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EFFECT OF SOWING METHODS AND SOME WEED CONTROL TREATMENTS ON DODDER CONTROL IN FLAX CROP

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ABSTRACT

Two field experiments were conducted at Sakha Experimental Station during 2004/2005 and 2005/2006 seasons to determine the effect of different sowing methods {dry method (afir) and dry method after false irrigation (hyrathy)} and weed control treatments (hand combing, imazethapyr, imazamox and butralin) on controlling dodder weed *Cuscuta epilinum* and on some growth characters of flax plants *Linum usitatissimum, L*. Results showed that the different sowing methods and hand combing were only suitable to avoid the competition of dodder weed due to their low weed population density. Also, the results showed that herbicides prevented the infestation with dodder up to 49 days in flax after treatments. All tested herbicides increased the plant height, number of capsules/plant, fiber yield and seed yield of flax crop in both seasons with different rations as compared to infested control treatment. Also, the results indicated that imazethapyr herbicide was least effective on chlorophyll content hence it caused 36.65% inhibition at 0.07 l/fed (twice) after 49 days from treatment, followed by imazamox at 0.4 l/fed (twice) 30.11% inhibition and butralin at 2.0 l/fed when used surface application at the same time. These results indicate that under heavy invested soil with dodder, it is possible to sowing after false irrigation (hyrathy) method with the application of herbicides i.e. butralin at 2.0 l/fed or imazamox at 0.4 l/fed (twice). These practices gave the highest reduction in dodder injury and increased flax yield and its components.

INTRODUCTION

The flax (*Linum usitatissimum, L*.) is considered as the second most important fiber crop in Egypt after cotton. In the recent years an increasing numbers of farmers have been reporting troubles due to dodder (*Cuscuta spp)* infection. Al-Menoufi *et al*. (1985) recorded that three species of (*Cuscuta spp)* parasitized on fourty eight host plants in different Governorates of the Nile Delta namely; Alexandria, Menoufia, Behera and kafr El-Sheikh.

Dawson (1978) reported that infection leads to large losses by reducing seed yield, lowering seed quality, interfering with machine harvesting and adding to the costs of seeds cleaing. Al-Shair (1986) mentioned that *Cuscuta epilinum* decreased flax technical length and fibre length, straw yield, seed yield and extracted oil indine value, and increased seed moisture content, refractive index and acid value of extracted oil, while number flax seed/g, seeds germination percentage, fiber finess, wast percentage and oil percentage were unaffected. Lang *et al.* (1989) carried out some field trials in soyabeans at three locations in younging country, Ningxia. They sprayed 60 –250 ml butralin/mu (1mu = 0.0067ha.) soil-incorporated alon or in combination at three-leaf stage of soyabean. The application

provided 32.6 – 100% control of *Cuscuta chinensis* and resulted in increases in 100 grain weight. The yield was 46.1 and 88.2% respectively. Khallida *et al.* (1993) reported that imazethapyr at 75 g a.i/ha was highly effective in controlling the parasitic weeds (*Cuscuta spp)* in faba been when applied as post-emergence. Also, provided at 20 g a.i./ha gave good control of *Cuscuta spp*. infestation without exhibiting any phytoxicity. Faghih *et al*. (1998) assessed the efficacy of 1.5 – 2.5 kg/ha Kerb (propyzamide) and 0.125 – 0.75 kg Pursuit (imazethapyr) applied as post-emergence for the control of *Cuscuta spp*. and other weeds in alfalfa (Lucerne, *Medicago sativa*). Results indicated that Kerb gave good control of *Cuscuta spp.* over the ranges tested. Best lucerne yields were achived with 0.125 kg Pursuit (76.5 and 19.2% increases in yield at 1st and 2nd cut, respectively. 2.5 kg Kerb 17.9% caused increase at 2nd cut. C*uscuta spp*. had most impact at the 2nd cut. Dimitrova (1998) carried out experiments at the Institute of Feeds in Pleven on a chernozem soil type moderate thickness. Alfalfa (lucerne) was treated in the year of its stand establishment with pivot 100 EK (100g imazethapyr/litre), applied at the rate of 100 –150 ml/ha during the 2nd – 4th trifoliate leaf phase. This treatment was effective not only against dodder (*Cuscuta spp)* but also against annual weeds.

The integrated control of dodder *Cuscuta spp.* may serve as alternative to high rate of herbicides, especially when used to as synergistic to other methods control and to reduce water pollution and costs of using the potent and highly expensive herbicides. Sher and Shad (1989) found that manual control hand plucking of *Cuscuta spp*. did not gave effective control. Allowing *Cuscuta spp*. to germinate and then destroying it by tillage gave some control and when combined with hand plucking complete control was achieved. It is well known that post-emergence herbicides may affect chloropyll content of flax plants. In these respect, Soliman (2002) reported that butralin had the least effect in inhibiting chlorophyll content after sixty three days from application at rate of 2.0 and 2.5 l/f. as soil incorporation. It decreased total chlorophyll contents by 19.89 and 21.88%, respectively. Also, gave significant increase in straw and seed yields of flax.

The aim of the present investigation was to study the effect of sowing methods and some weed control treaments in controlling dodder and their effect on growth of flax plants**.**

MATERIALS AND METHODS

Two field experiments were conducted at Sakha Agricultural Research Station during the two successive seasons of 2004/2005 and 2005/2006 to study the effectiveness of some herbicides for controlling dodder, (*Cuscuta epilinum)* in flax; (*Linum ustatissimum L.* c.v. Giza 7) under two different sowing methods, {dry method (afir) and dry method after false irrigation (hyrathy)}. Sowing dates were during the third week of October in both seasons. Split plot design was used with four replicates. The main plots were assigned to the sowing methods. Meanwhile, weed control treatments were randomally distributed at the sub plots. The plot area was 3.5 x 3 m2 and artificially infested by dodder seeds, where dodder seeds were mixed with

soil at 5% of flax seeds (W/W). In this study eight treatments were used as follow:-

1 – Pursuit (imazethapyr 10% AS) at the rate of 0.17 L/fed (twice), the first after fourty five days from sowing, and the second after three weeks later.
2 - Imidazolinone (Imazamox 18% EC) at the rate of 0.4 L/fed (once) after fourty five days from sowing and the appearance of dodder.
3 – Imidazolinone (Imazamox 18% EC) at the rate of 0.4 L/fed (twice), the first after fourty five days from sowing and the second after three weeks later.
4 – Amex (butralin 48% EC) at the rate of 2.0 L/fed soil incorporation.
5 – Amex (butralin 48% EC) at the rate of 2.0 L/fed surface application (after sowing and befor irrigation).
6 – Hand combing (twice), the first after fourty five days from sowing and the second after three weeks later.
7 – Healthy plants (non-infested).
8 – Control (infested).

Herbicides in both field experiments were sprayed by Knapsack sprayer CP3 with water volume of 200 liters per fed. Herbicidal nomenclature are listed in table 1. In both seasons, calcium super phosphate (15.5% P2O5) at the rate of 100 Kg/fed was added during land preparation for sowing and ammonium nitrate (33.5% N) at the rate 100 Kg/fed was added before the 1st and 2nd irrigation.

Table 1 : Nomenclature of herbicides used in this investigation.

Commn name	Trade name	Chemical name
Imazethapyr	Pursuit	2 – [4,5 – dihydro – 4- methyl - 4 - (1 – methylethyl) – 5 – oxo – 1 H- imidazol – 2yl] –5 – ethyl –3 pyridine – carboxylic acid.
Imazamox	Imidazolinone	(+)–2-{4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl}-5-(methoxymethyl)-3-pyridinecarboxylic acid.
Butralin	Amex	4 – (1,1 – dimethylethyl) – N – (1 – methylpropyl) – 2, 6 – dinitrobenzenamine.

All agronomic practices in flax such as land preparation, fertilization and irrigation were done as recommended during the two seasons study. Samples of dodder *Cuscuta epilinum* were taken from 1m2 After 21, 35 and 49 days from the last treatment to determine the reductin percentage in fresh weight of dodder. The samples of flax were taken after 70, 90 days from sowing and at harvest to determine plant height (cm), number of capsules per plant, fiber yield (kg/fed.) and seed yield (kg/fed.). Percent of reduction (R%) was calculated according to Topps and Wain (1957) formula as following:-

$$R\ \% = \frac{A - B}{A} \times 100$$

Where;-

A = The fresh weight of weeds in untreated plot.
B = The fresh weight of weeds in treated plot.

Chlorophyll content:

Chlorophyll a, b and total chlorophyll content as mg/gm fresh weight were determined according to Sweeny and Martin (1961).

Statistical analysis:

Data of the two experiments were subjected to proper analysis of varians according to Snedecor and Cochran (1980). The combined analysis was conducted for the data of the two rxperiments according to Gomez and Gomez (1983). Means were compared at 5% level of significance by the least significant different (LSD) test. All statistical analysis were performed by using analysis of variance of (IRRISTAT and MSTAT) computer software package.

RESULTS AND DISCUTION

1 – Effect of sowing methods, weed control treatments and their interaction on dodder in flax:

Data presented in Table 1 show the effect of sowing methods, weed control treatments and their interaction on reduction percentages of fresh weight of (*C. epilinum*) at 21, 35 and 49 days after last treatment. Concerning sowing methods, data clearly indicated that the difference between sowing methods was not significant in dodder; *C.epilinum* control, but the second method { dry method after false irrigation(hyrathy)} was better than the dry method (afir).

Data also revealed that the (*C. epilinum*) was very sensitive to the herbicide butralin at a rate of 2.0 l/fed when used as surface application, or soil incorporation, hence it found that this herbicide prevent seeds germination of (*C. epilinum*) particularly after fourty nine days from last treatment.

The hand combing treatment was the least effective in (*C. epilinum*) control with percent of reduction 32.5% . On the other hand, herbicide imazamox at a rate of 0.4 l/fed when used once or twice, followed by imazethapyr at a rate of 0.17 l/fed. when used twice were the most effective treatments on (*C. epilinum*). These results are in agreement with that of Khallida *et al.* (1993).

Results in Table 1 generally, revealed that all herbicides caused deleterious effects to *C. epilinum*, but the herbicides differed in the time needed to show these effects. Some of these exhibited a good effect within short time and the other needed a long time after application.

It was observed that the percents of reduction data of (*C. epilinum*) were slightly affected by hand combing treatment as compared with other tested herbicides, This, the results confirmed that hand combing treatment was not enough to control *C. epilinum* weeds. Those results agreed with the results obtained by Sher and Shad (1989). Also, from the above results it could be concluded that the herbicides butralin, imazamox and imazethapyr had a deep determinated effects on (*C. epilinum*) weeds.

Concerning the interaction between sowing methods and weed control treatments, this interaction had significant effects on reduction percentages of fresh weight (*C. epilinum*) after fourty nine days from last

treatment. The application of butralin gave the best results under the second sowing method {dry method after false irrigation (hyrathy)}.

Result shoud that the herbicides caused significant reduction in weight of (*C.epilinum*) in flax after different times of treatments. On the other hand, the results showed that sowing methods were not significant in dodder control.Their interaction caused significant reduction of dodder in flax plants. The present results showed that herbicides (soil application) were the most effective treatments for the control of (*Cuscuta spp).* Similar results were reported by Rao (1991) who mentiond that pendimethalin at 0.75, 1.25 and 1075 kg/ha which was tested as a pre-sowing applicaion was significantly effective in reducing the infestation of (*Cuscuta spp),* also, Abd El-Wahed (1996) showed that pendimethalin at 800, 600, 400 and 200g a.i./fed was effective for the control of *Cuscuta spp*. in lupine, Egyptian clover and chickoea.

2 – Effect of sowing methods, weed control treatments and their interaction on yield and its components of flax plants:

2.1. Plant height of flax:

Data presented in Table 2 show the effect of sowing methods, weed control treatments and their interaction on plants height (cm) at 70 and 90 days after sowing as well as at harvest.

Concerning sowing methods, data clearly indicated that plant height was not significantly affected, hence it could be noticed that plant height approximately was equal in the two sowing methods at 70, 90 days and at harvest.

Weed control treatments had a significant effect on plant height at 70, 90 days and at harvest. All tested herbicides increased the plant height at the three times as compared with the hand combing treatment, the latter approximatly slightly increased or was equal with the infested control treatment. This results are similar with that obtained by Al-Menoufi (1985) andAl-Sahir (1986). Also, these results agreed with the results of Fesehaie (1992) who observed that the twining vines of these parasitic weed not only deprive the host plants of nutrients but also inhibit growth.

Data also revealed that the herbicide butralin at rate of 2.0 l/fed gave the tallest plants and increased the plant height by about 19.12 and 17.12 cm at harvest when used as incorporation in soil or surface, as compared to the infested control treatment, followed by imazamox at rate of 0.4 l/fed when used once or twice post-emergence, while the herbicide imazethapyr gave the lowest plant height as compared to the other herbicides.

Plant height of flax was not significantly affected by the interaction between sowing methods and weed control treatment. The tallest plants were recorded under the second sowing method by applying the tested herbicides at 70,90 days and at harvest.

2.2. Number of capsules / plant:

Results presented in Table 3 revealed that sowing methods was not significantly effect on number of capsules/plant in both growing seasons, hence the second sowing method {dry method after false irrigation (hyrathy)} gave number of capsules / plant approximately equality with the other sowing method { dry method (afir)}.

T2-3

Results on the response of number of capsules / plant to weed control treatments denoted that weed control treatments increased number of capsules / plant as compared to the infested control treatment. This might be attributed to that flax plant in the latter treatment exposed to severe competition from dodder (*C. epilinum*) weed. The highest significant number for capsules per plant was observed in the case of herbicide butralin treatment at rate of 2.0 l/fed. when incorporated into soil pre-emergence. Imazamox at rate of 0.4 l/ fed (twice). The same herbicide when used (once) and imazethapyr 0.17 l/fed twice, these treatments increased the number of capsules per plant by 75.74, 67.12, 62.69, 53.71, and 46.63 % respectively. The treatment of hand combing recorded the least number of capsules / plant hence it, increased the number by only 23.32 %.

Data also included that the interaction between sowing methods and weed control treatments was not significant with regard to the number of capsules / plant at harvest.

2.3 Fiber yield (kg/fed):

Data in Table 3 revealed that sowing methods was not significant effect on fiber yield (kg/fed.) at harvest. Second sowing method increased the fiber yield of flax plants, this might be attributed to the second sowing method which caused reduction in weed density, hence it is suitable to avoid the strongst competition of dodder (*C. epilinum*), consequently to avoid the great exhausting of these weed and its negative impacts on flax plants and quality.

Data also revealed that fiber yield (kg/fed) was significantly affected by weed control treatments. The reduction in fiber yield values under hand combing treatment and infested control treatment reflected the negative impacts of dodder; (*C. epilinum*) on flax growth which may be occurred as a result of the competition between flax plants and dodder weed.

Herbicides were superior in increasing fiber yield of flax plants than hand combing treatment as compared with infested control treatment in both seasons, it could dependnt an *C. epilinum* control program, but it was used as a help factor. Also the results showed that using the tested herbicides was necessary to eliminate this weed and to avoid its negative impacts on crop plants. Fiber yield was not significantly affected by the interaction between sowing methods and weed control treatments.

2.4. Seed yield (kg/ fed):

For the effect of sowing methods on seed yield data in table 4 clearly revealed that differences between sowing methods were not significant in both seasons. but the second sowing method {dry method after false irrigation(hyrathy), gave the highest seed yield (599.25 kg/fed) while the first sowing method {dry method (Afir)} gave the least seed yield (552.95 kg/fed). Seed yield tended to be much lower with first sowing method, where seed yield losses due to first sowing method reached 46.3 kg/fed Regarding the effect of weed control treatments on seed yield, data denoted that weed control treatments had a significant effect on seed yield. The hand combing treatment recorded the lowest seed yield (546.3 kg/fed) where seed yield losses from compitition reached 59.8 kg/fed as compared to seed yield estimated from non-infested treatment (606.15 kg/fed). The above results

presented in Table 4 agreed with the obtained by Al-Menoufi *et al*. (1985) and Al-Shair (1986).

Comparing results between hand combing treatment and the tested herbicides generally, indicated that the highest increase in seed yield was achieved from the herbicide imazamox at rates of 0.4 l/fed. whether used twice or once, follwed by butralin at 2.0 l/fed. and imazethapyr. Hand combing treatment gave the lowest seed yield as compared with the all tested herbicides. This result showed that single hand combing and sowing methods were insufficient to provide the desired weed control level and this was reflected on the limited increases in the crop growth and consequently on fiber yield. This results is similar to that obtained by Sher and Shad (1989). These effects might be attributed to the dominant weeds in the hand combing treatment, and this assure on the important using of the suitable herbicides due to the expected proplem of dodder (*C. epilinum*) weed.

Seed yield was not significantly affected by the interactions between sowing methods and weed control treatments. The results tabulated showed that sowing methods only were useful in dodder control in infested soil with dodder, while non-useful in the case of the infested crop seeds with dodder. This means that those tretments were suitable to avoid the competition of dodder weed due to their low weed population density. All tested herbicides increased the seed yield of flax crop with different ratios as compared to infested control treatment.

3 - Effect of tested herbicides on chlorophyll contents:

Data presented in Table 4 showed the effect of different herbicidal treatments of dodder weed on chlorophyll content in the leaves of flax plants. The results revealed clearly that untreated healthy plants gave the highest chlorophyll content i.e. a, b and total chlorophyll. After thirty five days from applications, chlorophyll contents were decreased by 32.32 % with the herbicide imazethapyr at rate of 0.17 l/fed when applied twice on flax plants. Imazamox herbicide when used at rate of 0.4 l/fed once of caused decrease in total chlorophyll contents by 21.95%, this reduction increased by the increase of the herbicide rate, hence it recorded reduction of total chlorophyll contents by 25.91% when used with the same rate twice on flax plants after thirty five days application.

Also, the results tabulated revealed that the herbicide butralin had the least effect on inhibition of total chlorophyll contents after thirty five days from application when used at rate of 2.0 L/fed as surface application (after sowing and befor irrigation) it caused percentage of reduction as 17.03 % for total chlorophyll contents.

The obtained resukts showed that chlorophyll a was more sensitive to of the herbicides than chlorophyll b in the leaves of flax plants, these results agreed with that of Soliman (1997) who reported that chlorophyll a was more sensitive to tested herbicides than chlorophyll b in the leaves of water-hyacinth plants. The data presented in Table (4) showed that the most effective reducing agent of chlorophyll content of flax plants found to be the dodder weed, while the all tested herbicides showed least effective on chlorophyll content comparing with the former treatments, hence were less risky to chlorophyll content of flax plants.

T4

Table 5: Effect of some herbicides on chlorophyll contents (Mg/g) in flax leaves plants after 21 and 35 days from aplication.

Treatments	Rate/F	21 days					
		Chlorophyll a		Chlorophyll b		Total chlorophyll	
		mg /g	1%	mg /g	1%	mg /g	1%
Imazethapyr (twice)	0.17 L	1.07	26.21	0.91	22.22	1.98	24.71
Imazamox (once)	0.4 L	1.27	15.86	1.03	11.97	2.25	14.45
Imazamox (twice)	0.4 L	1.17	19.31	1.99	15.38	2.16	17.87
Butralin(incorp.)	2 L	1.23	14.48	1.05	10.26	2.28	13.31
Butralin (surfase)	2 L	1.28	11.72	1.08	7.69	2.36	10.27
Infested		0.81	44.14	0.60	48.72	1.41	46.39
Control (uninfested)		1.45	0.00	1.17	0.00	2.62	0.00
		35 days					
Imazethapyr (twice)	0.17 L	1.14	31.33	1.05	25.53	2.19	32.32
Imazamox (once)	0.4 L	1.32	20.48	1.19	15.60	2.51	21.95
Imazamox (twice)	0.4 L	1.25	24.70	1.15	18.44	2.40	25.91
Butralin(incorp.)	2 L	1.34	19.28	1.22	13.48	2.56	20.43
Butralin (surfase)	2 L	1.38	16.87	1.25	11.35	2.63	17.03
Infested		0.82	50.60	0.64	54.61	1.46	52.13
Control (uninfested)		1.66	0.00	1.41	0.00	3.07	0.00

Mg/g = Weight chlorophyll determined by Mg per g of leaves of clover plants.
I% = Percent inhibition of the the chlorophyll weight was calculated in relation to control.

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تاثير طرق الزراعة وبعض معاملات الحشائش على مكافحة الحامول فى الكتان

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أجريت تجربتان حقليتان فى مزرعة محطة البحوث الزراعية بسخا – كفر الشيخ خلال موسمى الزراعة ٢٠٠٤ – ٢٠٠٥ و٢٠٠٥ – ٢٠٠٦ لدراسة تاثير طرق الزراعة المختلفة وهى:-

ا – طريقة العفير العادى.

ب – طريقة العفير المحسن (الزراعة بعد رية كدابة).

وبعض مبيدات الحشائش (ايمازيثبير –ايمازاموكس – بيوترالين) بالاضافة الى معاملة النقاوة اليدوية على مكافحة حشيشة الحامول و نمو نباتات الكتان.

صممت التجربة فى قطع منشقة مرة واحدة فى اربع مكررات حيث احتوت القطع الرئيسية على طرق الزراعة بينما وزعت معاملات مكافحة الحشائش فى القطع الشقية. وقد تم زراعة التجربة بصنف جيزة ٧ فى كلا موسمى الزراعة.

اوضحت النتائج ان معاملة النقاوة اليدوية وطرق الزراعة المختلفة بمفردها غير كافية لمكافحة الحامول ولكن يمكن استخدامها فقط كعامل مساعد فى برنامج المكافحة المتكاملة . ايضا اشارت النتائج الى ان مبيد بيوترالين اعطى مكافحة جيدة للحامول تحت ظروف الزراعة بطريقة العفير المحسن يليه مبيد ايمازاموكس ثم ايمازيثبير.

ادت اصابة الكتان بالحامول الى حدوث نقص كبير فى وزن الالياف و محصول البذرة للكتان ,وكذلك نقص كبير فى محتوى نباتات الكتان من كلوروفيل ا, ب والكلوروفيل الكلى مقارنة بنباتات الكتان السليمة والغير مصابة.

اظهرت النتائج أن جميع مبيدات الحشائش المستخدمة أدت الى نقص ضعيف فى محتوى النبات من كلوروفيل أ؛ ب حيث سجل مبيد ايمازيثبير اعلى تاثير تثبيطى لمحتوى الكلوروفيل الكلى فى اوراق الكتان يليه مبيد ايمازاموكس وفى النهاية ياتى مبيد بيوترالين الذى سجل اقل نسبة تثبيط للكلوروفيل وذلك بعد ٣٥ يوم من المعاملة.

- لهذا توصى هذه الدراسة بأنه فى حالة الأراضى الموبؤة بالحامول يمكن استخدام طريقة زراعة العفير المحسن (حراتى) مع استخدام أحد مبيدات الحشائش الأتية بيوترالين بمعدل ٢ لتر/ ف سواء رش سطحى أو خلط فى التربة. أو مبيد ايمازاموكس بمعدل ٤٠٠سم٣/ فدان مرتين بعد ظهور الحامول كبديل للنقاوة اليدوية لمكافحة حشيشة الحامول فى الكتان بأمان حيث أعطت مكافحة جيدة للحامول بدون تأثيرات ضارة على نباتات الكتان.

Table (2): Effect of sowing methods, weed control treatments and their interaction on reduction percentages of fresh weight for dodder in flax (combined analysis of 2004 / 2005 and 2005/ 2006 experiments).

Treatments	Rate/F.	21 Days			35 days			49 days		
		Sowing methods			Sowing methods			Sowing methods		
		S1	S2	Mean	S1	S2	Mean	S1	S2	Mean
Imazethapyr (twice)	0.17 L	59.0	58.0	58.65	70.0	80.0	75.0	70.0	85.0	77.5
Imazamox (once)	0.4 L	51.0	60.0	55.50	62.0	75.0	68.5	77.0	80.0	78.5
Imazamox (twice)	0.4 L	62.0	76.0	69.00	72.0	80.0	76.0	80.0	85.0	82.5
Butralin(incorp.)	2 L	100.0	100.0	100.0	95.0	100.0	97.5	90.0	100.0	95.5
Butralin (surface)	2 L	100.0	100.0	100.0	97.0	100.0	98.5	92.0	100.0	94.0
Hand combing	-	43.0	55.0	49.0	38.0	45.0	41.5	32.0	35.0	32.5
Non-infested	-	100.0	100.0	100.0	100.0	100.0	100.0	98.0	100.0	99.0
Control (infested)	-	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Mean		64.38	68.63		66.75	72.50		67.38	73.13	
L.S.D. at 5% level for : -										
Sowing methods(S)			**N S**			**N S**			**N S**	
Weed control treatments (W)			**7.6**			**8.97**			**7.54**	
Interaction (S xW)			**N S**			**N S**			**9.76**	

S1= Dry sowing method (afir). S2= Dry sowing method after false irrigation (hyrathy).
Days = time after treat ment.

Table 3: Effect of sowing methods, weed control treatments and their interaction on plant height (cm) of flax (combined 2004/ 2005 and 2005/ 2006 experiments).

Treatments	Rate/F.	70 days			90 Days			at harvest		
		Sowing methods			Sowing methods			Sowing methods		
		S1	S2	Mean	S1	S2	Mean	S1	S2	Mean
Imazethapyr (twice)	0.17 L	22.20	25.70	23.95	50.45	56.30	53.38	93.75	93.75	93.75
Imazamox (once)	0.4 L	24.15	24.50	24.33	52.50	62.65	57.58	98.75	99.50	99.13
Imazamox (twice)	0.4 L	28.7	28.88	28.79	55.75	64.75	60.25	100.0	102.5	101.25
Butralin(icorp.)	2 L	24.50	25.13	24.82	55.17	64.23	59.70	98.75	99.75	99.25
Butralin (surface)	2 L	22.75	23.28	23.02	59.25	62.55	53.90	95.00	95.25	95.13
Hand combing (twice)		20.70	20.10	20.40	49.18	50.80	49.99	89.50	87.50	86.00
Non-infested		29.75	29.70	29.73	56.85	68.80	62.83	106.25	106.0	106.13
Infested (control)		20.40	18.25	19.33	41.85	45.18	43.52	79.25	85.00	82.13
Mean		24.14	24.44		52.00	59.41		94.5	96.16	
L S D at 5% level for : -										
Sowing methods(S)			**N S**			**N S**			**N S**	
Weed control treatments (W)			**3.76**			**6.02**			**6.23**	
Interaction (S xW)			**N S**			**N S**			**N S**	

S1 = Dry sowing method (afir). S2 = Dry sowing method after false irrigation (hyrathy).

Table 4: Effect of sowing methods, weed control treatments and their interaction on some yield componentes of flax plants (combined of 2004/ 2005 and 2005/ 2006 experiments)

Treatments	Rate/F.	No. capsules/plant			Fiber Yield (kg/f.)			Seed Yield (kg /f.)		
		Sowing methods			Sowing methods			Sowing methods		
		S1	S2	Mean	S1	S2	Mean	S1	S2	Mean
Imazethpyr (twice)	0.17 L	8.10	8.87	8.49	275.3	290.4	282.85	563.6	598.8	581.2
Imazamox (once)	0.4 L	8.42	9.37	8.90	340.8	354.6	347.7	613.0	656.3	634.65
Imazamox (twice)	0.4 L	9.12	9.72	9.42	368.5	390.2	379.35	645.6	667.0	656.3
Butralin (icorp.)	2 L	10.10	10.22	10.16	352.9	364.8	358.85	614.3	633.0	623.65
Butralin (surace)	2 L	9.30	10 .05	9.68	280.0	298.4	289.2	559.5	598.8	579.15
Hand combing		6.85	7.42	7.14	240.3	258.3	249.3	546.3	546.3	546.3
Non-infested		11.82	11.01	11.42	395.3	425.6	410.45	503.3	709.0	606.15
Infested (control)		5.75	5.83	5.79	233.3	242.9	238.1	378.0	393.8	385.9
Mean		8.68	9.06		310.8	328.1		552.9	599.3	
L S D at 5% level for : -										
Sowing methods(S)			**N S**			**N S**			**N S**	
Weed control treatments (W)			**0.82**			**15.7**			**87.3**	
Interaction (S xW)			**N S**			**N S**			**9.76**	

S1= Dry sowing method (afir). S2= Dry sowing method after false irrigation (hyrathy).