Effect of Seeding Rates and Weed Control Treatments oı Productivity and Weed Suppression in Flax Cultivar Sakh

Abou-Zied[1], K. A., Sanaa[2], S. Hassan, Khalil[3], H. E. and Nawar[4], A. I.

[1] Weed Research Central Laboratory, Agricultural Research Center, Giza, Egypt.

[2] Fiber Crop Research Department, Field Crop Research Institute, Agricultural Research Giza, Egypt.

[3] Intercropping Research Department, Field Crop Research Institute, Agricultural Research Giza, Egypt.

[4] Crop Science Department, Faculty of Agricultural, Alexandria University, Egypt.

Received on: 7/10/2015 *Accepted: 30/11/2015*

ABSTRACT

A two years field experiment was conducted during 2012/2013 and 2013/2014 winter seasons at Agı Research Station, Alexandria University, to study the effect of three seeding rates (30,45 and 60 kg/fed.) and eiş control treatments on agronomic characters of flax cultivar Sakha 4 and its companion annual weeds.

Increasing seeding rates had insignificant effect on broad, narrow and total weeds dry weight in the two Application of a combination of Brominal and Select Super was superior to hand weeding twice and individual ap of pre-emergence or post-emergence herbicides in reducing both categories and total weed dry weights.

As seeding rate increased plant height, technical length, seed and biological yields increased significantly lowest to the highest seeding rate, whereas number of capsules per plant, 1000 seed weight, fruiting zone length, of basal and apical branches and seed yield per plant were significantly decreased. Application of post-en herbicide combination of Brominal + Select Super gave significantly improved values for seed yield aı components compared to individual herbicide application, pre or post-emergence, and was comparable or superioı weeding twice in both seasons.

Key words: Flax, seeding rate, weed control, seed yield.

INTRODUCTION

Flax (*Linum usitatissmum*, L.), an important oil and fiber crop in Egypt, occupies a limited cultivated area in Egyptian corporation due to constraints in marketing, weed problems and the competition of flax with other winter crops for cultivated area.

Plants with large leaf area index have higher competition ability with weeds than those lower in such trait. Both light quality and quantity are important aspects regarding competition. Since the presence of dense leaf canopy reduces light availability to weeds, competition for light is greatest (Swanton and Wiese, 1991). Increase in weed density, as crop density decreases, lead to a reduction in soil resources availability to the companion crop and in turn lead to crop productivity decline.

Weeds have many attributes, undesirable to crop production, not the least being their ability to reduce crop productivity, but they also may be hosts for certain pathogens. Plant type and population density, in addition to weed control, can greatly decrease weed competition with crop plants for growth resources.

Flax is a very poor competitor with weeds in early stages of growth and to achieve its higher seed and fiber yields, optimum seeding ra appropriate methods of weed control shc applied. Increase in seeding rates modifies distribution to enhance the crop ability to c with weeds. Herbicides, as a chemical management practice, are considered th common method for controlling weec important in contributing, with crop higher to weeds suppression and yield increases. A higher seeding rates provide enough pl compete with weeds, the use of herbic indispensable and may reduce the need fc higher populations for weeds suppression (1993). Stevenson and Wright (1996) demo that reduction in flax seed yield, due to decreased in response to greater seeding rat those commonly used.

Use of herbicides for weed control in essential for several reasons including: 1) tl growth in early stages that allows weeds, c growth and higher adaptability, to compe crop plants, 2) the presence of weeds ada growth at higher crop plant densities such bind weed (*Cunvolvulus arvensis*, L.) and crop dense stands limits the use of other met weed control such as mechanical or manual h

Hand weeding is not only a traditional for weed control, but it is also expensive anc damage for plants. Therefore, using herbicides as alternative technology for weed control eliminates crop plants injury and, in turn, improve crop productivity. Many investigators recommended several herbicides as effective control methods against broad-leaved weeds, such as Granstar (Mousa, 2002 and Osman *et al*., 2010). However, Abd-El-Samie and Abd-El-Dayem (2000) and Osman *et al.* (2010) found, in divergent studies, that Fusilade showed effective weed control against grass weeds, compared to unweeded check treatment.

Different studies were conducted to investigate the response of plant height, stem diameter, 1000 seed weight and seed yield/fed to herbicide treatments (Kassem, 1992; Ghalwash and Soliman, 2007 and Osman *et al*., 2010).

This investigation was conducted to study the effect of seeding rates and different weed control treatments on agronomic characters and productivity of flax and its companion annual weeds.

MATERIALS AND METHODS

A two years field study was conducted during 2012/2013 and 2013/2014 winter seasons at the Agriculture Research Station, Alexandria University, to study the effect of three seeding rates and eight weed control treatments on flax plants (Sakha 4 cultivar) and its companion annual weeds. Flax seeding rates were 30, 45 and 60 kg/fed, however, the weed control treatments were Stomp (1.25 L/fed), Select Super (0.25 L/fed), Brominal (0.5 L/fed), Granstar (6 g/fed), the combinations of Select Super and Brominal, Select Super and Granstar, hand weeding twice (after three and six weeks from sowing) and unweeded control treatment (check). The trade and common names, as well as the chemical structures, use and time and rate of application of studied herbicides, are presented in Table (1).

Soil at the experimental site was clay-shell with the following chemical characteristics: pH = 8.2, total organic matter = 1.1 %, available N = 35.6 ppm, available P = 10.5 ppm and available K = 610.0 ppm. The design used was the split-plot with three replicates, in which the flax seeding rates and weed control treatments occupied, respectively, the main and sub plots. Each sub plot comprised 10 rows, 20 cm apart and 3 m in length (Subplot area = 6 m^2).

Flax seeds were hand drilled, in the sub plots rows, on November 10 and 12 for the first and second season, respectively.

After 60 days from sowing, weeds were hand pulled at random from one square meter for each sub plot, weeds were classified into broad-leaved and grassy weeds and dry weight of each category and total weeds were recorded after oven d 70 c^o for 24 hrs until constant weight.

Annual weed species prevalent experimental site included broad-leaved (*Malva parviflora*, *Chenopodium murale*, *E nigra* and *Vivia sativa*) and narrow-leaved weeds (*Avena fatua*, *Lolium temulentu Phalaris paradoxa*). Population of grassy comprised 62 to 64 % of the total weed po in the two seasons.

At full maturity stage, representative san 20 plants were randomly selected fror experimental unit to determine flax growth of plant height (cm), technical length (cm), zone length (cm) and number of basal anc branches/plant in addition to numb capsules/plant, 1000 seed weight anc yield/plant. The inner eight rows were harv calculate the seed and straw yields for each s then converted to yields/fed (kg).

Statistical analysis of data was co according to Gomez and Gomez (1984) usi (Statistical Analysis System) ver. 9.01.

RESULTS AND DISCUSSION

The present investigation was condu determine the effect of seeding rate anc control treatments on weed population, see and yield components and agronomic chara flax variety Sakha 4. The results obtained f present study will be presented as follows:

I. Effect of seeding rate and weed treatments on weeds population:

Statistical analysis revealed that seedi had insignificant effect on weed population seasons whereas applied weed control tre significantly affected broad, narrow and tota dry weight in both seasons. The interaction l seeding rate and weed control tre significantly affected broad-leaved wee weight in the two seasons.

With regard to seeding rate, means pres table (2) indicated that there was a tr decrease in both weed categories and total dry weight with increasing seeding rate kg/fed. That may be attributed to the ability plants to compete with weeds, especially leaved species with similar growth hab suppressing their growth.

Siddique *et al*. (2003) concluded that c the seeding rate alters competition above anc ground between flax and associated However, that effect was insignificant i seasons and that may be due to the applic herbicides to control weeds. Stevenson and (1996) concluded that when herbicides were control weeds in flax, no advantage was o with changes in seeding rates.

With respect to weed control treatments, data presented in table (2) indicated that all weed control treatments exerted significant reduction in the dry weight of broad-leaved, narrow-leaved and total weeds compared to the unweeded control, in both seasons, depending on the selectivity of the applied herbicide. The pre-emergence herbicide Stomp gave moderate control for both categories of weeds. Brominal and Granstar gave significant reduction in dry weight of broad-leaved weeds, but had no effect on narrow-leaved weeds hence the total weeds dry weight was relatively high. Similarly, application of Select Super resulted in a significant reduction in dry weight of narrow-leaved weeds, but had no effect on broad-leaved weeds, thus total weeds dry weight was relatively high. The most pronounced effect was observed for herbicides combinations, Brominal + Select Super and Granstar + Select Super, where they significantly reduced the dry weight of both categories of weeds and total dry weight of weeds in both seasons.

Herbicide combinations gave similar weed control values to the traditional method of hand hoeing twice. Similar finding were reported by Kassem (1992), Abd-El-Samie and Abd-El-Dayem (2000), Mousa (2002) and Osman *et al*. (2010) using different herbicides and herbicide combinations.

The interaction between seeding rate and weed control treatments had significant effect on dry weight of broad-leaved weeds only in the two seasons. Obtained data for that interaction (tables 5 and 6) showed a significant superiority of Brominal and Granstar, which are specific post-emergence herbicides for broad-leaved weeds over the pre-emergence herbicide Stomp, the combinations of those two herbicides with Select Super and hand weeding twice in both seasons. The differences were more pronounced at lowest and highest seeding rates compared to the intermediate rate. Also, herbicides combinations were superior to hand weeding twice in reducing dry weight of broad-leaved weeds, in the second season, at lowest and highest seeding rates compared to the intermediate rate. The data, also, cleared the effect of seeding rate on dry weight of broad-leaved weeds where it could be observed, in the check, that increasing seeding rate resulted in a significant reduction in dry weight of broad-leaved weeds in both seasons. These findings are in agreement with those reported by Abd El-Samie and Abd El-Dayem (2000), Mousa (2002) and Osman *et al*. (2010) who reported that all weed control treatments exerted significant reduction in the dry weight of broad-leaved weeds, and the magnitude of reduction was closely related to the applied seeding rate of flax.

II. Effect of seeding rate and weed treatments on agronomic characters o

Statistical analysis showed that both rate and weed control treatments had sig effects on all studied agronomic characters o the two seasons. Moreover, the interaction b the two studied factors was significant for te length, 1000 seed weight, number of basal b and seed yield/plant in the two seasons, wh was significant for fruiting zone length in the season only.

As seeding rate increased (tables 3 and height, technical length, seed and biologic per feddan increased significantly from the lo the highest seeding rate, in both seasons. contrary, number of capsules per plant, 10 weight, fruiting zone length, number of ba apical branches per plant and seed yield p decreased significantly from the lowest highest seeding rate in both seasons. Th indicated that the flax plant tended to perfo fiber producing plant with taller plant hei technical length, in addition to fewer ba apical branches, at higher seeding rates, wh tended to perform as an oil producing cro higher 1000-seed weight and number of c per plant leading to higher seed yield per lower seeding rates. These results were sin those reported by other researchers for plan (Mostafa, 2003 and El-Deeb *et al*., 2006), te length (Abd El-Daiem, 2004), 1000 seed (Abou-Zaid and Al-Azony, 2003), num capsules per plant (Kineber, 2003 and Sid *al*., 2003), seed and biological yields (Steven Wright, 1996 and Kineber *et al*., 1997), nu basal and apical branches per plant (Steven Wright, 1996) and seed yield per plant (Sid *al*., 2003 and Zedan, 2004).

Concerning the effect of weed treatments, means presented in table (3 indicated a significant effect for applied control treatment on all studied agr characters of flax in the two seasons.

Application of post-emergence he combination, especially Brominal and Select was superior to application of individual pre emergence herbicides in all seed yield an components, and was either comparable or s to hand weeding twice. However, the weed recorded higher values for plant height and te length, with lowest values for number of ba apical branches per plant. That might be ex by the higher competition exerted on the fla by weeds population in the unweeded Otherwise, the weedy check was signi inferior to weed control treatments.

These findings were in harmony with those reported by Kassem (1992), Abd El-Samie and Abd El-Dayem (2000) and Mousa (2002). However, Ghalwash and Soliman (2007) and Osman *et al*. (2010) reported that weed control treatments had significant effect on 1000 seed weight and seed yield.

Means for the interaction between the two studied factors (tables 5 and 6) showed significant differences between weed control treatments for technical length, 1000 seed weight, number of basal branches per plant, seed yield per plant and fruiting zone length, and these differences varied according to the applied seeding rate. With regard to technical length, the highest value was obtained from the weedy check and the highest seeding rate, whereas the lowest value was recorded for Brominal and Granstar at the lowest seeding rate, in both seasons. The remaining characters showed a decreasing trend with increasing seeding rate, where the ma of reduction was highest at the highest seedi The herbicides combination of Brominal + Super gave the highest values, whereas the check gave the lowest values in the two s The results obtained from the present inves revealed that increasing seeding rates supplemental weed control, especially broad weeds. The implementation of seeding rat integrated weed management practice v dependent on herbicide and flax seed costs, revenue loss from flax – weed inter Moreover, the combinations between herbic broad and narrow-leaved weeds are recomn over individual herbicides, for controllin weed categories in the flax crop, since the comparable, or even superior, to the conv method of hand hoeing twice especially v increasing labor costs.

Table 5: Means of Broad-leaved weeds dry weight, Technical length, 1000 seed weight, Number c branches and Seed yield per Plant as affected by seeding rates and weed control trea interactions in 2012/2013 season.

Seeding rate	Weed control treatments	Broad-leaved weeds dry weight (g)	Technical length (cm)	1000 seed weight (g)	No. of basal branches	Seed yield/ Plant (g)
D_1 30 kg	Stomp	25.67	71.5	9.2	2.33	1.43
	Brominal	18.33	68.8	9.6	2.07	1.29
	Granstar	20.33	69.0	8.8	1.43	1.08
	Select Super	298.3	71.1	8.6	1.87	1.21
	Brominal + Select Super	24.00	74.9	10.5	2.73	1.82
	Granstar + Select Super	28.00	70.3	9.2	2.17	1.40
	Hand hoeing twice	26.40	73.2	10.0	2.50	1.67
	Unweeded control	303.1	77.2	7.9	1.37	1.00
D_2 45 kg	Stomp	21.00	75.3	8.5	2.03	1.21
	Brominal	15.44	71.2	9.3	1.73	1.18
	Granstar	17.00	74.4	8.3	1.40	1.05
	Select Super	285.0	73.3	8.4	1.50	1.11
	Brominal + Select Super	21.33	79.1	9.9	2.23	1.41
	Granstar + Select Super	22.33	73.4	8.7	1.83	1.22
	Hand hoeing twice	23.67	75.5	9.4	2.10	1.45
	Unweeded control	286.3	81.2	7.5	1.20	1.00
D_3 60 kg	Stomp	19.00	79.1	7.7	1.63	1.09
	Brominal	13.93	73.6	8.5	1.30	1.08
	Granstar	15.00	74.4	8.3	1.00	0.98
	Select Super	284.4	74.1	7.5	1.33	0.97
	Brominal + Select Super	19.67	82.7	9.1	1.83	1.35
	Granstar + Select Super	20.33	75.4	7.9	1.40	1.11
	Hand hoeing twice	22.67	78.4	8.9	1.67	1.31
	Unweeded control	273.7	84.4	6.8	1.00	0.82
L. S. $D_{0.05}$		2.95	1.4	0.4	0.07	0.09

Table 6: Means of Broad-leaved weeds dry weight, Technical length, 1000 seed weight, Number o branches and Seed yield per Plant and Fruiting zone length as affected by seeding rates an control treatments interactions in 2013/2014 season.

Seeding rate	Weed control treatments	Broad-leaved weeds dry weight (g)	Technical length (cm)	1000 seed weight (g)	No. of basal branches	Seed yield/ Plant (g)	Fruiting zone length (cm)
D_1 30 kg	Stomp	60.00	67.5	8.5	2.13	1.32	18.4
	Brominal	7.66	65.0	8.8	1.90	1.19	16.0
	Granstar	8.33	65.1	8.1	1.33	0.99	15.2
	Select Super	333.3	67.1	8.0	1.73	1.07	15.6
	Brominal + Select Super	28.33	70.7	9.7	2.53	1.68	19.9
	Granstar + Select Super	16.33	66.4	8.6	2.00	1.29	18.1
	Hand hoeing twice	23.34	69.0	9.3	2.30	1.57	19.7
	Unweeded control	310.1	72.8	7.3	1.30	0.92	13.5
D_2 45 kg	Stomp	56.0	71.1	8.1	1.83	1.17	17.3
	Brominal	5.00	68.2	8.7	1.53	1.10	15.5
	Granstar	6.11	70.3	7.7	1.20	0.96	15.4
	Select Super	321.7	69.1	7.8	1.30	1.01	14.8
	Brominal + Select Super	23.33	74.7	9.3	2.03	1.38	18.8
	Granstar + Select Super	12.63	69.3	8.2	1.63	1.13	17.3
	Hand hoeing twice	14.01	71.3	8.9	1.90	1.35	18.5
	Unweeded control	290.3	76.7	7.1	1.00	0.81	13.1
D_3 60 kg	Stomp	44.33	74.6	7.4	1.53	1.01	16.6
	Brominal	3.33	69.5	8.1	1.30	0.98	14.6
	Granstar	5.13	70.2	7.4	0.97	0.86	13.8
	Select Super	319.3	69.7	7.2	1.23	0.89	14.3
	Brominal + Select Super	21.00	78.1	8.8	1.83	1.27	18.1
	Granstar + Select Super	10.64	71.2	7.6	1.40	1.03	16.7
	Hand hoeing twice	16.67	74.2	8.5	1.67	1.21	18.1
	Unweeded control	278.7	80.0	6.5	1.00	0.72	12.2
L. S. $D_{0.05}$		4.01	1.3	0.1	0.07	0.05	0.1

REFERENCES

Abd-El-Daiem, M. A. M. **2004**. Evaluation of some flax genotypes under different plant densities. M. Sc. Thesis, Fac. of Agric., Al-Azhar Univ.,Egypt.

Abd El-Samie, F. S. and M. A. Abd El-Dayem. **2000**. Effect of seeding patterns, tillage systems and weed control on yield and quality of flax. Fayoum J. Agric., Res. & Dev., **14**: 175-188.

Abou-zaid, T. A. and A. M. Al-Azoy. 2003. Response of flax to leveling, planting methods and seeding rates. J. Agric. Sci. Mansoura Univ., **28 (9)**: 6577-6589.

El-Deeb, I. A. E., N. A. Mohamed and Eman, A. E. El-Kady. **2006**. Effect of seeding rates, planting methods and phosphorous fertilizer sources on yield and its components of Sakha 2 flax cultivar. Zagazig J. Agric. Res., **33 (1)**: 27-45.

Ghalwash, A. M. and I. E. Soliman. **2007**. E of some weed control treatments on weeds, growth characters and yield components of flax (*Linum usitatissim* Egypt J. Agric. Res., **68 (1)**: 383-394.

Gomez, K. A. and A. A. Gomez. **1984**. St Procedures for Agriculture Research. John Wiley and Sons, New York, USA.

Kassem, M. M. **1992**. Productivity of flax "Giza 6" as affected by some weed treatments and seeding rates. Ann. Agr Moshtohor, **50 (1)**: 145-156.

Kineber, M. E. A. **2003**. Flax plants perform influenced by planting methods and rate. J. Agric. Tanta Univ., **29 (1)**: 64-73

Kineber, M. E. A., A. A. E. Mahmoud and I El-Kady. **1997**. Influence of planting and seeding rate on yield and its compo some flax genotypes. J. Agric. Tanta U **(3)**: 264-274.

Lafond, G. P. **1993**. The effects of nitrogen, row spacing and seeding rate on the yield of flax under a zero-till production system. Can. J. Plant Sci., **73 (2)**: 375-382.

Mostafa, S. H. A. **2003**. Response of Sakha 1 and Sakha 2 flax varieties to harvesting times and plant densities. 10th National Con. of Agron. Fac. Environ. Agric. Sci. El-Arish Sues Canal Univ. **October, 7-10**.

Mousa, A. M. **2002**. Effect of weed control on yield and quality for some genotypes in flax. M. Sc. Thesis, Fac. of Agric. Al-Azhar Univ., Egypt.

Osman, M. S., A. M. Okaz, E. E. Hassanein and E. M. El-Ninny. **2010**. Effect of flax varieties, weed control methods under two different sowing methods on weeds and flax crop and its quality. Egypt. J. Agric. Res., **88 (4)**: 1293-1309.

Siddique, A. B., D. Wright, A. Khatun Naher. **2003**. Studies on the effects of position on the mother plant and sowing on flowering, capsule production, seed yield components and viability (germina flax seeds. Pakistan J. Biol. Sci., **6 (1(** 944.

Stevenson F. C. and A. T. Wright. **1996**. rate and row spacing affect flax yields ar interference. Can. J. Plant Sci., **76 (3)**: 5

Swanton, C. J. and C. J. Wiese. **1991**. In weed management: the ration and ap Weed Technol., **5 (3)**: 657-663.

Zedan, Z. A. Z. **2004**. Response of sor varieties to planting methods and densities. Egypt. J. Appl. Sci., **19 (9 A** 121.

الملخص العربى

ير معدلات التقاوى ومعاملات مقاومة الحشائش على إنتاجية وتقليل الحشائش فى صنف الكتان سخا 4

خالد عباس أبوزيد[1]، سناء سعيد[2]، حسن السيد خليل[3] وعلى عيسى نوار[4]

[1] المعمل المركزى لبحوث الحشائش – مركز البحوث الزراعية – الجيزة – مصر.

[2] قسم بحوث الألياف – معهد بحوث المحاصيل الحقلية– مركز البحوث الزراعية– الجيزة – مصر.

[3] قسم بحوث التكثيف – معهد بحوث المحاصيل الحقلية– مركز البحوث الزراعية– الجيزة – مصر.

[4] قسم علوم المحاصيل – كلية الزراعة – جامعة الإسكندرية – مصر.

محمد على مجاور عبادة، ماهر خيرى يواقيم، بسام السيد عبد المقصود بلال

قسم بحوث العنب – معهد بحوث البساتين– مركز البحوث الزراعية– الجيزة– مصر

ت تجريتان حقليتان خلال الموسمين الشتويين 2013/2012 و2014/2013 بالمزرعة البحثية لكلية الزراعة، لإسكندرية لدراسة تأثير ثلاثة معدلات زراعة(30 و 45 و 60 كجم/ف) وثمانى معاملات لمكافحة الحشائش ـفات الخضرية والمحصولية للكتان– صنف سخا 4 – والحشائش المصاحبة له.

. أنه بزيادة معدل الزراعة لم يتأثر معنوياً الوزن الجاف لكل من الحشائش عريضة وضيقة الأوراق والوزن لحشائش الكلية، فى كلا الموسمين. كان تطبيق معاملة برومينال + سلكت سوبر أفضل من النقاوة اليدوية ما أدى تطبيق مبيدات الحشائش منفردة، سواء قبل أو بعد الانبثاق، إلى تقليل كلا نوعى الحشائش والحشائش

دة معدل الزراعة أزداد معنويا كل من ارتفاع النبات، الطول الفعال، محصول البذور والمحصول البيولوجى، فض معنوياً كل من عدد الكبسولات للنبات، وزن 1000 بذرة، طول المنطقة الثمرية، عدد الأفرع القاعدية ومحصول البذور للنبات.

، تطبيق معاملة برومينال+ سلكت سوبر بعد الانبثاق إلى زيادة معنوية فى محصول البذور ومكوناته بالمقارنة م مبيدات الحشائش منفردة، قبل أو بعد الانبثاق، أو النقارة اليدوية مرتين، فى كلا الموسمين.