6

Egypt. J. Agron. **Vol. 41,** No.1, pp. 59 - 68 (2019)

Efficiency of Sowing Method and Weed Control on Growth, Yield and Quality of Linseed (*Linum usitatissimum* L.)

Dalia A. A. El Hag

Agronomy Department, Faculty of Agriculture, Kafrelsheikh University, Kafr El-Sheikh, Egypt.

RELATIONSHIP between sowing method, weed control and crop yield is a complex relationships. Hence, adopting satisfactory and most compatible and effective combination of weed control and sowing methods is a foundational element of sustainability and long-term profitability. The current study aimed to evaluate the effect of sowing methods of linseed plants (*Linum usitatissimum* L.) and some weed control treatment. Field experiments were conducted in 2014/2015 and 2015/2016 seasons and the study was laid out in a split plot design with four replications in RCBD. Treatments included two sowing methods (broadcast and drill) were allocated in the main plots and seven weed control viz., T1- Unweeded (check control), T2- Brominal 500cm^3/fad was applied after three week from planting, T3- Granstar (6g/fad), T4- Fusilade supper (500cm^3/fad), T5- Brominal (500cm^3/fad) + Fusilade supper (500cm^3/fad), T6- Granstar (6g/fad) + Fusilade supper (500cm^3/fad) and T7- Hand weeding twice. Results indicated that significant differences among sowing methods in all traits. Broadcast method surpassed the all treatments and highest values in term of stem diameter whereas; drill methods recorded the highest values of the remaining characters. Drill methods recorded the highest values for the other characters. Concering weed control treatments, significant differences were observed among treatments. Treatment T1 recorded the highest values for Fiber percentage and lowest of straw yield/plant and seed yield. Treatment T4 recorded the greatest values for Technical length, stem diameter, seed index and fiber yield. Treatment T6 recorded the highest values for dry weight of linseed plant, plant height, straw yield/plant.

Keyword: Linseed plant, Sowing methods, Weed control, Yield and its components.

Introduction

Linseed (*Linum usitatissimum* L.) is one of the well-known earliest crops grown for fiber and yield (double purpose crop). Every part of linseed plant is utilized commercially, either directly or after processing. Seed contains 33 to 47 percent oil. A small quantity is directly used for edible ueses. About 20 per cent of the total oil produced is used at farmer, while the rest (80%) are used in industrial purpose. The cultivars grown mainly for seed/oil reason are reasonably short in height and possess more secondary branches and seed bolls (seed capsule). The cultivars grown for fiber use are tall growing with straight culms and have fewer secondary branches.

Linseed was grown during winter season in limited extended the cultivated area occupied by linseed need major advanced not only genetically, but also pragmatically in most of agronomic approaches. Appropriate agronomic practices could achieve an improvement yield and quality in a sustainable manner. This could be achieved by improvement of cultural practices such as sowing methods and different weed control treatments, which plays an important role in increasing linseed productivity. Generally, the less competitive ability against weed species is one of the major challenges forced to increase the area cultivated with linseed (*Linum usitatissimum*). Indication of many researches on the role of managing agronomic practices in developing and sustainability of linseed production, among these, sowing methods can have large impacts on weed control and provide a good opportunity to overcome undesirable weeds and decreasing the ability of weed resistance. Sowing of seeds with seed drill is better than any other methods because it positions the seed right at equal distances and proper depth. Kineber et al. (1997) found that the differences between planting methods (broadcasting and drilling) were

Corresponding author email: dalia_elhag@yahoo.com
DOI: 10.21608/agro.2019.7782.1147

insignificant for all straw yield and seed characters. El kholy (1999) found that the differences between planting methods (broadcasting and drilling) were insignificant in top branching zone length, number of capsules/plant, seeds number/plant, seeds number/capsule, seed yield/plant as well as per faddan, and oil percentage. El Azzouni et al. (2006) showed that the drilling method significantly exceeded broadcasting method in straw and fiber yields and their components. El Borhamy (2011) found that the differences between planting methods were not significant in technical length, stem diameter, straw yield/plant, number of seeds/ plant and seed yield/plant. While, the differences were significant in straw and seed yield/fad, seed index and seed oil percentage, whereas drilling was superior to broadcasting. Sorour et al. (2015) found that the planting method significantly differed in al studied characters except technical length, stem diameter and seed index. Shaheen (2017) found that planting methods affected significantly on plant height, yield and its components, seed yield and its components and on fiber yield and its related characters.

Weeds can be a severe and serious problem in linseed if left uncontrolled in correct time. Weeds have an excellent chance to develop in linseed in that way reducing linseed yield and seed quality. Maximized linseed yield throw agronomy and crop management during the growing season, in addition to the use of best herbicides at the optimum time, are critical to reach optimum linseed yields, minimal dockage and high oil quality. Controlling weeds in fields is necessary to rise up yield quantity and quality, as well as minimize great losses in crop production resulting from weed-crop competition. Reduction in crop yield has a direct correlation with weed competition. El-Maghraby et al. (1985) showed that Brominal gave the best results against most broad-leaf weeds in linseed and did not show any harmful effect on growth and development and increased the straw and seed yields. Abou –Zied et al. (2015) found that Brominal + Select super gave significantly improved values for seed yield and components. Osman et al. (2010) found that the use of Fluazifop butyl in linseed fields for decreasing weed competition in linseed and consequently improving straw of fiber yields Mańkowski & Pudelkp (2015) recorded that the applied herbicides had a significant impact on the length of the vegetative, straw yield, the percentage of fiber in the straw, weight and length of the fiber and its thinness and divisibility and showed that, weed control with herbicide has contributed to increased yield of linseed. Chhaganiya et al. (2017) found that the growth parameters, yield attributes, oil yield and seed yield were higher with lower weed count by uses weed control treatments or hand weeded. Shaheen (2017) found that weed control treatments significant affected linseed plant height, yield and its components, fiber yield and its related characters.

Materials and Methods

The present investigation was carried out at the Experiment Farm of Sakha Agriculture Research Station, Kafr El-Sheikh Governorate, Egypt during the two successive seasons of 2014/2015 and 2015/2016 to study the effect of sowing methods and weed control treatment on linseed growth, yield and some quality traits. The treatments included two sowing methods, e.g., Broadcast method and drilling in rows 20cm apart , seven treatments of weed control viz., T1- Unweeded (control), T2- Brominal 500 (cm^3/fad) was applied after three week from planting, T3- Granstar (6g/ fad) was applied after three week from planting. T4- Fusilade supper (500cm^3/fad) was applied after three week from planting. T5- Brominal (500cm^3/ fad) was applied after three week from planting + Fusilade supper (500cm^3/fad) was applied after four week from planting. T6- Granstar (6g/fad) was applied after three week from planting + Fusilade supper (500cm^3/fad) was applied after four week from planting and T7- Hand weeding twice. The trade name, common name and chemical structure of the used herbicides are shown in Table 1

The treatments were arranged RCBD using split plots with four replicates. The two plant methods were occupied in main plots while weed control treatments were occupied in sub plots. Plot area was 2x3m. Sowing date was on November 12th and 15th in the first and second season, respectively. The preceding crop was maize (*zea mays* L.) in both seasons. Seeding rate of Sakha 6 cultivar was 60kg/fad. Before sowing applied phosphorus at rate 100kg/fad in form of superphosphate (15.5%) and potassium sulphate (48% K_2O) at rate of 50kg/fad. Nitrogen fertilizer were added as urea (46.5%N) at the rate of 45kg N/fad and divided into two equal doses before the first and second irrigation.

The mechanical and chemical analysis of the experimental soil in 2014/2015 and 2015/2016 seasons were given in Table 2.

TABLE 1. Trade name, common name and chemical structure of the used herbicides.

Trade name	Common name	Chemical structure
Brominal	Bromoxynil	3,4-dibromo-4-hydroxybenzoyl nitrile
Granstar	Tribenuron methyl	Methyl-2-[(4-methyoy-6-methyl-1,3,5-triuzin-2-) methyl jamino sulfonyl] benzoate
Fusilade supper	Fluazifop-butyl	2-[4-[5-(trifluoromethyl)-2- pyridinylox)] phenoxy]propionate

TABLE 2. Mechanical and chemical properties of the experimental soil sites during 2014/15 and 2015/16 seasons.

Character								
Physical characteristics				Soil texture	Chemical analysis			
Seasons	Sand%	Silt%	Clay%		N (Exchangeable, ppm)	P (Exchangeable, ppm)	K (Exchangeable, ppm)	Soil pH
2014/2015	29.7	27.4	43.1	Clay	22.41	15.8	240	8.00
2015/2016	30.8	30.7	38.6	Clay loam	20.7	17	245	8.11

After 60 days from sowing, weeds were hand pulled at random from one quadrate square meter for each sub plot, weeds were classified into broad leafed and grassy. The dry weight was determined as g/m^3. Herbicides in both seasons were sprayed by CP3 in water volume 200 liters/ fad. Ten plants were randomly taken from each sum plot to determine straw yield components and seed yield was recorded from harvested area from each sub plot and converted to ton/fad and kg/fad, respectively.

Studied characters

Growth analysis

linseed plant, plant height and dry weight (g/ plant). Weeds; Dry weight of grassy weeds (g/m^2) and dry weight of broad weeds (g/m^2).

Yield and its components

Straw yield and its components: 1- Technical length (cm), 2- Stem diameter (mm) at the middle region of the main stem, 3- Straw yield (g/plant) after removing the capsules, 4- Straw yield (ton/ fad) after removing the capsules was estimated and converted into tons/fad.

Seed yield and its components: 1- Fruting zone length (cm) from the first apical branch to the apical bud of the main stem, 2- Number of capsules, 3- Number of seed/plant (g), 4- Seed yield/fad (kg/ fad), 5- Seed index (1000 seed weight g) average weight of 1000-seed, 6- Seed oil content that was determined according to the extraction methods by the A.O.A.C. (1990) using a soxhlet apparatus and petroleum ether with a boiling range of 60-80^{o}C solvent for 6h.

Fiber yield and its related components: 1- Fiber yield (ton/fad) was calculated from each sub plot, after remove the capsules. Technological properties: 1- Fiber length (cm), ten fiber ribbons from each treatment were separated out and each ribbon was measured. 2- Fiber percentage (%)= (Fiber yield/fad/straw yield/fad) x 100.

Statistical analysis

Data of the two experiments were subjected to proper statistical analysis of variance according to Snedicor & Cochran (1982). Duncan's multiple range test (Dancan, 1955) was used for comparison among treatment means.

Results and Discussion

Growth analysis

Regarding the influence of sowing methods, data in Table 3 show that, there were insignificant effects on dry weight of linseed, dry weight of broad and grassy weeds after 60 days from sowing in both seasons. Sowing methods affected significantly on plant height in both seasons (Table 4|). It can be noticed that drill sowing method recorded higher value of plant height than broadcast method in both seasons. These results were in harmony with Shaheen (2017). All weed control treatments recorded significant reduction in weeds. The effect of weed control on dry weight of linseed plant, broad weed, grassy weed and plant height were

(P≤ 0.01) in both seasons (Tables 3 and 4). The treatment with T6 (Granstar + Fusilade) recorded the highest values for dry weight of linseed plant flowed by T3 (Granstar). All weed control had reduction and recorded the lowest dry weight in both seasons (Table 3). Treatment T6 followed by T3 were recorded the lowest values for dry weight of broad weeds in 2014/15 and 2015/16 seasons, respectively. Regarding the treatment T7 (Hand weed) recorded the lowest dry weed of grassy in both seasons followed by T5 (Brominal + Granstar) in both seasons. Data presented in Table 4 show that the treatment with T6 recorded the tallest plant followed by T4 (Fusilade) compared with other treatments Table 4. Reduction in dry weight of weed leads to maximization efficiency of weed treatments (Chhaganiya et al., 2017). Shaheen (2017) found that the weed control treatments were significantly effect on plant height of linseed.

Yield and its components

From the obtained results in Tables 4 and 5, which indicated that there were different variation among sowing methods on technical length stem diameter, straw yield (g/plant) and straw yield (ton/fad). The results show a significant (P≤ 0.01 and 0.05) differences among technical length in both seasons, respectively. Significant differences (P≤ 0.05) in the second season for stem diameter, significant differences in the second season and in both seasons for straw yield (g/plant) and straw yield (ton/fad), respectively. Broadcast sowing method recorded the highest values for stem diameter and drill methods produced the highest values for the other traits. El Azzouni et al. (2006) showed that the drilling method significantly exceeded broadcasting method in straw and fiber yields and their components. Sorour et al. (2015) found that the planting method significantly differed in all studied characters except technical length, stem diameter. Shaheen (2017) found that planting methods affected significantly on yield and its components. Regarded for herbicides effect on technical length, stem diameter, straw yield (g/plant) and straw yield (ton/fad) results presented in Tables 4 and 5 show that there are highly significant (P≤ 0.01) in both seasons. Application of herbicides T4 and T6 recorded the highest values for Technical length in the first and second season, respectively. For stem diameter applications of T2 and T3 were produced the highest values. Treatment T6 recorded the highest values for straw yield/plant of linseed plants. On the other hand, T7 produced the highest straws yield/fad in both seasons.El-Hariri et al. (2002) reported that the herbicide treatments increased yield and its components. Therefore, controlling weeds in fields is necessary to rise up yield quantity and quality, as well as minimize great losses in crop production resulting from weed-crop competition. It is established fact that weed compete for light, space, nutrient and water with the crop and hamper overall growth of the same. if weeds are removed by weed control methods, the trend was reversed and crop gain height as well as more number of branches per plant. Osoman (2010) found that the use of Fluazifop butyl in linseed fields for decreasing weed competition in linseed and consequently improving straw of fiber yields (Mańkowski & . Pudelkp, 2015). Shaheen (2017) found that weed control treatments significant affected linseed yield and its components.

Seed yield and its components

The results presented in Table 5 showed significant (P≤ 0.05) differences among linseed plant for fruiting zone length in both seasons. Broadcast sowing produced the tallest zone length. Data presented in Table 6 showed a significant (P≤ 0.05) differences for number of capsules and seed index in both seasons. Drill sowing recorded the highest values for this trait compared with broadcast methods in both seasons. The results presented in Table 7 showed significant (P≤ 0.05) differences among linseed plant for seed index and seed yield/fad and the results presented in Table 7 showed significant (P≤ 0.01) differences among linseed plant for oil percentage in both seasons.

Drill sowing methods recorded the highest values for all of seed yield and its components. These results are agreement with El Azzouni et al. (2006) and El Borhamy (2011). On the other hand, Sorour et al. (2015) found that sowing methods insignificant effects on seed index. Shaheen (2017) found that planting methods affected significantly on seed yield and its components and on fiber yield and its related characters. Application of herbicides treatment affected significant (P≤ 0.01) for all of seed yield and its components (Table 5, 6 and 7). The highest values for fruiting zone length was with T6, number of capsules with T6 and T7, number of seed/plant, seed yield/plant and oil percentage with T6, seed index with application with T4 and T6 and the highest values for seed yield/fad with treatment T5 and T6. Osman et al. (2010) found that the use of Fluazifop butyl in linseed fields for decreasing weed competition in linseed and consequently improving straw of fiber yields.

TABLE 3 . Effect of planting methods and some weed control treatments on dry weight of linseed plant (g/m²), broad weeds (g/m²) and grassy weed (g/m²) at 60 days from sowing during 2014/2015 and 2015/2016 seasons.

Treatment	Dry weight of linseed (g/m²)		Broad weed (g/m²)		Grassy weed (g/m²)	
	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
A. Planting method						
Broadcast	0.252	0.219	8.602	7.388	3.307	3.400
Drilling	0.244	0.236	9.483	6.296	3.407	3.305
Sig.	N.S	N.S	N.S	N.S	N.S	N.S
B. Weed control						
T1- Unwed (Control)	0.172d	0.136g	22.240a	14.373a	7.793a	6.780a
T2- Brominal	0.257b	0.231d	7.800bc	7.057b	2.707b	3.120b
T3- Granstar	0.246b	0.247b	5.793de	4.737d	2.737b	3.127b
T4- Fusilade	0.256b	0.237c	8.753b	6.383bc	2.647b	2.523b
T5- Brominal + Granstar	0.239c	0.214e	6.677cd	5.520bcd	2.477bc	2.993b
T6- Granstar + Fusilade	0.328a	0.325a	5.193e	4.945cd	2.917b	2.597b
T7- Hand weed	0.219c	0.203f	6.910cd	4.880cd	2.220c	2.327b
Sig.	**	**	**	**	**	**
AB	N.S	**	N.S	N.S	N.S	N.S

- *,** and N.S indicate P< 0.05, P< 0.01 and not significant, respectively.
- In the same column means followed by the same letter are not significantly different at 5% level according to Duncan Multiple Range Test.

TABLE 4 . Effect of planting methods and weed control on plant height (cm), technical length (cm) and stem diameter (mm) of linseed Sakha 6 during 2014/2015 and 2015/2016.

Treatment	Plant height (cm)		Technical length (cm)		Stem diameter (mm)	
	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
A. Planting method						
Broadcast	44.7	47.1	98.3	95.2	2.25	2.58
Drilling	48.9	56.1	103.5	106.1	2.19	2.28
Sig.	*	*	**	*	N.S	*
B. Weed control						
T1- Unwed (Control)	29.4f	34.1e	88.0f	85.5e	2.12b	2.34ab
T2- Brominal	44.6e	50.4d	99.4e	98.5d	2.68a	2.62a
T3- Granstar	48.2c	54.0c	101.0d	101.3c	2.56a	2.67a
T4- Fusilade	53.8b	57.4b	107.4a	107.1a	2.55a	2.55ab
T5- Brominal + Granstar	48.3c	53.5c	103.0c	103.5b	1.79c	2.23b
T6- Granstar + Fusilade	56.7a	61.6a	105.8b	106.4a	1.97bc	2.27b
T7- Hand weed	46.9d	50.3d	101.7a	102.3bc	1.88bc	2.33ab
Sig.	**	**	**	**	**	*
AB	*	N.S	N.S	*	N.S	N.S

- *,** and N.S indicate P< 0.05, P< 0.01 and not significant, respectively.
- In the same column means followed by the same letter are not significantly different at 5% level according to Duncan Multiple Range Test.

TABLE 5. Effect of planting methods and weed control on straw yield/plant (g), straw yield (ton/fad) and fruiting zone length (cm) of linseed plants, in 2014/2015 and 2015/2016.

Treatment	Straw yield/plant (g)		Straw yield (ton/fad)		Fruiting zone length (cm)	
	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
A. Plant method						
Broadcast	1.929	2.004	3.921	4.158	19.382	18. 794
Drilling	2.020	2.341	4.219	4.487	17.771	18. 285
Sig.	N.S	*	*	*	*	*
B. Weed control						
T1- Unwed (Control)	0.907c	1.052b	2.720e	2.885e	12.765d	12.812e
T2- Brominal	1.811b	2.166a	3.968d	4.221d	18.832b	18.790c
T3- Granstar	2.315a	2.462a	3.955d	4.199d	18.748b	18.704c
T4- Fusilade	2.171ab	2.305a	4.339c	4.614c	19.795b	19.745b
T5- Brominal + Granstar	2.115ab	2.248a	4.339c	4.608c	19.536b	19.485b
T6-Granstar + Fusilade	2.360a	2.517a	4.498b	4.776b	24.207a	24.490a
T7- Hand weed	2.143ab	2.454a	4.667a	4.956a	16.155c	15.949d
Sig.	**	**	**	**	**	**
AB	*	N.S	*	**	**	N.S

- *,** and N.S indicate P< 0.05, P< 0.01 and not significant, respectively.
- In the same column means followed by the same letter are not significantly different at 5% level according to Duncan Multiple Range Test.

TABLE 6. Effect of planting methods and weed control on number of capsules/plant, number of seed/plant and seed yield/plant of linseed plants in 2014/2015 and 2015/2016.

Treatment	No. of capsules/plant		No. of seed/plant		Seed yield /plant (g)	
	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
A. Plant method						
Broadcast	16.14	18.95	125.3	131.6	0.836	0.878
Drilling	19.01	20.06	138.6	144.8	0.937	1.018
Sig.	*	NS	*	*	NS	NS
B. Weed control						
T1- Unwed (Control)	14.38c	16.14c	91.8f	96.1f	0.505d	0.541d
T2- Brominal	16.14b	17.99b	123.7e	129.5e	0.922b	0.986b
T3- Granstar	17.54b	19.47b	127.6d	133.6d	0.818c	0.876c
T4- Fusilade	17.89b	19.83b	132.6c	138.8c	0.907b	0.969b
T5- Brominal + Granstar	17.44b	19.37b	135.7b	142.1b	0.892b	0.954b
T6- Granstar + Fusilade	19.99a	22.05a	174.2a	182.4a	1.262a	1.349a
T7- Hand weed	19.64a	21.68a	138.2b	144.7b	0.902b	0.964b
Sig.	**	**	**	**	**	**
AB	N.S	N.S	N.S	N.S	N.S	N.S

- *,** and N.S indicate P< 0.05, P< 0.01 and not significant, respectively.
- In the same column means followed by the same letter are not significantly different at 5% level according to Duncan Multiple Range Test.

TABLE 7. Effect of planting methods and weed control on seed index, oil % and seed yield (kg/fad) of linseed plants in 2014/2015 and 2015/2016.

Treatment	Seed index		Oil %		Seed yield (kg/fad)	
	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
A. Plant method						
Broadcast	9.0	9.3	38.8	40.7	700	683
Drilling	9.6	10.0	39.9	41.3	822	815
Sig.	*	*	**	**	*	*
B. Weed control						
T1- Unwed (Control)	8.3e	8.7e	35.5e	36.9 e	596d	606b
T2- Brominal	9.4b	9.8b	40.7ab	42.4a	659c	773a
T3- Granstar	9.4bc	9.8bc	40.4b	42.1ab	775b	735a
T4- Fusilade	9.7a	10.1a	40.1bc	41.8bc	800b	767a
T5- Brominal +Granstar	9.3cd	9.6cd	39.5c	41.2c	854a	801a
T6- Granstar + Fusilade	9.7a	10.1a	41.2a	42.9a	865a	796.a
T7- Hand weed	9.1d	9.5d	38.2d	39.8d	790b	765a
Sig.	**	**	**	**	**	**
AB	N.S	N.S	N.S	N.S	N.S	N.S

- *,** and N.S indicate P< 0.05, P< 0.01 and not significant, respectively.
- In the same column means followed by the same letter are not significantly different at 5% level according to Duncan Multiple Range Test.

Mańkowski & Pudelkp (2015) reported that the controlling weeds in fields are necessary to rise up yield quantity and quality, as well as minimize great losses in crop production resulting from weed-crop competition. The higher oil yield recorded with two hand weeding may be due to deleterious effect of weed acids on crop development as well as nutrient supply from soil to plant which reported by Husain et al. (2015). Shaheen (2017) found that weed control treatments significant affected linseed, yield and its components, seed yield and its related characters. On the other hand, El-Hariri et al. (2002), reported that the herbicide treatments unaffected for seed index and seed oil percentage.

Fiber yield and its related components

The results presented in Table 8 showed highly significant (P≤ 0.01 and 0.05) differences among linseed plant for fiber length, the results showed significant (P≤ 0.05) differences among linseed plant for fiber yield (ton/fad) in both seasons and significant (P≤ 0.05) differences among linseed plant for fiber % in the second season. Drill sowing methods recorded the highest values for fiber length, fiber yield and fiber % (93.6, 95.0, 0.376, 0.397 and 9.6), respectively. Regarded the effect of weed control effects on fiber yield and their related components were highly significant effects in both seasons. Treatment 6 recorded the highest values (98.3 and 101.4) for fiber length, T4 recorded the highest values (0.428 and 0.451) for fiber yield and T1 recorded the highest values (11.1 and 11.0%) for fiber percentage. These results are agreement with El Azzouni et al. (2006), Nashy (2014), Osman et al. (2010) and Shaheen (2017). All weed control methods recognized their superiority over weedy check in respect of seed yield, stover yield and yield attributing characters by virtue of reduced weed competition. Angiras et al. (1991) also reported that herbicidal treatments produce significantly higher seed yield over unwedded check in linseed.

Interaction effects

Data presented in Table 9, illustrated the effect of interaction between sowing methods and weed control treatments. The effect of interaction between weed control and sowing methods on dry weight of linseed plant in 2015/2016 was significant. T6 (Granstar + Fusilade) with drill method recorded the highest values of dry weight (0.337g) compared with 0.131gm with uses broadcast method and T1 (Unwed). The effect of interaction between weed control and sowing methods on plant height in 2014/2015 was significant. Application weed control T6 (Granstar + Fusilade) with drill method recorded the highest plant height (58.8cm) compared with 27.3cm with uses broadcast method and T1 (Unweed). T6 (Granstar + Fusilade) with drill method was

recorded the highest Technical length and straw yield/plant (112.567 and 2.421) in 2015/2016 and 2014/2015 seasons, respectively. T7 (Hand weed) was recorded the highest straw yield (4.862 and 5.120ton/fad) with uses drill and broadcast sowing methods in 2014/2015 and 2015/2016. seasons, respectively. Fruiting zone length affected significantly (P≤ 0.01) by T6 **(**Granstar + Fusilade) and sowing methods which recorded (25.414 and 23.00) with broadcast and drill method without significant in 2014/2015 season, respectively.

TABLE 8. Effect of planting methods and weed control on fiber length, fiber yield and fiber %, during 2014/2015 and 2015/2016.

Treatment	Fiber length (cm)		Fiber yield (ton/fad)		Fiber %	
	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
A. Plant method						
Broadcast	87.2	91.5	0.332	0.349	8.7	7.8
Drilling	93.6	95.0	0.376	0.397	9.1	9.6
Sig.	**	*	*	*	N.S	*
B. Weed control						
T1- Unwed (Control)	87.4d	90.2d	0.302f	0.318f	11.3a	11.0a
T2- Brominal	77.7e	80.1e	0.332e	0.350e	8.6c	8.3c
T3- Granstar	90.2c	93.1c	0.344d	0.362d	8.9bc	8.6bc
T4- Fusilade	91.5c	94.4c	0.428a	0.451a	10.1b	9.8b
T5- Brominal + Granstar	93.2b	96.2b	0.364b	0.383b	8.6c	8.3c
T6- Granstar + Fusilade	98.3a	101.4a	0.357bc	0.376bc	8.1c	7.9c
T7- Hand weed	94.4b	97.4b	0.352cd	0.371cd	7.7c	7.5c
Sig.	**	**	**	**	**	**
AB	N.S	N.S	N.S	N.S	N.S	N.S

- *,** and N.S indicate P< 0.05, P< 0.01 and not significant, respectively.
- In the same column means followed by the same letter are not significantly different at 5% level according to Duncan Multiple Range Test.

TABLE 9. Means values of dry linseed plants, plant height, technical length, straw yield/plant, straw yield/fad and fruiting zone length as affected by interaction between sowing methods and weed control treatments.

Treatments 2015/16		Dry linseed plant (g/m^2)	Plant height (cm)	Technical length (cm)	Straw yield/ plant (g)	Straw yield/fad (ton/fad)		Fruiting zone length (cm)
		2014/15	2015/16	2014/15	2014/15	2015/16	2014/15	2014/15
Broadcast	T1	0.131c	27.3j	81.47i	0.93b	2.57j	2.94g	13.09f
	T2	0.220b	42.5h	92.45g	1.77a	3.90ch	4.46e	19.66ef
	T3	0.235b	46.5f	95.92f	2.25a	3.79h	4.34e	19.66de
	T4	0.226b	51.7d	101.98e	2.10a	4.23de	4.84bc	20.59cde
	T5	0.205b	46.6f	98.01f	2.05a	4.16ef	4.76c	20.40ef
	T6	0.313a	54.6c	100.20e	2.30a	4.30d	4.92b	25.41bcd
	T7	0.203b	44.1g	96.07f	2.07a	4.47c	5.12a	16.84bcd
Drilling	T1	0.140c	31.4i	89.46h	0.87b	2.87i	2.82g	12.43ef
	T2	0.242b	46.7f	104.50d	1.84a	4.03fg	3.97f	18.00cde
	T3	0.259b	49.8e	106.70c	2.37a	4.11ef	4.05f	17.83a-d
	T4	0.248b	56.0b	112.20a	2.23a	4.44c	4.38e	19.00abc
	T5	0.222b	50.0e	108.90b	2.17a	4.51c	4.45e	18.66ab
	T6	0.337a	58.8a	112.56a	2.42a	4.69b	4.62d	23.00a
	T7	0.203b	49.7e	108.53bc	2.21a	4.86a	4.79bc	15.46ab
F test		**	*	*	*	*	**	**

- *,** indicate P< 0.05 and P< 0.01, respectively.
- In the same column means followed by the same letter are not significantly different at 5% level according to Duncan Multiple Range Test.

Conclusion

Finally, and from the previous results and under these condition of this study, the use of drilling method and Brominal, Granstar against broad weeds and Fusilade, select against grassy weeds in linseed yields successfully decreased weed competition in linseed and consequently improved straw, fiber and seed yields.

References

Abou –Zied, K.A., Hassan, Sanaa S., Khalil, H.E. and Nawar, A.L. (2015) Effect of seeding rates and weed control treatments on productivity and weed suppression in linseed cultivar Sakha 4. *Alex. J. Agric. Res.* **60**(3), 221-228.

Angiras, N.N., Badiyala, D. and Singh, C.M. (1991) Comparative efficacy of herbicides for weed control in linseed (*Linum usitatissimum* L.). *Indian J. Weed Science,* **23**(3-4), 19-23.

.A.O.A.C. (1990) "*Official Methods of Analysis*" of the Association of Official Agricultural Chemists, 15th ed. Washington, D.C.U.S.A.

Chhaganiya, H.J., Patel, A.P. and Patel, V.D. (2017) Efficacy of cultural method of weed control on growth, yield and quality of linseed (*Linum usitatissimum* L.). *Inte. J. Curr. Microbiol. App. Sci.* **7**(2), 2711-2717.

Duncun, D.B. (1955) Multiple ranges and multiple F test. *Biometrics,* **11**, 1-42.

El Azzouni, A.M., Moawad, E.A. and Hussein, M.M.M. (2006) Effect of sowing date and pkanting method on yield and quality of some linseed genotypes. *Egypt. J. Appl. Sci.* **21**(12A) , 42-59.

El Borhamy, Amal M.A. (2011) Effect of planting methods, harvest time and retting on yield and quality of linseed. *Ph.D. Thesis*, Fac. Agric., Kafrelsheikh Univ., Egypt.

El kholy, W.M.H. (1999) Studies of some factors affecting linseed crop production. *M.Sc. Thesis*, Fac. Agric., Kafrelsheikh, Tanta Univ., Egypt.

El-Hariri, D.M., Hassanein, M.S. and Hussein, H.F. (2002) Effect of weed control treatments and nitrogen sources on linseed plants associated weeds in a newly reclaimed land. *Egypt. J. Agron.* **24**, 1-22.

El-Maghraby, M.I.A., Nasr El-Din, T. and Abd El-Baki, M.A. (1985) Joint action effects of some herbicides and plant growth regulators on linseed. *Proc. 6th Arab Pesticides Conf.* Tanta Univ., Vol. **111**, Egypt.

Fahad, S., Hussainm, S., Chauhan, B.S., Saud, S., Wu, C., Hassan, S., Tanveer, M., Jan, A. and Huang, J. (2015) Weed growth and crop yield loss in wheat as influenced by row spacing and weed emergence times. *Crop Protection,* **71**, 101-108.

Husain, K., Dubey, S.D., Verma, R.C., Tripathi, A.K. and Pandey, R.K. (2015) Effect of weed management with post emergence herbicides on seed yield, net return and oil quality of linseed (*Linum usitatissimum* L.). *Current Advances in Agricultural Sciences,* **7**(2), 120-124.

Kineber, M.E.A., Mohamed, A.A.E. and El-Kady, E.A.F. (1997) Influence of planting method and seeding rate on yield and its components of some linseed genotypes. *J. Agri. Res. Tanta Univ.* **23**(3), 289-299.

Mañkowski, J. and Pudelkp, K. (2015) Evaluation of the effect of the tillage system and weed control on the yield of linseed fiber and its quality. *Fibers, Textiles in Eastern Europe,* **23**(3), 111-117.

Nashy, H.A.M. (2014) Effect of some agricultural treatments on some genotypes of flax. *Ph.D. Thesis*, Fac. Agric., Al-Azhar Univ., Cairo, Egypt.

Osman, M.S., Okaz, A.M., Hasanein, E.E. and El-Ninny, E.M. (2010) Effect of linseed varieties, weed control methods under two different sowing methods on weed and linseed crop and its quality. *Egypt. J. Agric. Res.* **88**(4), 1293-1310.

Shaheen, Fatma E.M. (2017) Effect of planting methods and weed control on linseed yield. *M.Sc. Thesis,* Fac. Agric Kafrelsheikh Univ., Egypt.

Snedicor, G.W. and Cochran, W.G. (1981) "*Statistical Methods*". 7th. Iowa State Univ. Press, Iowa, USA.

Sorour, S.G.H., Ibrahim, M.H. and Kniber, H.M. (2015) Effect of planting method on yield and its quality of two linseed cultivars. *J. Agric. Res. Kafrelsheikh Univ.* **41**(3), 820-829.

(*Received* 30/1/2019;
accepted 31/3/2019)

نجاح طرق الزراعه ومقاومه الحشائش فى تحسين كمية وجودة الكتان

داليا عبدربه عبدالعزيز الحاج
قسم المحاصيل – كلية الزراعة – جامعه كفر الشيخ – كفر الشيخ – مصر.

اجري هذا البحث لمعرفة تأثير طرق الزراعة وبعض مبيدات الحشائش على نبات الكتان. أقيمت التجربة بالمزرعة البحثية بمحطة البحوث الزراعية بسخا بمحافظة كفرالشيخ – مصر فى موسمى الزراعة 2015/2014 و 2016/2015. استخدم في تصميم التجربة تصميم القطاعات المنشقة فى نظام القطاعات كاملة العشوائية فى أربعة مكررات. استخدم الصنف سخا 6 في كلا الموسمين. وضعت طرق الزراعة (الزراعة بطريقة البدار والزراعة بطريقة التسطير) فى القطع الرئيسية، معاملات مبيدات الحشائش فى الشقية . بدون معامله - كنترول T1، بروماينال 500 سم^3/فدان T2، جرانستار (6جم/فدان) T3، فيوزيد سوبر (500سم^3/فدان) T4، بروماينال (500 سم^3/فدان) + فيوزيد سوبر 500 (سم^3/فدان) T5، جرانستار(6جم/فدان) + فيوزيد سوبر (500 سم^3/فدان T6، نقاوه يدوية مرتين كل 20 يوم T7.

وبينت النتائج ما يلى:
- وجود اختلافات معنوية بين طرق الزراعة لمعظم الصفات تحت الدراسة. الزراعة بدار سجلت أعلى قطر للساق لنبات الكتان. بينما الزراعة تسطير سجلت أعلى القيم لباقي الصفات.

- كان تأثير معاملات الرش بمبيدات الحشائش عالى المعنوية حيث دلت البيانات على ذلك.
- المعاملة T1 سجلت أعلى قيم لنسبة الألياف واقل قيم لمحصول القش/نبات ومحصول البذور.