J. of Plant Production, Vol. 1 (2): 213 -227, 2010

IMPACT OF WATER STRESS ON YIELD AND ITS COMPONENTS OF SOME FLAX GENOTYPES (*Linum usitatissimum, L.*)

Leilah, A. A.[*]; M. H. Ghonema[*]; M. E. Kineber[**] and I. H. Talha[**]
*** Agronomy department Faculty of Agriculture Mansoura University**
**** Field Crop Research Institute, ARC**

ABSTRACT

Two field experiments were carried out at the Experimental Farm Governorate of Sakha Agricultural Research Station, Kafr-elSheikh, Egypt during the two successive seasons 2006/2007 and 2007/2008. The main objectives of this investigation were to study the effect of irrigation regime in four different growth stages (skip-irrigation at stem elongation 41 days after sowing (DAS), apical branching (64 DAS), flowering (83 DAS) and seed filling (114 DAS)). on growth, yield and yield components of six flax genotypes (Ilona , Sakha 3, Sakha1, Sakha2, strain16 and Giza 8). The obtained results could be summarized as follows.

Skip-irrigation at seed filling gave the highest values of technical stem length in the first season , stem diameter and straw yield/fad. in both seasons. Also, flax genotypes under study differed significantly in their straw yield and its related characters in both seasons, except straw yield in the first season and stem diameter in the second season. Giza 8 gave the highest value in stem diameter and yield of straw yield / plant in both seasons, while Sakha 2 gave the highest straw yield /Fad. in both seasons.

The interaction between irrigation treatment and flax genotypes had a highly significant in technical stem length and straw yield per plant in the first season.

Skip-irrigation during the seed filling gave the highest values in length of top capsule zone, number of capsules/plant, number of seeds/ plant and seed yield/Fad. in both seasons. Skip-irrigation at flowering stage gave the highest oil seed percentage in both seasons.

Also, flax genotypes under study differed significantly in their seed yield and its related characters in both seasons. In this respect Strain16 recorded the highest length of top capsule zone, number of capsules per plant, seed yield per plant in first season while Giza 8 recorded highest value in second season. Strain 16 recorded the highest value in seed oil content in both seasons.

The interaction between irrigation treatment and flax genotypes was significantly for length of top capsule zone, number of capsules /plant, number of seeds/plant and seed oil content in both seasons.

On light of the obtained results, skip one irrigation during the seed filling stage gave better results under lower amounts of water during the growth of flax.

INTRODUCTION

Water stress in plant is one of major factors limiting crop production. The effect of water stress on growth and yield of flax plants depend on the duration and timing of water stress. Larsen (1962), indicated that lack of moisture during stem elongation reduced straw yield, while after flowering stage it reduced seed yield. Talha and Osman (1978) noticed that the effect of water stress on oil content of oilseed flax was greatest at the later stages of plant growth (flowering and ripening) than at early stages. El-Farouk *et al.*

(1982) reported that the highest yields of seeds and straw yields per Fad. resulted from five irrigation. They also added that water stress during vegetative stage restricted growth and decreased seed and straw yield. Yenpreddiwar, *et al.* (2007a), Reported that 2 (irrigation at flowering and capsule filling stages) recorded the highest yield, but 1 (irrigation at flowering stage) recorded the highest water use efficiency. Yenpreddiwar *et al.* (2007b), reported that two irrigations applied at flowering and capsule filling stages significantly increased the yield attributes and yield of linseed.

The aim of this study were to investigate the effect of irrigation regimes in different growth stages and six flax genotypes and their impact on growth, yield and yield components.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm Governorate of Sakha Agricultural Research Station, Kafr-elSheikh, Egypt during the two successive seasons 2006/2007 and 2007/2008. Each experiment included twenty four treatments, which were the combinations of four irrigation treatment, i.e., (skip-irrigation at : stem elongation (41 days after sowing (DAS)), apical branching (64 DAS), flowering (83 DAS) and seed filling (114 DAS)). As main plots and six flax genotypes, i.e., (Ilona, Sakha 3, Sakha 1, Sakha 2, strain 16 and Giza 8).

Table (1): The following Table shows the pedigree of different flax genotypes.

Flax genotypes	Pedigree
Ilona	A fiber type Imported from Holland.
Sakha 3	A fiber type , selected from the cross(Belinka 2E X I.2096).
Giza 8	A double type, selected from the cross (Giza 6X Santa Catalina).
Strain 16	An oil type , selected from the cross (Giza 8 X S. 2419).
Sakha 1	A double type, selected from the cross (Bombay X I. 1485).
Sakha 2	A double type, selected from the cross (I.2348 X Hera).

A split plot design with four replication was used in both seasons. Each sub-plot size was $6m^2$ (2x3m). To avoid the effect of lateral movement of irrigation water, the main plots were isolated by levees 75cm wide. Seed of different flax genotypes were sown on 1st and 6th November in the first and the second seasons, respectively. The experimental area was fertilized with 15.5 P_2O_5/fad. as super phosphate (15.5 P_2O_5) through soil preparation as well as with 45 kg N/fad. Other cultural practices were done as usual in flax fields. The maize crop is the previous crop.

At harvest, ten guarded plants were randomly selected from each sub plot to recording yield components. Straw and yields of flax/fad. Data collected included :

A. Straw yield and its related characters :

1- Technical stem length (cm) .

2-Main Stem diameter (mm) .
3- Straw yield (g /plant).
4- Straw yield (tons/ Fad.).

B. Seed yield and its related characters :

1- Length of top capsule zone (cm) .
2- Number of capsules per plant .
3- Number of seed per plant .
4- Seed yield (g /plant).
5- Seed yield (kg /Fad.)
6- Seed Oil percentage .

Data of the two experiments were subjected to proper statistical analysis of variance according to Sendecor and Cochran (1982). Duncans multiple range test (Duncan, 1955) was used for comparison among treatment means.

RESULTS AND DISCUSSION

A. Straw yield and its related characters :

1- Technical stem length :

Mean values of technical stem length as influenced by flax genotypes as irrigation treatment and their interaction during 2006 / 2007 and 2007 / 2008 seasons are cited in Table (2 and 3).

Technical length was significantly influenced by irrigation treatments during first season of study But in second season it was significantly influenced by flax genotypes. More-over water stress during stem elongation stage reduced technical length. where skip-irrigation in the seed filling stage gave the highest value in both season. these results are in agreement with those of El-kady (1985), who Found that technical length increased by increasing available soil moisture in the root zone. These results indicate that drought after elongation stem stage doesn't caused a depression in technical length.

Also, flax genotypes exerted significant effect on technical stem length in both season where Sakha 3 gave the highest value in first season. More-over Sakha 1 gave the highest value in second season. these results are in line with those obtained by many investigators El- Farouk *et al.* (1982), indicated that Giza 6 was superior to Giza 5 in growth characters in terms of technical length. El-Gazzar and Abou-Zaied (2001), reported that Sakha 1 significantly surpassed Sakha 2 and Strain 3 in technical stem length.

Technical length had significant effect(on technical stem length) in first season affected by interaction between irrigation treatment and flax genotypes. Also, data in Table (4) showed that skip-irrigation during the stem elongation with Sakha 3 gave the highest value in Technical length More-over skip-irrigation at apical branching with strain 16 gave the lowest value .

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2- Stem diameter :

Results in table (2 and 3) showed that, irrigation treatment and flax genotypes had no significant effect on stem diameter in both seasons. where skip-irrigation in the seed filling stage gave the highest value in both seasons. these results are in agreement with those reported by El-kady (1985) who found that stem diameter was increased by increasing available soil moisture in the root zone.

Also, results showed that, highly significant differance between flax genotypes in first season. where Giza 8 gave the highest value in stem diameter. More-over in second season data showed that there was no significant effect between flax genotypes where Sakha 1 gave the highest value. these results are in harmony with those reported by many investigators El- Farouk *et al.* (1982), indicated that Giza 6 was superior to Giza 5 in growth characters in terms of stem diameter. El-Gazzar and Abou-Zaied (2001), reported that Sakha 1 significantly surpassed Sakha 2 and Strain3 in stem diameter.

3- Straw yield per plant :

Means of straw yield per plant are presented in Table (2 and 3) for each of irrigation treatment at six flax genotypes.

Results show that high significantly was detected due to the effect of irrigation treatment on straw yield per plant in both seasons. straw yield per plant was greater with skip-irrigation in the flowering stage in first season. while its was greater with skip-irrigation in the seed filling stage in second season. these results are in harmony with those reported by Gabiana *et al.* (2005) which they noticed that straw yield responded well to irrigation. The reduction in straw yields due to drought after stem elongation stage could be not attributed to the reduction in technical length and stem diameter.

Also , results show that high significant between flax genotypes. where Giza 8 gave the great value in both seasons. these results are in line with those obtained by Hella *et al.* (1987), which they found that Giza 5 was higher in straw yield/plant than Giza 6. Kineber (1991), found that straw yield/plant . of S.193/1 were higher than Giza 5.

Results Also, showed that, the interaction between irrigation treatment and flax genotypes had a significant effect on straw yield/plant in the first season. Also, data in Table (5) showed that the highest value in straw yield per plant recorded under skip-irrigation during flowering stage with Giza 8 cultivars in first season. More-over skip-irrigation at apical branching with Ilona flax genotypes gave the lowest value.

4- Straw yield per Fadden :

The effect of irrigation treatment and flax genotypes on straw yield per Fad. during 2006 / 2007 and 2007 / 2008 season are presented in Table (2 and 3). Irrigation at different levels of available soil moisture depletion had no significant effect on straw yield per Fad. in both seasons. where skip-irrigation in the seed filling stage gave the highest value (3.758 and 3.205 tons/fad.) in both season. Res. these results are in line with those reported by Gabiana *et al.* (2005), noticed that straw yield

responded well to irrigation. The reduction in straw yields due to drought after stem elongation stage could be not attributed to the reduction in technical length and stem diameter.

Results in Tables (2and3) show that Sakha 2 gave the highest value (3.794 and 3.507 tons/fad.) in both seasons. Res. these results are in harmony with those reported by Hella *et al.* (1987), found that Giza 5 was higher in straw yield/plant than Giza 6 and Kineber (1991), who found that straw yield/plant . of S.193/1 were higher than in Giza 5.

Table (4): Effect of interaction between irrigation treatment and cultivars on Technical stem length (cm) in 2006 / 2007 season.

Flax genotypes	Irrigation treatment			
	(1)	(2)	(3)	(4)
Ilona	89.95 m-o	91.53 lm	93.03 kl	99.40 e-h
Sakha 3	103.6 a	97.05 h-j	97.82 hi	101.3 c
Giza 8	98.80 f-i	93.45 kl	99.20 e-i	100.5 d
Strain 16	91.20 l-n	85.82 q	87.15 pq	102.6 b
Sakha 1	96.75 ij	93.45 kl	101.4 c-e	101.4 c-e
Sakha 2	98.60 g-i	88.00 o-q	95.35 jk	88.93 n-p

Means followed by the same letter are not significantly different at 5% level according to Duncan's multiple range test (1955).

Table (5): Effect of interaction between irrigation treatments and flax genotypes on straw yield/plant (g) in 2006 / 2007 season.

Flax genotypes	Irrigation treatment			
	(1)	(2)	(3)	(4)
Ilona	0.757 l-n	0.588 n	0.686 mn	1.074 i-k
Sakha 3	1.150 h-j	0.819 lm	0.9085 kl	0.922 kl
Giza 8	1.147 h-j	1.048 jk	2.011 a	1.686 b
Strain 16	1.057 jk	1.391 d-g	1.404 c-f	1.401 c-f
Sakha 1	1.582 bc	1.098 i-k	1.366 d-h	1.367 d-g
Sakha 2	1.258 e-i	1.241 e-j	1.472 cd	1.217 f-j

Means followed by the same letter are not significantly different at 5% level according to Duncan's multiple range test (1955).

B. Seed yield and its related characters :

1- Length of top capsule zone :

Mean length of top capsule zone in (cm) as affected by irrigation treatments and flax genotypes are presented in Table (6 and 7)

Results show that, irrigation treatment significantly affected length of top capsule zone in the second season. Skip-irrigation in the seed filling stage gave the highest top capsule zone, while skipping of irrigation in stem elongation recorded the lowest tone. These results are in similar to those obtained by El- kady (1985),which found that capsule zone length was increased by increasing available soil moisture in the root zone.

6-7

Also, results show that high significantly between flax genotypes affected by irrigation treatment where Strain 16 gave the high value in first season. while Giza 8 gave the highest value in second season. In this respect, El- kady (1985), noticed that flax variety Giza 6 surpassed Giza 5 for top capsules zone length. El-Gazzar and Abou-Zaied (2001), reported that Sakha 2 significantly surpassed Sakha 1 and Strain 3 in top capsule zone length.

The interaction between irrigation treatments and flax genotype had a significant effect on length of top capsule zone in both seasons. Also, data in Tables (8 and 9) showed that the highest value in length of top capsule zone recorded under skip-irrigation during the stem elongation with Strain 16 in first season. While its recorded under skip-irrigation during the seed filling stage with Sakha 1 in second season. More-over the lowest value recorded by skip-irrigation at apical branching with Sakha3 in both seasons.

Table (8): Effect of interaction between irrigation treatment and flax genotypes on Length of top capsule zone (cm) in 2006/2007 season.

Cultivar	Irrigation treatment			
	(1)	(2)	(3)	(4)
Ilona	6.27 i-l	5.70 k-m	6.55 h-k	6.80 h-k
Sakha 3	4.95 mn	4.62 n	6.52 h-k	6.07 j-l
Giza 8	6.75 h-k	5.32 l-n	8.85 de	10.25 a
Strain 16	10.82 a	8.80 de	6.95 h-j	10.60 a
Sakha 1	8.30 e-g	8.50 ef	9.17 c-d	9.87 b
Sakha 2	7.05 h-j	6.97 h-j	9.40 c-e	6.57 h-k

Means followed by the same letter are not significantly different at 5% level according to Duncan's multiple range test (1955).

Table (9): Effect of interaction between irrigation treatment and flax genotypes on Length of top capsule zone (cm) in 2007/2008 season.

Cultivar	Irrigation treatment			
	(1)	(2)	(3)	(4)
Ilona	8.325 l-o	7.775 o	12.05 cd	12.65 c
Sakha 3	7.875 o	7.900 o	10.15 f-j	9.425 h-n
Giza 8	9.775 f-k	10.23 e-j	10.38 e-i	15.60 b
Strain 16	9.825 f-k	10.82 d-g	8.500 k-o	8.925 j-o
Sakha 1	10.65 e-h	9.375 h-n	8.850 j-o	17.55 a
Sakha 2	8.150 no	11.05 d-f	9.550 g-m	9.075 i-o

Means followed by the same letter are not significantly different at 5% level according to Duncan's multiple range test (1955).

2- Number of capsules per plant :

Mean of capsules number per plant as influenced by irrigation treatment and flax genotypes for the two seasons of study are presented in Table (6 and 7).

Data showed that a highly significant effect between irrigation treatments on number of capsules/plant in first season. Skip-irrigation in the

seed filling stage gave the highest value in number of capsules per plant (4.467 and 4.742) in both seasons. The decrease in number of capsules per plant with decreasing soil moisture might be due to the abortion of some flowers as a result of the relation ship between moisture stress and different physiological processes occurring in plant. these results are in agreement with those reported by many investigators. Jain *et al.* (1997), found that seeds were higher with irrigation than with the rainfed control.

Also, results indicate highly significant differences between flax genotypes in this trait. Strain 16 gave the highest value in first season. while Giza 8 gave the highest value in one season. these results are in harmony with those reported by many investigators El-Sweify (1993), reported that S. 2419/1 was superior in main number of capsules per plant. El-Shimy and Moawed (2000), found that flax variety Giza 8 was superior over Viking in number of capsules/plant.

Data also presented in Table (6 and 7) show that were significant effects on length of top capsule zone and number of capsules/plant due to the interaction between irrigation treatments and flax genotypes in the two seasons.. Also, data in Table (10and11) showed that the high value in number of capsules per plant was recorded by skip-irrigation during the seed filling with Strain 16 in first season. While its recorded by skip-irrigation during the seed filling with Giza 8 in second season. More-over the lowest value recorded by skip-irrigation at apical branching with Ilona flax genotypes in first season, while its recorded by skip-irrigation at flowering stage with Ilona flax genotypes in second season.

3- Number of seeds per plant :

Number of seeds per plant as affected by irrigation treatments and flax genotypes in both seasons are presented in Tables (6 and 7).

High significant differences among irrigation treatment on number of seed per plant were noticed in both seasons. where skip-irrigation in the seed filling stage gave the highest value (28.11 and 28.90) in both seasons. these results are in harmony with those reported by Ram *et al.* (2005), reported that the second irrigation with 66 mm CPE promoted number of seeds per capsule. This results showed that irrigation after elongation stem increasing seed yield. these results agreed with those reported by Larsen (1962) and El-Kady (1985).

Also, results showed that highly significant difference among flax genotypes in number of seed per plant were noticed in both seasons. where Giza 8 gave the highest value in number of seed per plant in both seasons. This trend may be due to the characteristics of each cultivars. These results are in agreement with Salama (1983), who reported that Giza 6 out yields Giza 5 in number of seeds/plant. Abd El-Fatah (1994), who noticed that Giza 8 was superior in number of seeds/plant.

Data in Tables (6 and 7) indicated that there were highly significant effect for the interaction between irrigation treatment and Flax genotypes on number of seeds/plant in both seasons.

Table (10): Effect of interaction between irrigation treatment and flax genotypes Number of capsules / plant in 2006 / 2007 season.

Flax genotypes	Irrigation treatment			
	(1)	(2)	(3)	(4)
Ilona	2.72 k	1.19 l	1.85 l	3.12 i-k
Sakha 3	3.25 g-k	1.80 l	2.70 k	3.15 i-k
Giza 8	3.40 g-k	3.77 e-j	7.15 a	5.35 bc
Strain 16	3.25 g-k	4.82 cd	2.92 jk	7.25 a
Sakha 1	4.05 d-i	3.45 g-k	4.12 d-h	4.05 d-i
Sakha 2	3.60 f-k	4.62 c-e	4.17 d-g	3.60 f-k

Means followed by the same letter are not significantly different at 5% level according to Duncan's multiple range test (1955).

Table (11) : Effect of interaction between irrigation treatment and flax genotypes on Number of capsules/plant in 2007/ 2008 season.

Cultivar	Irrigation treatment			
	(1)	(2)	(3)	(4)
Ilona	2.475 jk	2.675 i-k	2.300 k	4.625 c-e
Sakha 3	3.075 h-k	3.900 e-h	3.325 g-j	2.550 i-k
Giza 8	7.425 h-k	6.800 b	3.650 f-h	8.600 a
Strain 16	5.233 cd	4.432 d-f	3.725 f-h	4.100 e-g
Sakha 1	5.075 cd	4.100 e-g	3.050 h-k	4.725 c-e
Sakha 2	3.150 h-k	5.225 cd	4.175 e-g	3.850 e-h

Means followed by the same letter are not significantly different at 5% level according to Duncan's multiple range test (1955).

Also, data in Table (12 and 13) showed that the highest value was recorded by skip-irrigation during flowering with Giza 8 in first season. While its recorded under skip-irrigation during the seed filling stage with Giza 8 in second season. More-over the lowest value recorded under skip-irrigation at flowering stage with Ilona flax genotypes in first season, while its recorded under skip-irrigation at stem elongation stage with Ilona flax genotypes in second season.

Table (12): Effect of interaction between irrigation treatment and flax genotypes on Number of seeds/plant in 2006/2007 season.

Cultivar	Irrigation treatment			
	(1)	(2)	(3)	(4)
Ilona	17.30 h	11.65 l	10.63 l	11.00 l
Sakha 3	18.30 gh	15.27 h	19.10 f-h	21.77 e-g
Giza 8	18.67 f-h	17.30 h	46.50 a	42.30 b
Strain 16	17.65 h	22.23 ef	17.67 h	43.35 ab
Sakha 1	22.85 e	18.07 gh	24.17 e	28.60 d
Sakha 2	23.63 e	16.60 h	23.57 e	21.67 e-g

Means followed by the same letter are not significantly different at 5% level according to Duncan's multiple range test (1955).

Table (13): Effect of interaction between irrigation treatment and flax genotypes on Number of seeds/plant in 2007/2008 season.

Cultivar	Irrigation treatment			
	(1)	(2)	(3)	(4)
Ilona	12.52 op	19.55 h-m	14.15 m-p	30.60 de
Sakha 3	20.30 h-k	19.95 h-l	19.92 h-l	17.73 j-o
Giza 8	43.80 b	36.90 c	20.83 h-k	54.65 a
Strain 16	28.57 d-f	11.95 p	20.52 h-k	23.52 f-i
Sakha 1	24.05 f-i	13.35 n-p	14.45 l-p	25.00 f-h
Sakha 2	20.02 h-l	36.22 c	23.90 f-i	21.90 g-j

Means followed by the same letter are not significantly different at 5% level according to Duncan's multiple range test (1955).

4- Seed yield per plant :

The effects of irrigation treatments and flax genotypes on seed yield per plant during the two seasons 2006 / 2007 and 2007 / 2008 of study are presented in Tables (6 and 7) .

Results showed that, there no significant difference between irrigation treatment in both seasons where skip-irrigation in the flowering stage gave the highest value in first season. while skip-irrigation in the seed filling stage gave the high value in second season. These results are in harmony with those reported by Singh *et al.* (2000) reported that Seed yield increased with increasing irrigation. this results showed that irrigation after stem elongation increasing seed yield.

Also, results showed that, there were highly significantly effect between flax genotypes in seed yield per plant in both seasons. where Strain 16 gave the highest value in first season while Giza 8 gave the highest value in second season. These results are in line with those noticed by many investigators El-Shimy and Moawed (2000), found that flax variety Giza 8 was superior over Viking in number of seed yield/plant. Abou-zaied (2001), reveled that Giza 8 ranked the first in number of seed yield/plant.

5- Seed yield per fad. :

Data presented in Tables (6 and 7) show the means of seed yield per fad., as affected by irrigation treatments and Flax genotypes in both seasons of study.

Data showed that, irrigation treatment had no significant effect on seed yield/fad. in both seasons of study. Skip-irrigation at the growth stage of seed filling stage gave the highest value in both seasons. seed yield per fad. which obtained in second season was higher than that obtained in first one. it may be attributed to the climatic condition. These results are in line with that obtained by Singh *et al.* (2000), reported that which they Seed yield increased with increasing irrigation.

Also , results showed that highly significant different existed among flax genotypes. Where Giza 8 gave the highest value in both seasons than other cultivars. these results are in line with those obtained by many investigators Momtaz *et al.* (1980), reported that flax cv. Giza 5 surpassed the check cv. Giza 4 in seed yields/fad. by 18.18% and 10.09 % respectively , while Giza 6 cultivar exceeded the check cv.

Giza 4 in seed yield/fad. by 11.39% and 15.22% respectively. El- kalla and El- kassaby (1982), reported that Giza 6 produced the highest seed yield/fad.

6- Oil percentage :

Means of oil percentage as affected by irrigation treatment and flax genotypes during the two seasons of study are presented in Tables (6 and 7).

Results showed that, high significantly effect between irrigation treatments on seed oil content in both seasons. Skip-irrigation at the flowering stage gave the highest value in both seasons while deprived of irrigation in the seed filling stage gave the lowest value in both seasons. these results are in harmony with those reported by many investigators. Omidbaigi *et al.* (2001), showed that increasing the water supply to 60 mm increased seed yield . but had no significant effect on seed oil content. The increase in oil yield may be attributed to increase seed yield.

Also, data showed that highly significant differences in oil percentage among flax genotypes in both seasons. Strain 16 gave the highest value in both seasons. these results are attributed to the characteristics of each flax genotypes where Strain 16 flax genotypes is the purpose of oil painting. these results are in harmony with those reported by many investigators. Green and Marshal (1981), obtained a significant variation in seed weight and oil content between and within cultivars in a diverse collection of 214 L. usitatissimum accessions. In general, high oil content consistently was associated with large seeds. El-Shimy *et al.* (1997), evaluated 14 flax genotypes and found, Giza 8 ranked first and exceeded the other genotypes in seed yield and its related traits S. 2465/1 had the highest oil content.

The Effect of the interaction between irrigation treatments and Flax genotypes was highly significant in both seasons. Also, data in Table (14) showed that the high value in oil percentage was recorded by skip-irrigation during the stem elongation with Giza 8 in both seasons. More-over the lowest value recorded by skip-irrigation stem elongation with Ilona flax genotypes in both seasons.

Table (14): Effect of interaction between irrigation treatment and flax genotypes on seed oil content in 2006 / 2007 season.

Flax genotypes	Irrigation treatment			
	(1)	(2)	(3)	(4)
Ilona	39.74 l	54.06 cd	54.50 bc	40.92 kl
Sakha 3	42.10 jk	53.97 cd	54.19 c	51.34 ef
Giza 8	59.10 a	39.59 l	51.26 ef	44.44 i
Strain 16	50.22 fg	56.25 b	52.21 de	44.20 i
Sakha 1	43.15 ij	46.85 h	43.10 ij	45.00 i
Sakha 2	44.50 l	44.38 l	44.00 ij	43.50 ij

Means followed by the same letter are not significantly different at 5% level according to Duncan's multiple range test (1955).

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تأثير الإجهاد الرطوبى على المحصول ومكوناته لبعض التراكيب الوراثية للكتان

عبدا لرحيم عبد الرحيم ليلة *، محمد حسين غنيمة *، محمد السيد قنيبر و إبراهيم حسن طلحة****

*** قسم المحاصيل - كلية الزراعة - جامعة المنصورة**

**** معهد بحوث المحاصيل الحقلية - مركز البحوث الزراعية**

أقيمت تجربتان حقليتان بالمزرعة البحثية لمحطة البحوث الزراعية بسخا – كفر الشيخ خلال موسمي ٢٠٠٦/٢٠٠٧م – ٢٠٠٧/٢٠٠٨ م لدراسة تأثير الحرمان من الري على محصول بعض التراكيب الوراثية من الكتان أثناء مراحل النمو المختلفة(- حرمان من الرى في طور الاستطالة (٤١ يوم من الزراعة)- حرمان من الرى في طور التفريع القمى (٦٤ يوم من الزراعة) - حرمان من الرى في طور التزهير (٨٣ يوم من الزراعة) - حرمان من الرى في طور تكوين الكبسولة واكتمال النضج (١١٤ يوم من الزراعة استخدم في هذه الدراسة ستة تراكيب وراثية من الكتان وهى (ايلونا ، سخا٣ ، سخا١ ، سخا٢ ، سلالة ١٦ ، جيزة ٨).

وتتلخص أهم النتائج المتحصل عليها فيما يلي :.

* أعطت معاملة الحرمان من الري فى مرحلة اكتمال النضج (١١٤ يوم من الزراعة) اعلي القيم فى كلا من الطول الفعال – قطر الساق – محصول القش للفدان (طن) –طول المنطقة الثمرية – عدد كبسولات النبات – عدد بذور النبات – محصول البذرة للفدان فى كلا الموسمين.
* تفوق الصنف جيزة ٨ فى كلا من صفة قطر الساق ومحصول القش للنبات بينما تفوق الصنف سخا٢ فى صفة محصول القش للفدان (طن) فى كلا الموسمين.
* أعطت معاملة الحرمان من الري فى مرحلة التزهير (٨٣ يوم من الزراعة) اعلي القيم فى نسبة الزيت فى البذور فى كلا الموسمين .
* تفوقت السلالة ١٦ على باقي التراكيب الوراثية في كلا من الصفات التالية (طول المنطقة الثمرية – عدد كبسولات النبات – محصول البذرة للنبات – نسبة الزيت فى البذور) فى كلا الموسمين.
* أظهرت نتائج التفاعل بين عوامل الدراسة اعلي قيمة في محصول القش للنبات فى الموسم الأول وذلك عند الحرمان من الري فى مرحلة استطالة الساق ٤١(يوم من الزراعة) وكذلك استخدام الصنف سخا٣ .

وكذلك سجلت نتائج التفاعل بين عوامل الدراسة أعلى القيم فى كلا من طول المنطقة الثمرية فى مرحلة استطالة الساق(٤١ يوم من الزراعة) والسلالة ١٦ فى الموسم الأول بينما فى الموسم الثاني فى مرحلة اكتمال النضج والصنف سخا١ أما عدد كبسولات النبات فأعلى القيم حققت فى مرحلة اكتمال النضج (١١٤ يوم من الزراعة) والسلالة ١٦ فى الموسم الأول بينما مع الصنف جيزة ٨ فى الموسم الثاني وأما نسبة الزيت بالبذور سجلت أعلى قيم التفاعل فى مرحلة استطالة الساق (٤١ يوم من الزراعة) والصنف جيزة ٨ فى كلا الموسمين.

* من نتائج هذه الدراسة فأنة يمكن استنتاج أن الحرمان من الري في مرحلة اكتمال النضج (١١٤ يوم من الزراعة) لا يؤثر على المحصول وبذلك يمكن توفير كمية من مياه الري. كما يمكن التوصية بزراعة الصنف جيزة ٨ لغرض إنتاج الزيت.

قام بتحكيم البحث

أ. د/ عوض طه القصبى	**كلية الزراعة – جامعة المنصورة**
أ. د/ عبد الواحد عبد الحميد السيد محمد	**كلية الزراعة – جامعة كفر الشيخ**

Table (2): Means of straw yield and its related characters of different flax genotypes as affected by irrigation treatment during 2006- 2007 season.

Variable	Sig.	Irrigation treatment (A)				Sig.	Flax genotype (B)						Interaction (A x B)
		(1)	(2)	(3)	(4)		Ilona	Sakha 3	Sakha 1	Sakha 2	Giza 8	Strain 16	
Technical stem length(cm)	**	96.47b	91.55d	95.66c	99.01a	**	95.28b	100.4a	99.79a	94.08b	96.24b	94.33b	**
Stem diameter (mm)	NS	1.73	1.64	1.7	1.86	**	1.65c	1.56c	1.85ab	1.73bc	1.95a	1.94a	NS
Straw yield (g /plant)	**	1.15bc	1.03c	1.30a	1.27ab	**	0.86c	1.02c	1.36ab	1.25b	1.46a	1.42ab	**
Straw yield (t / fad)	NS	3.623	3.220	3.561	3.758	NS	3.311	3.528	3.564	3.794	3.584	3.400	NS

****and NS indicate, P < 0.01 and not significant, respectively. Means of each factor followed by a common letter are not significantly different at 5 % level according to DMRT.**

(1) Skipping of irrigation in stem elongation., (2) Skipping of irrigation in apical branching.,

(3) Skipping of irrigation in flowering stage., and (4) Skipping of irrigation in seed filling.

Table (3): Means of straw yield and its related characters of different flax genotypes as affected by irrigation treatment during 2007-2008 season.

Variable	Sig.	Irrigation treatment (A)				Sig.	Flax genotypes (B)						Interaction (AxB)
		(1)	(2)	(3)	(4)		Ilona	Sakha3	Sakha 1	Sakha 2	Giza 8	Strain 16	
Technical stem length(cm)	NS	78.97	79.50	78.91	79.14	**	72.90c	78.41b	79.78a	78.60b	74.93b	79.21a	NS
Stem diameter (mm)	NS	1.78	1.76	1.71	1.90	NS	1.72	1.74	1.86	1.82	1.84	1.74	NS
Straw yield (g /plant)	**	0.97ab	0.97ab	0.86b	1.11a	**	0.83c	0.81c	1.02ab	1.05ab	1.09a	0.89bc	NS
Straw yield (t / fad)	NS	2.898	3.089	3.170	3.205	**	3.037b	2.895b	2.973b	3.507a	3.482a	2.972b	NS

****and NS indicate, P < 0.01 and not significant, respectively. Means of each factor followed by a common letter are not significantly different at 5 % level according to DMRT.**

(1) Skipping of irrigation in stem elongation., (2) Skipping of irrigation in apical branching.,

(3) Skipping of irrigation in flowering stage., and (4) Skipping of irrigation in seed filling.

Table (6) : Means of seed yield and its related characters of different flax genotypes as affected by irrigation treatment during 2006 - 2007 season.

Variable	Sig.	Irrigation treatment (A)				Sig.	Flax genotypes (B)						Interaction (AxB)
		(1)	(2)	(3)	(4)		Ilona	Sakha 3	Sakha 1	Sakha 2	Giza 8	Strain 16	
Length of top capsule zone(cm)	NS	7.32	6.65	7.90	8.36	**	6.48de	5.94e	8.62b	7.36cd	8.18bc	9.73a	**
Number of capsules /plant	**	3.37c	3.27c	3.82bc	4.46ab	**	2.44c	2.92c	4.03b	3.84b	5.14a	5.21a	**
Number of seeds/plant	**	19.37c	16.85d	23.60b	28.11a	**	13.52e	22.41cd	24.94bc	20.91d	29.59a	27.14ab	**
Seed yield (g /plant)	NS	0.15	0.15	0.20	0.18	**	0.05e	0.11d	0.20bc	0.19c	0.24ab	0.26a	NS
Seed yield (kg / fad)	NS	367.86	346.79	362.25	416.50	**	129.97d	334.60c	400.29bc	474.10a	483.00a	444.50bc	NS
Seed oil content	**	46.46bc	49.18a	49.87a	44.89c	**	48.61b	48.39b	44.43c	43.87c	48.73b	51.61a	**

****and NS indicate P < 0.01 and not significant, respectively. Means of each factor followed by a common letter are not significantly different at 5 % level according to DMRT.**

(1) Skipping of irrigation in stem elongation., (2) Skipping of irrigation in apical branching.
(3) Skipping of irrigation in flowering stage., and (4) Skipping of irrigation in seed filling.

Table (7) : Means of seed yield and its related characters of different flax genotypes as affected by irrigation treatment during 2007-2008 season.

Variable	Sig.	Irrigation treatment (A)				Sig.	Flax genotypes (B)						Interaction (AxB)
		(1)	(2)	(3)	(4)		Ilona	Sakha 3	Sakha 1	Sakha 2	Giza 8	Strain 16	
Length of top capsule zone(cm)	**	9.10b	9.52b	9.91b	12.20a	**	9.77b	8.79b	11.42a	9.22b	11.50a	9.55b	**
Number of capsules /plant	NS	4.40	4.52	3.37	4.74	**	2.92c	3.20c	4.470b	3.96b	6.34a	4.33b	**
Number of seeds/plant	*	24.87ab	22.98bc	18.96c	28.90a	**	19.90b	19.31b	20.84b	23.61b	37.76a	20.01b	**
Seed yield (g /plant)	NS	0.18	0.17	0.14	0.20	*	0.13b	0.16b	0.18b	0.18b	0.25a	0.13b	NS
Seed yield (kg / fad.)	NS	480.70	473.43	427.29	546.98	**	146.48c	470.03b	443.00b	639.08a	690.80a	451.81b	NS
Seed oil content	**	46.56bc	49.28a	49.97a	44.99c	**	48.71b	48.49b	44.53c	43.97c	48.83b	51.71a	**

***,**and NS indicate P < 0.50, P < 0.01 and not significant, respectively. Means of each factor followed by a common letter are not significantly different at 5 % level according to DMRT.**

(1) Skipping of irrigation in stem elongation., (2) Skipping of irrigation in apical branching., flowering stage., and (4) Skipping of irrigation in seed filling. Skipping of irrigation in (3)