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UTILIZATION OF SEED DRILL MACHINE FOR PLANTING FLAX CROP AND IRRIGATION WATER MANAGEMENT

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ABSTRACT

The results showed that the yield was significantly affected by the water applied levels. The highest value flax seed yield was obtained with treatment (B) 753.25 kg seed/fed, and 4.58 Mg straw/fed, while the lowest value was obtained with treatment (D) 656.0 kg seed/fed, and 4.0 Mg straw/fed.

1- By increasing sowing machine forward speed from 3.61 to 7.22 km/h, tends to decrease germination ratio from 88.0 to 78.0 %. Also, *the longitudinal and lateral scattering values increased from (3.1 to 4.5 %) and (1.3 to 1.8 %)when the sown machine forward speed increased from 3.61 to 7.22 km/h. Also, the coefficient of uniformity increased from (91 to 95 %).*

2- increasing the sowing machine forward speed from 3.61 to 7.22 km/h, tends to increase the effective field capacity from (1.50 to 2.90 fed/h), consumed power from (14.0 to 33.0 kW), energy requirements from (9.33 to 11.38 kW.h/fed), slip ratio from (2.99 to 7.50 %) and decrease field efficiency from (89.5 to 82.0 %), respectively.

3-The lowest value of amount water applied was recorded with treatment (D) 1117.01 m^3/fed, while the highest value was recorded with treatment (E) 1974.16 m^3/fed, the water saving was 19.25, 10.27, 6.20 and 43.42 % for treatment A,B,C, and D, respectively as compared with treatment E.

4- Also treatment (D) was recorded the highest value of crop water use efficiency was 0.67 kg/m^3, while treatment (E) was recorded the lowest value was 0.49 kg/m^3.

5-The highest value of actual water consumptive use was obtained with treatment (E) 1485.51 m^3/fed, while the lowest value was obtained with treatment (D) 1005.9 m^3/fed.

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INTRODUCTION

Flax is the second important fiber crop after cotton in Egypt. It is grown for producing fibers only or seeds only, but in Egypt it is grown as double purpose crop. Flax is the oldest fiber crop in Egypt. Flax is grown during winter season. They play an important role in national economy due to export and local industry. In Egypt the flax cultivated area was about 35700 feddans yearly (Ministry of Agriculture). Flax production still depends mainly on manual methods for planting and harvesting, consuming time, cost, non- uniformity of seeds which ultimately results in poor and more over high percentage of crop losses.

Water is often the primary limiting factor in any crop production. Therefore irrigation management is very important nowadays in Egypt due to the shortage in water resources as well as the expansion of agriculture in newly reclaimed lands.

El-Kady, et al. (1995) showed that amount of water applied increased with decreasing the last irrigation intervals. The 6 weeks treatment saved about 30% of applied water than the 2 weeks treatment while the 4 weeks interval saved about 20% compared with 2 weeks treatment.

Shams et al. (1996) reported that the irrigation treatment received all the irrigation recorded the highest amount of water and consumed more water (2401.6 and 1253.1 m^3/fed) than the other treatments, while the less amount of water applied and water consumptive use (1897.1 and 1194.5 m^3/fed) were achieved when holding one irrigation at seed filling stage of flax.

Saied et al. (1996) study the effect of four varieties of flax, application of two sources of nitrogen and two methods of planting drill and broadcasting on flax yield and water relations. They noticed that the broadcasting method of planting or application of anhydrous ammonia under variety Giza 5 received the highest amount of irrigation water (2735.5 m^3/fed) and water consumptive use (1520.4 m^3/fed), while the seed drill method or application ammonium nitrate under Giza 7 variety utilized the less amounts of irrigation water (2353.3 m^3/fed), and water consumptive use (1377.6 m^3/fed).

Steffanova (1998) indicated that the highest total effectiveness of the used irrigation water is obtained at an irrigation rate of 950 mm at which every cubic meter of irrigation water forms an average of 0.72 kg of flax fibers. He added the marginal product is increased with the increase of the irrigation rate up to 600 mm, it reaches its maximum value of 098 kg of flax fibers for each cubic meter of water at an irrigation rate between 600 and 700 mm and after that it begins to decrease and finally it becomes negative at 1200 – 1300 mm.

Mosalem et al. (1999) indicated that the sowing method had significant effect on straw yield and its related characters, seed yield and yield components as well as fiber length and seed oil contents. On the other hand, mechanical drilling method increased significantly fiber yield per feddan compared with manual broadcasting. It could be recommended to grow flax using mechanical drilling with 70kg/feddan and harvesting after 150 days from planting to obtain the highest fiber yield.

Mostafa et al. (2002) show that the delaying harvesting date from 160 to 190 days from sowing recorded a significant increase in plant height, green stalk yield /plant as well as per feddan, fiber yield /feddan, fiber length, fiber percentage, upper branching zone length, seed index, number of capsules/plant, seed index, seed yield /plant as well as per fed.

Imbabi and Omran (2002) developed a feeding device of single-row push type seeder to be used in sesame seeds planting. Their results indicated that the seed distribution in both sides of the drilled centerline was mainly affected by the ground wheel speed and increased as the speed increased, 100 % of seed were scattered in 9 cm on both sides of drilled centerline.

Morad and Fouda (2003) selected of the proper system for seedbed preparation, planting and harvesting flax under Egyptian conditions. They found that treatment (chiseling twice, rotary plow, land leveler, manual planting and mechanical harvesting by pulling machine) required the highest value of energy (23.64 kW.h/ton). While treatment (chiseling twice, rotary plow, land leveler, mechanical planting by seed drill and manual harvesting) required the lowest value of energy (16.1kW.h/ton).

Abo- El-Naga et al. (2003) studying the effect of different band width sowing systems on flax crop productivity. They indicated that the highest yield of seeds, straw and fibers were (0.697, 3.967 and 0.727 ton/fed.) and (0.36, 3.598 and 0.684 ton/fed.) for Sakha 1 and Blanka, respectively, by using the modified machine planting at width of 80 cm. Also, the consumed energy in the sowing by modified machine was (3.103 kW.h/fed.). While the seed drill and hand sowing were (5.19 and 0.299 kW.h/fed.), respectively.

Kamel et al (2003) investigated the effect of some operating factors on the uniformity of seeds distribution by using pneumatic seed drill comparing with mechanical seed drill at five different forward speeds after three levels of land preparation. The longitudinal and lateral scattering increased as the forward speed increased for both of the two seed drill. The longitudinal and lateral scattering values ranged from 1.54 to 5.69 cm and from 0.18 to 2.85 cm when the forward speed ranged from 0.56 to 2.34 m/s, respectively under different land preparation levels

The aim of study is to study the effect of mechanical planting by seed drill and different water applied levels on water relation and yield of flax under the least required energy .

MATERIALS and METHODS

A field experiment was conducted at EI-Karda Water Requirement Research Station. Kafr EI-Sheikh Governorate. During winter season 2006/2007 to study the effect of water applied levels. Watering at field capacity (A), field capacity+10% (B), actual evaporation (C), field capacity- 5% (D) and control at the farmer (E) applied on flax yield and its water relations. The treatments were arranged in a complete randomized block pattern with five replications. Seed were planted on 20th November and harvesting date 20th April. Flax Giza 7 local variety were planted mechanically by using a seed drill Tye machine at forward speed of 5 km/h. No. of rows 25, spacing of rows 10 cm with 250 cm working width at rate of 70 kg of seeds/feedan.

Table 1: Physical and mechanical properties of flax seed.

Mass of 1000 kernel, g	8.5
Moisture content, (wb) %	9.0
Capsule diameter, mm	6.5
Bulk density, kg/cm^3	0.73
Repose angle, degree	18.0
Coefficient of friction, degree	0.26

All the experiment plots were chiseling twice followed by rotary plow and leveled by land leveler. Fertilizing and weed control were the same in all treatments according to the technical recommendations.The soil physical characteristics are presented in Table 2,3.

Table 2: Soil texture and its fractions for experiment site.

Soil depth, cm	Clay ,%	Silt ,%	Sand ,%	Texture class
0 -20	56	26	18	clayey
20 -40	51	27	23	clayey
40 -60	47	29.5	23.5	clayey

Table 3: The physical analysis of soil sample for experiment site.

Soil depth, cm	Field capacity,%	Wilting point,%	Bulk density,%
0 -20	44.18	23.95	1.01
20 -40	38.90	21.15	1.19
40 -60	36.45	19.30	1.25

The following characters of plant were studied:-

At harvest, the following characters were measured:

Plant height (cm), technical length (cm), stem diameter (mm), stalk yield (Mg/fed), fiber yield (kg/fed), fiber length (cm), no. of capsules/plant, no. of seed/capsule, mass of 1000-seeds (g), and seed yield (kg/fed).

Fiber yield per feddan was determined from the straw yield per plot after retting and extraction of fiber. To determine fiber length, ten fiber ribbons from each treatment were spread out and each ribbon was measured in cm, then the average fiber length of these records were calculated.

Materials:-

- Mounted chisel plow (local made) with 7 tines corresponding to 175 cm working width.
- Mounted rotary plow (local made) with 32 blades corresponding to 160 cm working width.
- Trailed land leveler (local made) with 3.05 m working width.

Average plowing depth was 15 cm at a speed of 3.5 km/h, while leveling were conducted at a speed of 4.8 km/h.

- Mounted seed drill (Tye) and specification as follow:-

Table 5: The specification of seed drill machine (Tye).

Specification	Seed drill machine
Source of manufacture	American
Full width, m	3
Row spacing, cm	10
Number of tubes	25
Total mass, kg	450
Metering system used	Plastic studded roller mechanism
Seed tube type	Rubber
Hopper capacity, kg	140
Tractor power used , kW	45
Coupling method	3 point direct coupling
Transmission system	Chain
Number of wheels	2

- Mounted pulling machine power shaft rotational speed 540 rpm, with 1.52 m puller width. The harvesting operation by pulling machine was conducted at forward speed of 4.5 km/h under stalk moisture content of 42% and capsule moisture content of 32%.

Methods:-

Germination ratio.

The germination ratio (G_r) was determined by using the following formula:

$$G_r = \frac{N_p}{N_s} \times 100 \;,\% \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where :

N_p = Number of flax plants within a length of 10 m. and

N_s = Number of flax seeds delivered within the same length.

Planting uniformity and accuracy.

The planting accuracy including longitudinal and lateral scattering and distribution uniformity were determined and measured in 10 m length with three replicates as follows:

a- Seed scattering

Longitudinal and lateral seed scattering (distribution) were determined by measuring the plants spacing in each treatment. The seed longitudinal and lateral scatterings were calculated from the following formula **(Steel and Torrie, 1980*)***

$$\text{Scattering} = \sqrt{\frac{\text{Sum of saquare of variance of seed scattering from its mean}}{\text{Number of hills}}} \quad ..2$$

b- Uniformity of plant distribution (Coefficient of uniformity)

The plant distribution was analyzed to determine the coefficient of variation (CV) of plants spacing according to the following formula:

$$CV = \frac{\text{SD of plant spacing}}{\textit{Average}\ \text{plant spacing}} \times 100 \quad ,\% \ldots\ldots\ldots\ldots\ldots\ldots..3$$

$$\text{SD = is the standard deviation} = \sqrt{\frac{(S - S^{-})^2}{n}}$$

S = on-row spacing, cm

S^- = average on-row spacing, cm; and

n = Number of sample

Field capacity and efficiency.

Theoretical field capacity (T.F.C.) was calculated as follows:

$$T.F.C. = \frac{1}{Total\ planting\ time\ (h/fed)} \quad ,fed/h \ldots\ldots\ldots\ldots\ldots .4$$

However the effective field capacity (E.F.C.) was calculated as follows:

$$\text{E.F.C.} = \frac{1}{\text{actual planting time, (h/fed.)}} \quad , fed/h \ldots\ldots\ldots.5$$

While the field efficiency (η_f) was calculated by using the following formula:

$$\eta_f = \frac{\text{E.F.C.}}{\text{T.F.C.}} \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

Where*:*

Total time = actual planting time + adjusting time + turning time + feeding time

Bulk density = Mass of sample, kg / Volume of sample,cm^3 , kg/cm^3……………………………………………………..…………7

Determination of wheel slip:-

Slip of seed drill wheel is an important factor which affects sowing rate. The percentages of slip were estimated for seed drill at three forward speeds. Slippage was calculated by using the following equation:

Slippage, % = d1 – d2 / d2 x 100 …………..…………..8

Where:

d1= Distance of 10 forward revolution without load, m, and

d2 = Distance of 10 forward revolution with load, m.

power consumption and energy requirements.

The power consumed (EP) by the planters was calculated by measuring fuel consumption during planting operations for different treatments under study. The following formula was used to estimate power consumption (*EP*) by the planters according to **(Embaby, 1985*).***

$$\text{EP} = \left(F_c \times \frac{1}{60 \times 60}\right)\rho_f \times \text{L.C.V.} \times 427 \times \eta_{th} \times \eta_m \times \frac{1}{75} \times \frac{1}{1.36}, kW \ldots\ldots\ldots 9$$

where:

F_c = fuel consumption, *l/h;*

ρ_f = density of diesel fuel (*0.85 kg/l);*

L.C.V. = lower calorific value of diesel fuel (*10000 kcal/kg);*

427 = thermo-mechanical equivalent*, kg.m/k cal;*

η_{th} = thermal efficiency of diesel engine, (40%)*;and*

η_m = mechanical efficiency of diesel engine, (80%).

The energy required (*ER*) for planting flax was estimated using the following equation:-

$$ER = \frac{Power\,consumption\ (kW)}{Effective\,field\,capicity\ (fed/h)}, kW.h/fed \ldots\ldots\ldots\ldots\ldots 10$$

Actual planting depth.

The actual planting depth was measured after ten days from planting date in 1m length along the row (three replicates) for each treatment. The actual planting depth was measured by measuring the vertical distance from soil surface to seed place in soil after removing the soil cover of seed.

Water measurements:-

A mount of irrigation water applied was measured by a rectangular were according to the following equation:

$Q = C\,L\,H^{3/2}$, **(Masoud, 1967)** 11

Where:

Q = Discharge, m^3/min.

C = An empirical coefficient that must be determined from discharge measurements.

L = Length of the crest, m

H = Head above the weir crest, m.

Water consumptive use:-

Water consumptive use was computed as the difference in the soil moisture contents after and before irrigation according to the following equation by **(Israelson and Hansen, 1962):**

$Cu = D \times Bd \times (\theta 2 - \theta 1) \times 4200 / 100$, cm........................12

Where:

Cu = Water consumptive use, cm

D = Soil depth, cm

Bd = Soil dry bulk density, g/cm3

Θ1 = Soil moisture content before irrigation, (% by weight).

Θ2 = Soil moisture content after irrigation, (% by weight).

Crop water use efficiency (CWUE):-

The crop water use efficiency was calculated according to the following equation **(Michael, 1978)**

CWUE = Seed flax yield (kg) / Water consumptive use (m^3), kg/m^3 …………..….13

Water utilization efficiency (WUE):-

The water utilization efficiency was calculated as **(Michael, 1978)**

WUE=seed flax yield (kg) / Water delivered to the field (m^3), kg/m^3……………………..14

RESULTS AND DISCUSSION

The sowing accuracy was investigated for mechanical seed drill under different forward speeds of 3.61, 5.83, and 7.22 km/h.

The sowing accuracy included longitudinal and lateral scattering and distribution uniformity of plants.

Longitudinal and lateral scattering:-

The effect of forward speeds on the longitudinal and lateral scattering of sown flax plant are shown in Table 6

The longitudinal and lateral scattering values increased from (3.1 to 4.5 %) and (1.3 to 1.8 %)when the sown machine forward speed increased from 3.61 to 7.22 km/h because the machine vibration is increased . The minimum values of longitudinal and lateral scattering were obtained under forward speed of 3.61 km/h.

Uniformity of sown flax plants:-

The coefficient of uniformity of sown flax plants, which was affected by sowing forward speed are illustrated in Table 6.

Table 6 :Effect of forward speeds on longitudinal and lateral, Germination ratio and Coefficient of Uniformity ,%

Forward speed, (Km/h)	Longitudinal, (%)	Lateral, (%)	Germination ratio,(%)	Coefficient of uniformity,(%)
3.61	3.1	1.3	88.0	91.0
5.83	3.8	1.5	83.0	93.5
7.22	4.5	1.8	78.0	95.0

Table 7: Performance of seed drill machine for planting flax crop.

Forward speed, (km/h)	E.F.C., (Fed/h)	Power, (kW)	Energy, (kW.h/fed)	Field Eff., (%)	Slip, (%)
3.61	1.50	14.0	9.33	89.5	2.99
5.83	2.40	25.0	10.42	86.3	5.40
7.22	2.90	33.0	11.38	82.0	7.50

The results indicated that the minimum values of sown plants spacing (or the maximum values coefficient of uniformity of sown plants was 95.0%) were obtained with the sowing forward speed 7.22km/h.

By increasing sowing machine forward speed from 3.61 to 7.22 km/h, tends to decrease germination ratio from 88.0 to 78.0 %, as shown in Table 6. This results my be due to lifting seeds uncovered above the soil surface at high planting speed.

From Table 7. it is obvious that increasing the sowing machine forward speed from 3.61 to 7.22 km/h, tends to increase the effective field capacity from (1.50 to 2.90 fed/h), consumed power from (14.0 to 33.0 kW), energy requirements from (9.33 to 11.38 kW.h/fed), slip ratio from (2.99 to 7.50 %) and decrease field efficiency from (89.5 to 82.0 %), respectively.

Flax yield and yield components:-

Values of flax seed yield characters as affected by different levels of irrigation water applied are presented in Table 8. Results show treatment **(B)** achieved the highest value of plant height (125.0 cm), technical length (95.0 cm), stem diameter (3.30 mm), stalk yield (4.58 Mg/fed), fiber yield (484 kg/fed), fiber length (85.5 cm), number of capsules/plant (9.50), mass of 1000-seeds (9.50 gm) and flax seed yield (753.25 kg/fed), followed by treatment **(A)**. While treatment **(D)** recorded the lowest values of plant height (112.0 cm), technical length (80.0 cm), stem diameter (2.30 mm), stalk yield (4.0 Mg/fed), fiber yield (405 kg/fed), fiber length (79.0 cm), number of capsules/plant (8.0), mass of 1000-seeds (8.12 gm) and flax seed yield (656 kg/fed).The above mentioned results may be due to more uniform distribution of the environmental growth factors (light, water and nutrients) for all plants, uptake of nutrients from soil is more easy which increase the dry matter accumulation in plant organs. These results are in agreement with those of **Mostafa, et al. (2002) and Mosalem, et al. (1999).**

Table 8: Show the effect of different level of irrigation water on flax yield and yield components.

Treatments	Level of irrigation water				
Characters	A	B	C	D	E
Plant height, cm	120.0	125.0	115.0	112.0	118.0
Technical length, cm	88.0	95.0	81.0	80.0	85.0
Stem diameter, mm	3.10	3.30	2.60	2.30	2.80
Stalk yield / plant, gm	2.23	2.50	2.18	2.10	2.13

Stalk yield / fed, Mg	**4.40**	**4.58**	**4.21**	**4.00**	**4.10**
Fiber yield / fed, kg	**468**	**484**	**448**	**405**	**428**
Fiber length, cm	**83.5**	**85.5**	**82.0**	**79.0**	**80.0**
Upper branching zone length, cm	**13.20**	**14.10**	**11.00**	**10.50**	**12.10**
No. of capsules / plant	**9.0**	**9.5**	**8.5**	**8.0**	**8.9**
No. of seed / capsule	**7.25**	**7.50**	**7.05**	**6.56**	**7.15**
Mass of 1000-seeds, gm	**9.00**	**9.50**	**8.50**	**8.12**	**8.88**
Seed yield / plant, gm	**0.65**	**0.71**	**0.60**	**0.53**	**0.64**
Seed yield / fed, kg	**741.50**	**753.25**	**731.75**	**656.00**	**733.50**

Amount of water applied:-

The amount of irrigation water applied to flax for different treatments are presented in Table 9. It can be noticed that amount of water applied were 1594.18, 1771.34, 1851.78, 1117.01 and 1974.16 m^3/fed, for treatments A,B,C,D, and E, respectively. It can be concluded that amount of water applied was lower with treatment (D) field capacity 5 %, than these applied with other treatments.

The water saving was 19.25, 10.27, 6.20 and 43.42 % for treatments A,B,C, and D, respectively as compared with treatment E.

Actual water consumptive use:-

The seasonal water consumptive use by flax plants as influenced by different levels is shown in Table 9. It is noticed that as the amount applied increased the values of water consumptive use increased and vice versa. Treatment (E) control recorded the highest values of water consumptive use 1485.51 m^3/fed, followed by treatment (C) 1408.18 m3/fed, and (A) 1349.46 m^3/fed While treatment (D) recorded the lowest values 1005.90 m^3/fed.

Table 9 : Amount of water applied (m^3/fed), water saving, and actual water consumptive use as affected by different level of irrigation water.

Treatments	**Amount of water applied, m^3/fed**	**Water saving,%**	**Actual water consumptive use**	
			m^3/fed	**Cm**
Field capacity (A)	**1594.18**	**19.25**	**1349.46**	**32.13**
Field capacity + 10 % (B)	**1771.34**	**10.27**	**1291.50**	**30.75**
Actual evaporation (C)	**1851.78**	**6.20**	**1408.18**	**33.53**
Field capacity – 5 % (D)	**1117.o1**	**43.42**	**1005.90**	**23.95**
Control as the farmer (E)	**1974.16**	**------**	**1485.51**	**35.37**

Irrigation application efficiency:-

Data in Table 10 show that values of irrigation application efficiency as affected by different levels of irrigation water. Data reveal that, irrigation application efficiency was 85.91, 74.30, 77.14, 90.87 and 76.03 % for treatments A,B,C,D, and E, respectively. It can be concluded that the maximum values of irrigation application efficiency was achieved with treatment (D), due to the less amount of applied irrigation water.

Consumptive use efficiency:-

Also Table 10 show that values of consumptive use efficiency. Data reveal that the maximum value was 99.10 % achieved with treatment (D).

Crop water use efficiency:-

The term water use efficiency has been widely used in irrigation crop production to describe the efficiency of irrigation with respect to crop yield. The maximum value of crop water use efficiency was 0.67 kg/m^3 with treatment (D), while the minimum value was 0.49 kg/m^3 achieved with treatment (E) as show in Table 10.

Field water use efficiency:-

Table 10 indicated that the data clearly show that the irrigation at field capacity – 5% (D) treatment recorded the highest value of crop water use efficiency and field water use efficiency, while treatment (E) control recorded the lowest values.

Table 10 : Irrigation application efficiency, consumptive use efficiency, crop water use efficiency and field water use efficiency as influenced by different levels of irrigation water.

Treatments	Irrigation application efficiency,%	Consumptive use efficiency, %	Crop water use efficiency, kg/m^3	Field water use efficiency, kg/m^3
Field capacity (A)	85.91	98.54	0.54	0.47
Field capacity + 10 % (B)	74.03	98.48	0.58	0.43
Actual evaporation (C)	77.14	98.58	0.52	0.40
Field capacity – 5 % (D)	90.87	99.10	0.67	0.59
Control as the farmer (E)	76.03	98.97	0.49	0.37

Economic evaluation:-

Table 11:Production, total costs, total income, net profit, water applied, water productivity and economic efficiency for flax crop as influenced by different levels of irrigation water.

Treatment	Yield		Costs L.E/fed			Total return, L.E/fed		Water applied, m^3/fed	Water productivity, L.E/m^3	Economic efficiency
	Seed, kg/fed	Straw, ton/fed	Variable	Fixed	Total	Total income	Net profit			
A	741.50	4.40	1015	1750	2765	5907.50	3142.50	1594.18	1.97	1.137
B	753.05	4.58	1015	1750	2765	6056.25	3291.25	1771.34	1.86	1.190
C	731.75	4.21	1015	1750	2765	5763.75	2998.75	1851.78	1.62	1.085
D	656.00	4.00	1015	1750	2765	5280.00	2515.00	1117.01	2.25	0.910
E	733.5	4.10	1015	1750	2765	5717.50	2952.50	1974.16	1.50	1.068

Data in Table 11 illustrated that the values of production, total cost, total income, net profit, water applied and water productivity as influenced by different treatments for flax crop. The data indicated that the maximum values of total income and net profit 6056.25 and 3291.25 L.E/fed, respectively, was obtained from treatment (B). While the maximum water productivity (2.25 L.E/m^3)was obtained from treatment (D). It could be that these increase in water productivity is due to the decrease of total water applied.

Economic efficiency index refers to the agriculture and irrigation activities which can gives the highest return from each L.E unit which can spend on crop production. The data revealed the economic efficiency was 1.137, 1.190, 1.085, 0.910, and 1.068 L.E/fed, for treatment A,B,C,D, and E, respectively. From these results it could be concluded that the increases in economic efficiency due to the enhancement of net profit (1.190 L.E for each L.E spend) in the treatment B compared with other treatments.

CONCLUSION

The results showed that the yield was significantly affected by the water applied levels. The highest value flax seed yield was obtained with treatment (B) 753.25 kg seed/fed, and 4.58 Mg straw/fed, while the lowest value was obtained with treatment (D) 656.0 kg seed/fed, and 4.0 Mg straw/fed.

1- By increasing sowing machine forward speed from 3.61 to 7.22 km/h, tends to decrease germination ratio from 88.0 to 78.0 %. Also**,** the longitudinal and lateral scattering values increased from (3.1 to 4.5 %) and (1.3 to 1.8 %)when the sown machine forward speed increased from 3.61 to 7.22 km/h. Also, the coefficient of uniformity increased from (91 to 95 %).

2- increasing the sowing machine forward speed from 3.61 to 7.22 km/h, tends to increase the effective field capacity from (1.50 to 2.90 fed/h), consumed power from (14.0 to 33.0 kW), energy requirements from (9.33 to 11.38 kW.h/fed), slip ratio from (2.99 to 7.50 %) and decrease field efficiency from (89.5 to 82.0 %), respectively.

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الملخص العربي

الاستفادة من آلة ألتسطير لزراعة محصول الكتان وإدارة مياه الرى الحقلى

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يعتبر محصول الكتان من أقدم محاصيل الألياف التي استعملها الإنسان في صناعة ملابسة وقد وجدت المنسوجات الكتانية في مقابر قدماء المصريين والتي يرجع تاريخها إلى خمسة آلاف سنة. والكتان نبات حولى شتوي يتراوح طوله من ٥٠-١٢٠سم وسمكه من ١,٥ –٣مم وذلك حسب الصنف والظروف البيئية التي ينمو فيها المحصول. والتفريع في الكتان يكون قميا في الطرز الليفية بينما يكون قمي وقاعدي في الطرز الزيتية كما تلعب الكثافة النباتية دورا في هذه القاعدة إلى حد ما.

الهدف من تلك الدراسة وهو دراسة تأثير إضافة مستويات مختلفة من الري علي إدارة المياه لمحصول الكتان وعلي إنتاجيته في أراضي شمال الدلتا٠

أقيمت تجربة حقلية في محطة تجارب المقننات المائية بالقرضا- محافظة كفر الشيخ وذلك خلال الموسم الشتوي ٢٠٠٥/٢٠٠٦وذلك لدراسة تأثير الري بمستويات .

وكانت معاملات الدراسة هي:

(١) معاملة أ كميات مياه تعادل رفع الرطوبة إلى السعة الحقلية

(٢) " ب " " " " " " " " + ١٠٪

(٣) " ج " " تعادل كميات التبخر الفعلية بين الريات

(٤) " د " " نعادل رفع الرطوبة إلى السعة الحقلية – ٥٪

(٥) " هـ " " تعادل ما يعطيه الفلاح وفي نفس الوقت تستخدم كمقارنة.

وقد استخدم تصميم القطاعات الكاملة العشوائية في خمسة مكررات ودلت النتائج علي:-

١. أدت زيادة السرعة الأمامية لآلة الزراعة من ١٦و٣ إلى ٢٢و٧ كم / ساعة أدت إلى زيادة السعة الفعلية الحقلية من (٥و١ إلى ٩و٢ فدان/ساعة) والقدرة المستهلكة من (١٤ إلى ٣٣ كيلووات) والطاقة المستهلكة من (٣٣و٩ إلى ٣٨و١١ كيلووات ساعة/فدان) والانزلاق من (٩٩و٢ إلى ٥و٧ %) ونقصت الكفأة الحقلية من (٥و٨٩ إلى ٨٢ %) على التوالى٠
٢. بزيادة السرعة الأمامية لآلة الزراعة من ١٦و٣ إلى ٢٢و٧ كم / ساعة أدت إلى نقص نسبة الإنبات من (٨٨ إلى ٧٨ %)٠ وأدت إلى زيادة التشتت الطولي والعرضي من (٣و١ إلى ٨و١ %) وأدت إلى زيادة معامل الانتظامية لآلة الزراعة من (٩١ إلى ٩٥ %) على التوالى٠

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٣. أنه يوجد فروق عالية المعنوية نتيجة تأثير مستويات الـري المختلفـة علـي إنتاجيـة محصـول الكتـان. وقـد أعطـت المعاملـة (ب) أعلـي إنتاجيـة ٧٥٣,٢٥ كجـم بذور/فـدان ، ٤,٥٨ طـن قش/فدان بينما أعطت المعاملة (د) أقل إنتاجية ٦٥٦ كجم بذور/فدان ، ٤ طن قش/فدان .

٤. المعامله(د) سجلت أقل كمية لأضافه مياه الري حيث بلغت ١١١٧,٠١ م^{٣} /فدان بينما سجلت المعاملة هـ أكبر كمية لأضافه مياه الري (١٩٧٤,١٦ م٣ /فدان). بلغت نسبة التـوفير لميـاه الـري ١٩,٢٥ ، ١٠,٢٧ ، ٦,٢٠ ، ٤٣,٤٢ % للمعـاملات أ ، ب ، ج ، د علـي الترتيـب مقارنة بـــ (هـ).

٥. أقل قيمة الاستهلاك المائي كانت مع المعاملة (د) (١٠٠٥,٩ م٣/فدان) بينما أعلي قيمة كانت مع المعاملة هـ (١٤٨٥,٥١م٣ (فدان) و سجلت أعلي قيمة لصافي العائد من الوحدة المائية .