. 11) in both seasons, respectively.

Meanwhile the narrow distances between rows (15 cm) gave the lowest number of capsules with the values of (3. 76 and 3. 38) but the highest estimates obtained by wide space (20 cm) with the mean values of (4. 17 and 3. 72). in the first and second seasons, respectively. These results were in agreed those obtained by Moawed (2001) and Hussein et al (2007).

Soil conditioner (Agar Agar) affected significantly number of capsules / plant by height mean values of (4. 01 and 3. 62) while, control treat gave the lowest (3. 92 and 3. 48) in the first and second seasons, respectively. these results agreed with those found by Wallace et al (1986) and El - Aggory Eglal et al (2002).

The interaction between (IxD), (IxC) and (IxDxC) had significant effect number of capsules plant in the first and second seasons, respectively. Meanwhile, the interaction between (DxC) did not reach the level of significance in the first and second seasons. It mean that each studied factor acted separately.

5 - seed yield gm /plant :

Analysis of variance of seed yield / plant under various irrigation intervals showed significant effect Table 3.

Applying irrigation intervals three days for flax plant gave the heaviest seed yield / plant (0. 403 and 0. 393 g) followed by two days (0. 391 and 0. 371) while, the lowest obtained by one day (0. 383 and 0. 352g) in both seasons, respectively. Opposite with results were obtained by Pontoppidan

(1958), Singh et al (2000) and Atta et al (2007) under clay soil condition.

Results illustrated that the narrow distance between rows (15 cm) gave the lowest seed yield / plant (0. 386 and 0. 329 g). Meanwhile, the highest seed yield / plant obtained by the wide space (20 cm) with the mean values of 0. 398 and 0. 415 g in both seasons, respectively. These results similar with those obtained by Abd Allah et al (1989) and El- Sweify *et al* (2007).

Table 3: Mean values of number of capsules / plant , seed yield / plant gm and seed yield / fad kg. as affected by irrigation intervals , row distances and soil conditioner in 2004 / 2005 and 2005 / 2006 seasons

Main effects and interaction	Number of capsules / plants		Seed yield gm/ plant		Seed yield kg/ fad	
	2004 / 2005	2005 / 2006	2004 / 2005	2005/2006	2004 / 2005	2005/2006
I – Irrigation regimes						
One day	3.28	3.11	0.383	0.352	297.17	282.13
Two day	3.89	3.41	0.391	0.371	301.59	291.41
Three day	4.73	4.13	0.403	0.393	367.08	342.11
F .Test	*	*	*	*	*	*
L.S.D	0.311	0.792	0.010	0.021	8.96	12.17
II – Row distances						
15 cm between rows	3.76	3.38	0.386	0.329	341.94	335.21
20 cm between rows	4.17	3.72	0.398	0.415	301.93	275.22
III – Soil conditioner						
Control	3.92	3.48	0.412	0.436	293.28	305.32
Agar Agar	4.01	3.62	0.372	0.308	350.61	305.11
IV – Interaction						
IXD	*	*	*	*	*	*
IXC	*	*	*	*	*	*
DXC	N.S	N.S	N.S	N.S	N.S	N.S
IXDXC	*	*	N.S	N.S	N.S	N.S

Agar Agar as soil conditioners affected significantly seed yield / plant. The heaviest seed yield / plant was obtained when adding Agar Agar 0. 412 and 0. 436 gm in both seasons, respectively. Meanwhile, the lowest seed yield / plant was obtained under control treatment 0. 372 and 0. 308 g in both seasons, respectively. This findings are in line with those of Khadr et al (1988) and El-Aggory Eglal *et al*. (2002).

The interaction between (IxD) and (IxC) had significant effect on seed yield / plant in both seasons. On the other hand, the interaction between (DxC) and (IxDxC) did not reach the level of significance in both seasons.

6- Seed yield kg/ fad :

Seed yield / fad is the 2 second outcome of flax plant which cultivated in Egypt as double purpose. The obtained results herein showed significant variation in seed yield / fad for three factor under study i. e. irrigation intervals, row distances and soil conditioner. Table 3.

Irrigation intervals at three days gave the heaviest seed yield / fad

367. 08 and 342. 11 kg. followed by two days (301. 59 and 291. 42 kg) while, the lowest obtained by one day as irrigation intervals (297. 17 and 282. 14) in both seasons, respectively. Opposite rank with results were obtained under clay soil condition by El-Sabbagh (1998), Moawed (2001),), meanwhile Abo-kaied et al (2007) confirm this finding.

Results reveled that the narrow distance between rows (15 cm) gave the highest seed yield / fad kg (341. 94 and 335. 21 kg). Meanwhile, the lowest seed yield /fad. obtained by the wide space (20 cm) with the mean values of 301. 93 and 275. 22 (kg). in both seasons, respectively. This results similar with those obtained by Momtaz and Shalaby(1981), Moawed (2001) and Hussein et al (2007).

Adding Agar Agar as soil conditioners gave the highest seed yield / fad 350. 61 and 305. 11 kg. Meanwhile, the lowest seed yield / fad was obtained without soil conditioner 293. 28 and 305. 32 kg in both seasons, respectively. Similar results were obtained by Wallace et al. (1986), Khader *et al* (1988), El- Aggory Eglal et al (2002) and Abo – kaied *et al* (2007)

The interaction between (IxD) and (IxC) had significant effect on seed yield / fad in both seasons. Meanwhile, the interaction between (DxC) and (IxDxC) did not reach the level of significance in both seasons. It could be recommended to irrigate flax every three days, row spacing (15 cm) and using Agar Agar as soil conditioner to obtained the highest seed yield / fad.

Mean values of fiber yield / plant (g) and per fad (kg) and straw yield / fad for flax plants as affected by irrigation intervals, row spacing and soil conditioner (Agar Agar) in the two successive seasons are present in Table (4).

Analysis of variance showed significant differences in all studied factors for fiber yield/plant, fiber yield / fad and straw yield / fad in the two successive seasons.

7. Fiber yield g/ plant :

Irrigation intervals (three days) gives the highest fiber yield / plant (0. 143 and 0. 131 gm) followed by two days (0. 139 and 0. 120 g) while, the lowest obtained by one day as irrigation intervals (0. 130 and .119 g) in both seasons, respectively. Similar finding were obtained by Abo-kaied *et al*. (2007) and opposite under clay soil by El- shimy *et al*. (1988) and Atta *et al*. (2007).

The narrow rows distances (15 cm) gained the highest fiber yield / plant (0. 216 and 0. 139 gm) comparing with the wide rows distance (20 cm) (0. 196 and 0. 108 gm) in both seasons, respectively.

In respect with fiber yield / plant the results revealed that adding Agar Agar as soil conditioner gave the highest fiber yield / plant (0. 209 and 0. 128 gm) Meanwhile, the lowest obtained by control trait (0. 203 and 0. 119 gm) in both seasons, respectively. The interaction between (IxD), (IxC) and (IxDxC) had significant effect on fiber yield / plant in both seasons. Meanwhile, the interaction between (DxC) did not reach the level of significance in both seasons.

8- Fiber yield Kg/ fad :

Data of fiber yield / fad as affected by irrigation intervals, rows distances and soil conditioner are shown in Table 4. Irrigation intervals effect significantly in this character. Three day gives the highest fiber yield / fad (492. 05 and 416. 17 kg) and followed by two days (441. 46 and 391. 42 kg) while, the lowest obtained by one day as irrigation intervals in both seasons, respectively. It is a great interest to note that these is a appositive correlation between fiber yield / plant and fiber yield / fad. This is expected since yield is a resultants of productivity (fiber yield / plant). It mean that higher fiber yield / plant under specific irrigation intervals, rows spacing and soil conditioner gave also, higher fiber yield/ fad. These results are agree with those obtained by EL- Farouk *et al*.(1982) Moawed (2001).

Table 4: Mean values of fiber yield g/ plant, fiber yield kg/ fad and straw yield ton/ fad as affected by irrigation intervals , row distances and soil conditioner in 2004 / 2005 and 2005 / 2006 seasons .

Main effects and interaction	Fiber yield gm/ plant		Fiber yield kg/fad		Straw yield ton/ fad	
	2004/2005	2005/2006	2004/2005	2005/2006	2004/2005	2005/2006
I – Irrigation regimes						
One day	0.130	0.119	401.12	355.16	2.673	2.313
Two day	0.139	0.120	441.65	391.42	2.959	2.521
Three day	0.143	0.131	492.05	416.17	3.280	2.898
F. Test	*	*	*	*	*	*
L.S.D	0.007	0.009	3.83	4.972	0.230	0.107
II – Row distances						
15 cm between rows	0.216	0.139	459.11	417.58	3.170	2.941
20 cm between rows	0.196	0.108	430.58	357.59	2.770	2.214
III – Soil conditioner						
Control	0.203	0.119	422.57	347.56	2.880	2.303
Agar Agar	0.209	0.128	467.18	427.61	3.060	2.852
IV – Interaction						
IXD	*	*	N.S	N.S	N.S	N.S
IXC	*	*	*	*	N.S	N.S
DXC	N.S	N.S	*	*	*	*
IXDXC	*	*	*	*	N.S	N.S

Similar finding were obtained by rows distances trait thus narrow distances (15 cm) gives higher fiber yield / fad by means (459. 11 and 417. 58 kg). While, the lowest fiber yield / fad obtained by the wide spacing (20 cm) (430. 58 and 357. 59 kg) in both seasons, respectively

Agar Agar as soil conditioner gave the highest fiber yield / fad (467. 18 and 427. 61). Meanwhile, the lowest obtained by control treatment (422. 57 and 347. 56) in both seasons, respectively.

The interaction between (IxC), (DxC) and (IxDxC) had significant effect on fiber yield / fad in both seasons. Meanwhile, the interaction between (IxD) did not reach the level of significance in both seasons. It could be recommended to irrigate flax every three days, row spacing 15 cm and using Agar Agar as soil conditioners to obtained the highest fiber yield /fad.

9- Straw yield ton/ fad :

Regarding straw yield ton/fad, data revealed that three days as irrigation intervals reached maximum estimates with the mean values of 3. 280 and 2. 898 ton followed by two days(2. 959 and 2. 521 ton) and the lowest straw yield / fad obtained by one day which recorded (2. 673 and 2. 313 ton) in the first and second seasons, respectively. The superiority of the third irrigation intervals may be due to suitable condition for increasing cell size and division like nutrients around plants in root zone which did not lost by arrigate water every day. These results are in agreement with those obtained by Azzam *et al*. (1987), EL-Aggory Eglal *et al.* (2002) and Abo-Kaied *et al.* (2007).

Narrow distance between rows (15 cm) gave the highest straw yield ton/ fad with the mean values of (3. 170 and 2. 941ton), while the lowest estimates obtained by the wide space (20 cm) with the mean values of(2. 770 and 2. 214 ton) in both seasons, respectively. This results are in agreement with those obtained by Momtaz *et al.* (1981), El-Farouk *et al*. (1982) and Hussein et al (2007).

Soil conditioner Agar Agar gave the highest straw yield ton/ fad (3. 060 and 2. 852 ton). Meanwhile, the lowest obtained by control trait (2. 880 and 2. 303 ton) in the first and second season, respectively. similar results were obtained by Abo-Kaied *et al.* (2007).

The interaction between (DxC) had significant effect on straw yield / fad ton in both seasons. Meanwhile, the interaction between (IxD), (IxC) and (IxDxC) did not reach the level of significance in both seasons.

REFERENCES

Abd Alla, A. F, M. EL-Farouk, T. Nasr El-Din and S. Z. Zedan (1989). Variation in plant characteristics of tow flax varieties grown under different densities and nitrogen levels. Egypt. J. Appl. sci, 4(3) : 868-878.

Abo-Kaied, H. M. H. Afaf E. A. , Zahana and T. A. Abo-Zaied (2007) Effect of mycorhizal inoculation on yield and drought tolerance of some flax varieties - J. Agric. Sci. Mansoura Univ. 32 (4) : 2421-2431.

AL-Kaddoussi, A. R. and E. A. Moawed(2001). Yield analysis of seed and straw yield components under three row spacing for some genotypes of flax (Linum usitatissimum L.) Egypt. J. Apple. Sci, 16(12):426-441.

AL-Thabet, I. S. S. 2003. Effect of irrigation interval on growth and yield of three flax varieties. Egypt. J. Apple. Sci. , 18 (3B):538-548.

Atta, Y. I. M. , M. M. M. Hussein and A. A. Nasser(2007) Some factors affecting linseed (Linum usitatissimum L.) yield, quality and water use efficiency. Zagazig. J. Agric. Res. , 34 (4): 617-642.

Azzam, R, R. Ayoub, M. Khallafallah, and H, Moawed. (1987). Field application of polymeric gel, RAPG in desert plantation – Third international conf. On Radiation. Processing for plastic and rubber,

Lodbroke Hotel, Warwick, UK Nov. 2-4 UK.

EL-Aggory Aglal M. , SH. M. Abd- EL- Rasoul and R. I. Kanany(2002). The biopolymer, AGAR AGAR, as a soil conditioner. Egypt. J. Agric. Res. , 80 (1): 13-27.

El-Farouk, M. , E. A. Mahmoud, A. L. Sahsah and H. M. Eid(1982). Water stress and plant density in relation to yield and some technological properties of flax fiber, Res. Bull. 470 Fac. of Agric Zagazig univ.

EL-Kady, E. A. F. 1985. Effect of water and fertilizer requirements on quantitive and qualitative characters of flax, Ph. D. Thesis Fac, of Agric, Kafer El-Sheikh, Tanta Univ.

El-Sabbagh, A. A. , S. A. Abd El-Hafez and El-Sh. I. Abo-Ahmed 1998. Response of some flax cultivars to water stress. Menofiya J. Agric Res. , Vol. 23(5) : 1367-1376.

El-Shimy, G. H. , M. El-Farouk, N. G. Ainer and A. I. Sahsah (1988). Effect of irrigation regimes and nitrogen fertilization on yield, yield components and anatomical characters of flax. Agric. Res. Rev. Cairo, 65(15):1-22.

El-Sweify, A. H. H, and S. H. A. Abd Le-Dayem and Amaney, M. M. El-Refaie 2007. Effect of plant density and potassium fertilizer on yield and its quality of some flax genotypes under sandy soil conditions. J. Agric. Sci. Mansoura univ. , 32(1):99-115

Hussein, M. M. M;M. A. Abdel –Dayem and Amaney, M. M. EL –Refie 2007. Effect of plant density and potassium fertilizer on yield and its quality of some flax genotypes under sandy soil conditions. J. Agri. Sinc. Mansoura Univ. , 32(1):99-115.

Khadr, M. S. ;A. H. Abd El-Hady ; Y. H. Mohamed and M. O. El-Moatasem. 1988. Effect of some soil amendments on the productivity of a sandy and calcareous alkaline soil. Inter. symp. soil conditioners. National Res. Center, Cairo, Egypt pp 197-204.

Mladenova, B. 1998. Necessity of irrigation and its influence on flax seed yield under the conditions of the high fields in western. Bulgaria – Rasteniev '' dni – Nauki, 35(1) : 26-29

Moawed, E. A 2001. Effect of microelements and row distances on the yield of some flax (Linum usitatissimumn L.) varieties. Egypt, J. Appl, Sci, 16(6) : 157-172

Momtaz, A ; and T. A. shalaby 1981. studies of plant density and nitrogen fertilizer levels effect on yield and quality of flax. J. Agric. Res. Tanta Univ. 7(1):211-222.

Pontoppidan, H. 1958. Traits with watering of fiber flax-lin 12 (3): 21-32 (c. f. Field Crop Abst. , 11 1686).

Singh – Sp; R. S Dixit and G. R Singh 2000. Response of linseed to various moisture regimes and nitrogen levels on moisture depletion pattern, consumptive use and water use efficiency. Environment and Ecology, 18(I):37 – 38.

Snedecor, G. W and W. G Cochran 1980. Statistical Method. 7th Ed, Iowa State Univ. , press Ames. , Iowa, U. S. A. : 325 – 330.

Wallace, A.; G. A. Wallace and A. M. Abu -Zamzam. 1986. Effects of soil conditioners on water relationships in soils. Soil Sci. , 141: 346-351.

Zedan, S. A. 2004 Response of some flax varieties to planting methods and plant densities. Egypt. J. Appl. Sci. , 19(9A) : 108 – 121.

تأثير فترات الري ومسافات الزراعة على محصول الكتان ومكوناته تحت ظروف محسنات التربة والأرض الرملية

علي محمد علي العزوني و سعيد زكي عبد الحميد زيدان.
قسم بحوث الألياف- معهد بحوث المحاصيل الحقلية -مركز البحوث الزراعية-جيزة-مصر

أقيمت تجربتان حقليتان في محطة البحوث الزراعية بالإسماعيلية - محافظة الإسماعيلية - مصر خلال الموسمين ٢٠٠٤/٢٠٠٥و ٢٠٠٥/٢٠٠٦ وذلك لدراسة تأثير فترات الري بالرش وهي ١, ٢و٣ ايام لمدة ساعتين يوميا ومسافات الزراعة ١٥و ٢٠ سم بين السطور مع رش التربة الرملية بمركب الاجار اجار كمحسن للتربة بعد شهر من الزراعة علي صنف الكتان جيزة ١٠ وقد استخدم تصميم القطع المنشقة مرتين في ثلاث مكررات

وتتلخص أهم النتائج المتحصل عليها في الأتي :

١- أثرت معاملات الري معنويا في كل الصفات تحت الدراسة طول النبات ، الطول الكلي ، محصول القش للنبات ، عدد كبسولات النبات ، محصول البذرة للنبات ، محصول البذرة للفدان محصول الألياف للنبات ، محصول الألياف للفدان ومحصول القش للفدان في كلا الموسمين بينما هذا التأثير لم يصل إلى درجة المعنوية في صفة الطول الفعال بالموسم الأول وكانت اعلي القيم لهذه الصفات تم الحصول عليها بري الكتان كل ثلاثة أيام.

٢- أعطت مسافة الزراعة عشرين سم بين السطور اعلي القيم لصفات محصول القش للنبا ت ، عدد الكبسولات للنبات ومحصول البذرة للنبات في كلا الموسمين بينما كانت اعلي القيم لصفات طول النبات ، الطول الفعال ، محصول البذرة للفدان ، محصول الألياف للفدان ومحصول القش للفدان بزراعة الكتان علي مسافة 15سم بين السطور بكلا الموسمين

٣- أدى استخدام مركب الاجار اجار كمحسن للتربة الحصول علي اعلي القيم بين جميع الصفات تحت الدراسة مقارنة بعدم الإضافة في كلا الموسمين.

٤- لم يظهر التفاعل ما بين الري ومسافات الزراعة وإضافة مركب الاجار اي معنوية لكل من صفات طول النبات ، الطول الكلي، محصول القش للنبات ، محصول البذرة للنبات ، محصول البذرة للفدان ومحصول القش /فدان في كلا الموسمين مما يؤكد ان كل عامل من العوامل تحت الدراسة يعمل منفردا

** وبصفة عامة يمكن تقليل استخدام المياه في ري الكتان المنزرع بالأراضي الرملية والرى بالرش لتقليل الآثار الضارة من فقد العناصر الغذائية حول منطقة الجذور للنبات بالرشح وزيادة تكاليف محصول الكتان وفقد للمياه وذلك بالري كل ثلاثة أيام لمدة ساعتين وكذلك الزراعة على مسافة ١٥ سم بين السطور وإضافة مركب الاجار اجار كمحسن للتربة للحصول على أعلى محصول ألياف للفدان وذلك بمنطقة الإسماعيلية أو ما يماثلها من ظروف بيئية.