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A COMPARISON BETWEEN THREE TILLAGE AND SOWING SYSTEMS FOR FLAX PRODUCTION

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ABSTRACT

The present study was carried out at research farm of Rice Mechanization Center, Kafr El-Sheikh Governorate during the two successive growing seasons of 2005/2006 and 2006/2007 to study the effect of tillage systems and sowing methods on seed and straw yield of two different genotypes flax varieties (Sakha 1 and .Sakha 3). Tillage systems were used, Conventional system: chisel plow (twice) + mechanical scraper (twice), Moderate system: chisel plow (twice) + disk harrow (twice) + mechanical scraper and Advanced system: chisel plow (twice) + rotary plow (once) + laser scraper. The sowing methods were manual broadcasting, mechanical broadcaster and developed mechanical broadcaster .

The results can be summarized as follows:

1-The highest values of germination ratio (90.97 and 90.25 %) and the lowest values of coefficient of variance (12.3 and 13.6 %) were obtained at advanced tillage system for Sakha 1 and .Sakha3, respectively. While, the sowing methods have no significant effect on germination

2- The Maximum yield of straw (4.71 and 4.52 ton/fed) and seeds (575 and 421 kg/Fed) were obtained by using advanced system and modified broadcaster for Sakha1 and .Sakha 3, respectively.

4- Using advanced tillage system saving about 10.89 and 5.75% in energy requirement compared with conventional and moderate systems, respectively.

5- Using advanced tillage system instead of conventional and moderate systems with developed broadcaster increased the net profit of seed and straw yields by (61.31 and 77.49%) and by (22.82 and 35.68%) for flax Sakha1 and Sakha 3, respectively.

INTRODUCTION

Flax is considers a very best fiber crop and the most important economic crops in the world as well as in Egypt, where it plays an effective role in the national economy due to export and local industry. Flax is usually grown as a dual purposes crop, for the production of fiber extracted from straw and obtained oil from seeds. In Egypt, the total annual flax cultivated area is about 20835 feddans, (Annon 2006/2007, Ministry of Agriculture and Land Reclamation).

In general, yield of flax and its quality are affected by several agricultural practices such as seedbed preparation, planting method, plant population and distribution treatments. The suitable planting method is an essential factor for raising germination percentage, increasing number of plants per unit area.

Concerning the effect of seedbed preparation method on flax yield, Abdel-Mageed and El-Sheikha (1993) tested the compound active-passive implements (rota-digger) against two groups of tillage treatments namely; plow with a rotary tiller then planting with seed drill and the other, plow with chisel plow in one trip and rotary tilling in another trip then seed drilling. The experiments were conducted on flax production. They concluded that considerable increase in flax yield components associated with the use of the rota-digger.

Relating to the effect planting method on flax yield, El-Shal (1987) evaluated a pneumatic planter to plant different kinds of seeds under different plate seeds and different air suctions to investigate the uniformity of distribution. He concluded that the pneumatic planter was effective for all seeds and grains of different sizes and shapes under suitable suction pressure and feed-plat seeds.

Morad and Fouda (2003) studied the effect of different seedbed preparation, planting and harvesting treatments on the production of flax crop. Their results reveal that, seedbed preparation by chiseling twice followed by rotary plow and land leveler, mechanical planting by seed drill and mechanical harvesting by pulling machine is considered the proper system for producing flax as it requires minimum cost.

With respect to the effect of seeding rates, response of flax genotypes to seeding rates had been studied by several workers El-Kady *et al.* (1988); El-Shimy et al. (1993); El-Kady *et al*. (1995); Esmail and Moursy (1994); Mohamed (1996). They reported that the highest seeding rate caused a significant increment for each of technical length, straw/seed yield/Fed. and fiber percentage. However, led to a significant reduction in main stem diameter, and number of capsules/plant. Meanwhile, Kineber *et al.* (1997) found that the differences between planting methods were insignificant for all straw and seed characters except broadcasting recorded the highest values, but without significant difference.

The sowing process is considers one of the most important agricultural operations. The art of placing seeds in the soil is to obtain high germination ratio and healthy plants to achieve highest yield (Abd Alla, 1999).

Abo El-Naga and Badr (2003) studied the effect of different width sowing systems on flax crop using modified machine at width of 20, 40, 60, and 80 cm ; seed drill without furrow openers; seed drill with flat distributors at width 25 cm and hand sowing. Their results concluded that, the lowest values of (C.V %) of the plant distribution were obtained by modified machine at width of 80 cm, (8.37% and 8.96%) at lateral and longitudinal direction, respectively. While the highest yield of seeds, straw and fibers were (0.697, 3.967 and 0.727 ton/Fed.) and (0.360, 3.598 and 0.684 ton/Fed.) from Sakha 1 and Blanca verities, respectively using the modified machine at width of 80 cm.

Kineber (2003) study the effect of planting methods (strip method, drilling method 12.5, 10.0 and 7.5 cm apart and manual broadcast) and seeding rates of 60, 70, 80 and 90 kg /Fed. His results concluded that the differences between planting methods were significant for all straw and seed characters and strip method recorded the highest values. The highest values for all straw characters under study were obtained when using strip methods and seeding rate of 90 kg/Fed., whereas the highest values for all seed characters were obtained when using strip method and 60 kg /Fed.

Flax is a dual purpose crop from which seed and fiber can be removed at varying degrees depending upon its agricultural production (Parks *et al.* 1993). Seed flax grows well in reduced tillage with flax yield equal or much higher than in conventional tilled plots (Gubbels and Kenaschuk, 1989, Brandt, 1992, Lafond, 1993). Tillage affects cotton fiber quality and yield inconsistently as an indirect response due to a shift in the growing season to conventional tillage (Pettigrew and Jones, 2001, Bauer and Frederick, 2005)

Jonn *et al*. (2005) studied the tillage effects on flax. Their results indicated that, flax dry plant matter yields were significantly greater for chisel and disk treatments than no till treatments. Fiber flax yield and fiber properties indicate additional field preparation may be required to produce increased yields with improved fiber properties. Increases in straw yield will clearly affect the total fiber yield per acre.

The production of flax in Egypt is not sufficient to provide the needs for oil and fibers. Flax production still depends mainly on manual methods for planting and harvesting consuming time, cost, and more over high percentage of crop losses. A gap between production and consumption has raised, which could be minimized by increasing flax yield per agricultural unit area through performance improvement of agricultural operations. This can be only achieved by mechanizing production processes. Moreover, little studies known about the impact of tillage treatments on the quality and variability of flax fiber quality.

For this reason, Egyptian planners have turned toward concepts of mechanizing flax production. Therefore, the main objective of the present study is to investigate the influence of tillage systems and sowing methods on seed and straw yields using two different varieties of flax crop (Sakha 1 and Sakha 3).

MATERIALS AND METHODS

The present study was carried out at research farm of Rice Mechanization Center, Kafr El-Sheikh Governorate during the two successive growing seasons of 2005/2006 and 2006/2007 to study the effect of tillage systems and sowing methods on seed and straw yield of two different genotypes flax varieties (Sakha 1 and Sakha 3) as follows:

a- Tillage systems

1- Conventional system (CS): Chisel plow (twice) + Mechanical scraper (twice),

2- Moderate system (MS): Chisel plow (twice) + Disk harrow (twice) + Mechanical scraper,

3- Advanced system (AS): Chisel plow (twice) + Rotary plow (once) + Laser scraper,

b- Sowing methods

1- Manual broadcasting (HS)

2- Mechanical broadcaster (MB)
3- Developed mechanical broadcaster (DMB)

The experiments were conducted in a clay soil as shown in Table (1) at soil moisture content ranged from 21 to 22%. However, the values of soil bulk density and soil porosity for each tillage system were summarize in Table (1).

Table (1): Soil mechanical analysis, bulk density and porosity of the experimental field.

Soil mechanical analysis	**Clay %**	**Slit %**	**Sand %**	**$CaCo_3$ %**	**Organic matter %**
	53.32	**17.63**	**29.05**	**1.3**	**1.71**

Tillage system	**Soil bulk density, kg/cm^3**		**Soil porosity**	
	0-10 cm	**10-20 cm**	**0-10 cm**	**10-20 cm**
Conventional	1.145	1.186	0.567	0.552
Moderate	1.218	1.234	0.540	0.534
Advanced	1.261	1.285	0.524	0.515

The experimental field area was about 3 feddans were divided into two main plots for cultivating Sakha1 and Sakha3 flax varsities, each plot was divided into three equal sub plots for applying tillage systems, each sub plot was divided into three equal sub-sub plots for applying sowing methods.

The study systems were applied in the experimental field with four replicates. Plowing depth was ranged from 15 to 17 cm at a speed of 3.0 km/h , while harrow disk, rotary plow and scraper were conducted at a speed of about 3.5 km/h. Each sowing methods was adjusted on seed rate of 70 and 45 kg/Fed for Sakha1 and Sakha3, respectively to broadcast 1800-1900 seeds/m^2. Fertilizing, irrigation and weed control were the same in all treatments according to the technical recommendations.

To carry out this study the following machines and tractors were used:

- A mounted chisel plow (local made) with 7 blades and 1.75 m working width.
- A trailed disc harrow (double action) with 24 disks and 3.5 m working width.
- A mounted rotary plow (Kubota) with 24 blades and 1.6 m working width.
- Mechanical and laser scrapers with working width 3.0 m
- John Deere tractor (88.9 kW) was used with chisel plow, disk harrow and mechanical /laser scrapers.
- NASR tractor (48.2 kW) was used with rotary plow and mechanical broadcaster.
- Mechanical broadcaster (tractor-mounted power take off driven) with 5.0 m distribution width.
- Developed mechanical broadcaster (Marey, 2004) mounted on the power unit of the prime mover of Yanmar rice transplanter (ARP-8) with 2.0 m distribution width.

Measurements:

1- Clod Size Distribution

The clod size was measured using an apparatus consisting of six different sieves mounted on each other and installed on a frame. The soil samples were taken from five different locations after treatment and were left to dry in air. After sieving all the individual (fractions, they were weighed and converted to a percentage of total sample weight. The mean weight diameter (M.W.D.) of soil clods was calculated using the following equation according to Van Bavel (1949).

$$M.W.D. = \sum_{1=1}^{n} x_i \,.\, W_i \text{ -- } (1)$$

where:

x_i = the main diameter of each size fraction, mm.;

W_i = the proportion of the total sample weight of size fraction, where, the summation is carried out over all size fractions including the one that passes through the finest sieve.

2- Energy requirements

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

$$ER = \frac{Power\ consumption\ (kW)}{Actual\ \ field\ capicity\ (Fed/h)}, kW.h/Fed \text{ --------------------- } (2)$$

The power consumed during applying tillage systems and sowing methods was calculated by the measured fuel consumption for different machines under study. The following formula was used to estimate power consumption (*EP*) according to the principles and assumption of Hunt (1983).

$$EP = \left(F_c \times \frac{1}{60 \times 60}\right)\rho_f \times L.C.V. \times 427 \times \eta_{th} \times \eta_m \times \frac{1}{75} \times \frac{1}{1.36}\ (kW) \text{ ----- } (3)$$

where:

***EP* =** Energy requirement, kW;

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%)*;*

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

3- Estimation Cost

The cost of tillage and sowing operation was estimated and calculated according to the hiring price of Agricultural Mechanization Sector, Ministry of Agriculture as follows:-

Machine		Hiring price (LE)	Unit
Chisel plow + tractor	1st face	26.4	feddan
	2nd face	22	feddan
Disc harrow + tractor		132	hour
Rotary plow + tractor		44	feddan
Mechanical scraper + tractor		24.2	hour
Laser scraper + tractor (88.9 kW)		77	hour
Mechanical broadcaster + tractor		25	feddan
Developed mechanical broadcaster		30	feddan

4- Statistical analysis

The experimental treatments were arranged in split- split plot experimental design, with four replicates. The main treatments were flax varieties while the sub treatments were tillage systems and the sub-sub treatments were sowing methods. The obtained experimental data were statistically analyzed using the split plot design program in RMC computer division.

5- Germination ratio

The germination ratio (G.R) was calculated after ten days from planting and irrigation date by using the following formula:

$$GR\ (\%) = \frac{PN}{SN} \times 100 \text{ -- (4)}$$

where: PN = Average plant number/m^2;

SN = Average number of sowed seeds/m^2 which was calculated during calibration of sowing methods.

6- Sowing Uniformity

The sowing uniformity was determined by measuring plant distribution in two lateral and longitudinal directions after seed emergence period (15 days after sowing) using a wooden frame (0.5×0.5 m) which divided to 100 equal squares (5×5 cm). The coefficient of variation in longitudinal and lateral directions from average number of plants at standard area was taken as an indicator for sowing uniformity. It was calculated according to the following formula.

$$C.V = \frac{\sigma_n}{x^-} \times 100 \text{ --- (5)}$$

where:

C.V = coefficient of variation from average number of plants at a standard unit area.

x^- = average number of plant at standard unit area.

σ_n = Standard deviation.

$$\sigma_n = \sqrt{\frac{\sum \langle x - x^- \rangle^2}{n}} \text{ --- (6)}$$

where:

Σx = Summation of the number of plants on the longitudinal or lateral direction.

Σx^{-2} = Summation of the square number of plants on the longitudinal or lateral direction.

n = Number of readings.

The coefficient of variation under 10% is considered excellent and with value under 20% is generally considered acceptable for must field applications as reported by Coates (1992).

7- Plant characteristics and yield components

At full maturity of flax crop, a sample of ten guarded plants randomly taken from each plot to determine some plant characteristics such as No of plant/m^2, technical stem length and diameter, upper branching zoon length, number of capsules/plant, straw and seed yield per feddan.

RESULTS AND DISCUSSION

1- Germination ratio and sowing uniformity:-

The germination ratio and sowing uniformity were investigated under different levels of tillage and different sowing methods for Sakha1 and Sakha3 flax varieties. The obtained results are illustrated in Fig. (1) and concluded as follows:

1-1 Germination ratio

As shown in Figure (1) it could be noted that, the germination ratio was gradually increased from Conventional system(CS) "Chisel plow (twice) + Mechanical scraper (twice) + Manual broadcasting" to Moderate system(MS) "Chisel plow (twice) + Disk harrow (twice) + Mechanical scraper + Mechanical broadcaster" or to Advanced system(AS) "Chisel plow (twice) + Rotary plow (once) + Laser scraper + Developed mechanical broadcaster" for both flax varieties under study. This result may be due to fine tillage and good leveling, which results in good conditions for emergence of flax seeds in the advanced tillage system (AS) than others.

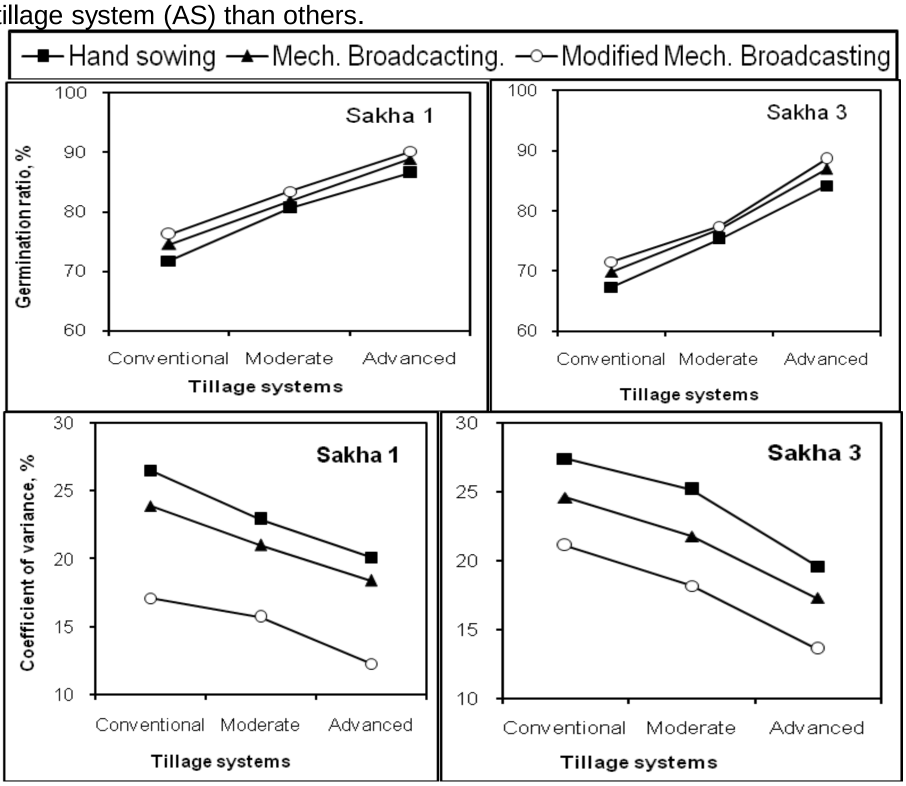

Fig. (1): Effect of tillage systems and sowing methods on germination ratio and Sowing uniformity (coefficient of variance, %).

The germination ratio was increased by 6.91 and 6.48 % for Sakha1and Sakha3 flax varieties, respectively due to using advanced tillage system (AS) instead of conventional system (CS). Also, it can be noted that the effect of sowing methods on germination ratio was not significant at any given tillage system for both varieties under study. The highest values of germination ratio of 88.65 and 87.25 % were obtained under advanced tillage system at developed mechanical broadcaster for Sakha 1 and Sakha 3 flax varieties, respectively. Therefore, it could be stated that, the best conditions for germination ratio through this investigation were obtained under the advanced tillage system and developed mechanical broadcaster.

1-2 Uniformity of sown flax plants

The uniformity of plant distribution is considered an important factor affecting directly on quality and quantity of yield components. The minimum values of variation coefficient, the best uniformity of plant distribution which proposed to get. Uniformity of sown flax plants, which was affected by the tillage systems and sowing methods are illustrated in Fig. (1). The results indicated that tillage and sowing methods have a significant effect on uniformity plant distribution. The minimum values of variation coefficient were obtained with advanced tillage system while the maximum values were recorded with conventional system for both varieties at any given sowing methods under study. This is may due to decreasing the clod sizes under 100 mm and good leveling with the advanced system as indicated in Fig (2).

On the other hand, using developed mechanical broadcaster instead of manual broadcasting and mechanical broadcaster decreased the main values of coefficient of variance by 35.11 and 8.92% for Sakha 1 flax variety and 26.73 and 11.77% for Sakha3 flax variety, respectively. The reason behind this results is good seed distribution in both directions by developed broadcaster.

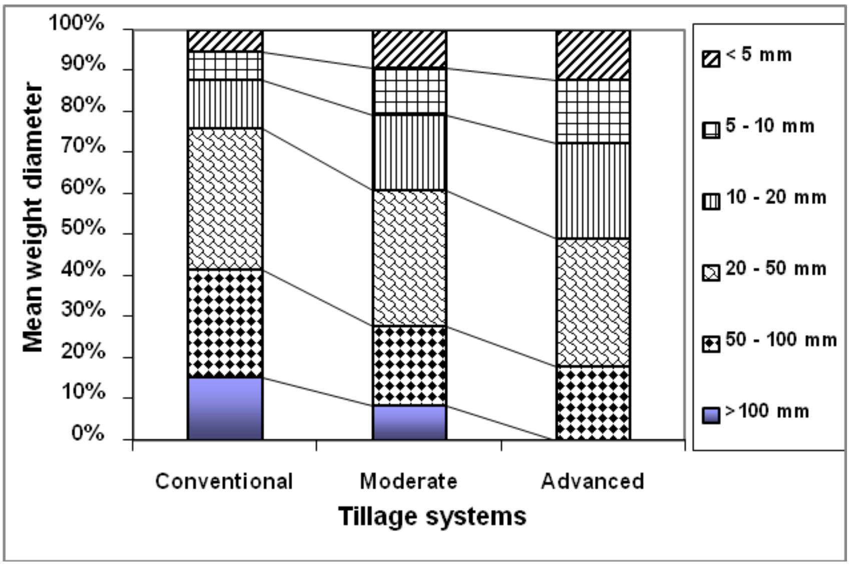

Fig (2): Main weight diameter of clods for three different levels of tillage.

2- Straw yield and its components

In general, the high quality of flax fibers requires specific characteristics such as small main stem diameter, high technical stem length and consequently high total straw yield. The mean values of the straw yield and its related characters as affected by tillage systems and sowing methods for both varieties of Sakha 1 and Sakha 3 are summarized in Table (2) and illustrated in Fig (3). The obtained results indicated that there were significant difference between the three tillage systems on straw yield and its components for both flax varieties under this study.

The advanced tillage system gave the highest values of 1725 /m^2, 78.90 cm and 4.52 ton/Fed for number of plant/m^2, technical stem length and straw yield/Fed, respectively, when using developed broadcaster for flax variety of Sakha 3. The same trend was obtained for flax variety of Sakha 1. These results may be due to fine tillage using rotary plow and good leveling by using laser scraping which increasing the germination ratio and good sowing uniformity in number of plants per unit area due to using the developed broadcaster. On the other contrary, the lowest values of 1300.50 /m^2, 64.28 cm and 2.18 ton/Fed for number of plant/m^2, technical stem length and straw yield/Fed, respectively were obtained when using the conventional tillage system at manual broadcasting method for Sakha 1 flax variety. The same trend was obtained for flax variety of Sakha 3.

Table (2): Effect of tillage systems and sowing methods on the mean values of straw components for flax varieties of Sakha1 and Sakha3 through two planting seasons.

Tillage systems	Sowing methods	No of plants/m^2		Technical length (cm)		Stem diameter (mm)	
		Sakha 1	Sakha 3	Sakha 1	Sakha 3	Sakha 1	Sakha 3
Conventional	Manual broadcasting	1300.50	1310.25	64.28	64.85	2.88	2.73
	Mechanical broadcaster	1350.15	1360.50	66.55	67.28	2.79	2.65
	Developed broadcaster	1380.50	1450.40	68.47	68.85	2.58	2.43
Moderate	Manual broadcasting	1460.50	1465.50	66.53	68.53	2.60	2.42
	Mechanical broadcaster	1481.25	1478.50	69.95	71.22	2.50	2.35
	Developed broadcaster	1510.50	1507.50	71.00	73.10	2.34	1.93
Advanced	Manual broadcasting	1530.75	1600.50	72.70	74.45	1.92	1.85
	Mechanical broadcaster	1621.25	1692.32	75.53	76.75	1.82	1.67
	Developed broadcaster	1650.40	1725.25	77.22	78.90	1.56	1.49

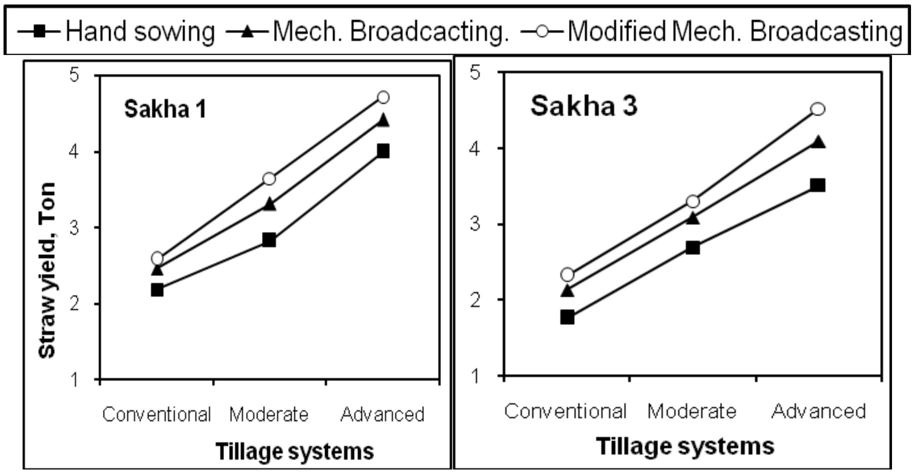

Fig. (3): Effect of tillage systems and sowing methods on straw yield of Sakha1 and Sakha3 flax varieties.

3- Seed yield and its components

Mean values of flax seed yield and its components as affected by tillage system and sowing methods for both varieties of Sakha1 and Sakha3 during this investigation are presented in Table (3) and Fig (3).

From these results, it can be concluded that the seed yield and its related characters was significantly affected by the different tillage systems and sowing methods. A gradual and significant decrement in the mean values of upper branching zone length and number of capsules/plant and increment in the mean values of seed yield/fed were obtained by using moderate or advanced tillage systems instead of conventional system for both varieties of flax under study. The reasons behind these results may be due to field preparation method of conventional system where the soil was looser with bigger clod diameters as indicated in Fig (2).

Table (3): Effect of tillage systems and sowing methods on the mean values of seed components for flax varieties of Sakha1 and Sakha 3 through two planting seasons.

Tillage systems	Sowing methods	Upper branching zoon length (cm)		No of capsules/plant	
		Sakha1	Sakha3	Sakha1	Sakha3
Conventional	Manual broadcasting	12.85	9.72	10.92	7.70
	Mechanical broadcaster	12.72	9.52	10.86	7.67
	Developed broadcaster	12.37	9.25	10.81	7.65
Moderate	Manual broadcasting	12.02	8.95	10.70	7.62
	Mechanical broadcaster	11.87	8.77	10.65	7.60
	Developed broadcaster	11.67	8.55	10.51	7.51
Advanced	Manual broadcasting	11.77	7.92	10.40	7.50
	Mechanical broadcaster	11.52	7.75	10.33	7.45
	Developed broadcaster	11. 41	7.45	10.29	7.39

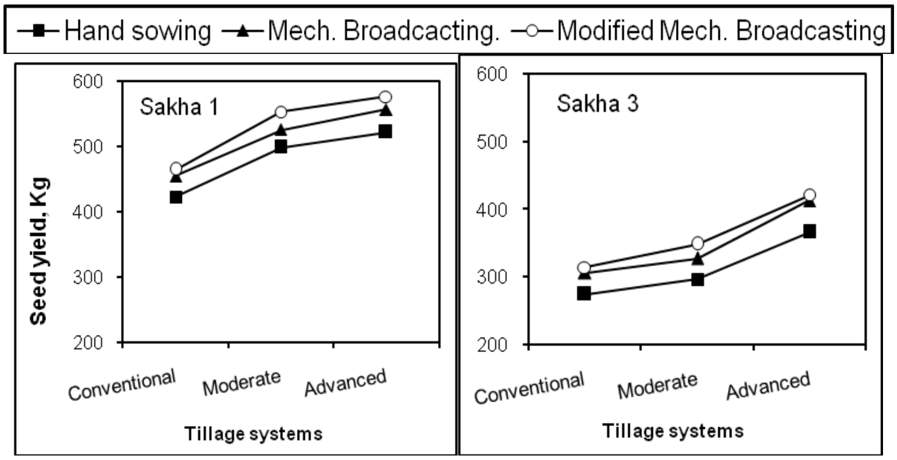

Fig. (4): Effect of tillage systems and sowing methods on seed yield of Sakha1 and Sakha3 flax varieties.

Also, it is clear that, using developed broadcaster gave the highest mean values of seed yield/fed for flax varieties of Sakha1 and Sakha3. Meanwhile, the lowest mean values of seed yield and its related characters were obtained when using manual sowing method flax varieties of Sakha 1 and Sakha 3. This trend may be due to higher sowing uniformity which results in flax plants received sufficient requirements of nutrients, light and water.

4- Fuel consumption and energy requirements

The total power consumed and energy required in each tillage system and sowing method were calculated and summarized in Table (4). The results indicated that there is significantly effect of tillage systems and sowing methods on power consumption and energy requirement was obtained in this study. The obtained results cleared that, the total power consumed increased from 117.03 kW in the conventional tillage system to 154.99 kW in the moderate system and decreased to 98.05 kW in advanced tillage system. However, the energy requirement was decreased from 134.92 kW.h/Fed in the conventional tillage system to 127.11 kW.h/Fed in the moderate system and decreased to 119.33 kW.h/Fed in advanced tillage system. These results means that using advanced tillage system instead of other tillage systems under study saved power consumption and energy requirement.

The values of the total power consumption obtained under different sowing methods were 0.08, 18.98 and 6.55 kW, however, the energy requirement values were 0.08, 3.57 and 8.33 kW.h/Fed due to using Manual broadcasting, mechanical broadcaster and developed mechanical broadcaster, respectively.

Also, these results concluded that, using advanced tillage system + developed mechanical broadcaster saved about 15.35% and 35.24% in power consumption compared with conventional and moderate tillage systems, respectively. Moreover, it could be cleared that using advanced tillage system saved about 10.89% and 5.75% in energy requirement compared with conventional and moderate systems, respectively.

Table (4): Effect of tillage systems and sowing methods on power consumption and energy requirement.

Tillage systems	Sowing methods	Power consumption, kW	Energy requirement, kW.h/Fed
Conventional	Manual broadcasting	117.11	135.00
	Mechanical broadcaster	136.01	138.49
	Developed broadcaster	123.58	143.22
Moderate	Manual broadcasting	155.07	127.19
	Mechanical broadcaster	173.96	130.68
	Developed broadcaster	161.54	135.41
Advanced	Manual broadcasting	98.13	119.41
	Mechanical broadcaster	117.03	122.90
	Developed broadcaster	104.61	127.62

5- Cost analysis and net profit

The total operation cost and total profit of flax seed and straw yields were estimated to calculate the increment percentage in net profit due to using different levels of tillage systems and sowing methods during this investigation (according to the following data: Flax seed price =2500 LE/ton, straw price =800 LE/ton and 1$=5.67 LE, 2007). The obtained results of the effect of tillage systems and sowing methods on total operation cost and net profit of seed and straw total yields are illustrated in Fig (5). These results indicated that using different tillage systems and sowing methods are highly significant effect on the total operation cost and net profit of total seed and straw yields.

The sowing costs were found to be 15, 25 and 30 LE/Fed for manual broadcasting, mechanical broadcaster and developed mechanical broadcaster, respectively. However, the tillage cost were found to be 104.4, 202.4 and 189.4 LE/fed for conventional, moderate and advanced systems, respectively.

These results cleared that the highest total operation cost was obtained with moderate tillage system+ developed mechanical broadcaster while the lowest value of total operation cost was obtained with conventional system+ manual broadcasting. On the other hand, the increment percentage in net profit of flax seed and straw yields was increased by (61.31 and 77.49%) and by (22.82 and 35.68%) due to using advanced tillage system instead of conventional system and moderate system with developed broadcaster for Sakha1 and Sakha 3, respectively.

From the economic point of view, it could be stated that, in spite of increasing the total operation cost due to using the advanced tillage system + developed mechanical broadcaster, the increment percentage in net profit of flax seed and straw yields will cover these costs compared with other tillage systems and sowing methods.

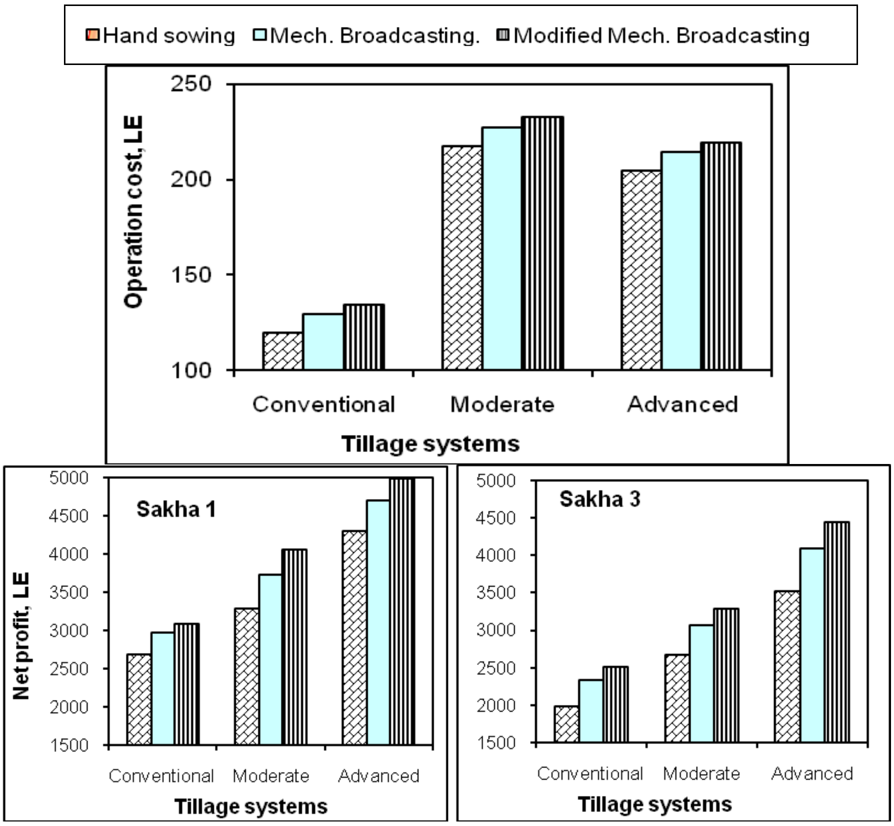

Fig. (5): Effect of tillage systems and sowing methods on operation cost and net profit for flax varieties of Sakha1 and Sakha3.

CONCLUSION AND RECOMMENDATIONS

From the previous results it can be concluded and recommended that,

- Tillage and sowing methods have a significant effect on uniformity plant distribution
- Using developed mechanical broadcaster instead of manual broadcasting and mechanical broadcaster decreased the main values of coefficient of variance by 35.11 and 8.92% for Sakha 1 flax variety and 26.73 and 11.77% for Sakha3 flax variety, respectively.
- Seed yield and its related characters was significantly affected by the different tillage system and sowing methods. using advanced tillage system + developed mechanical broadcaster saved about 15.35% and 35.24% in power consumption compared with conventional and moderate tillage systems, respectively.
- It can be recommended that using the advanced tillage system+ developed broadcaster to maximize the net profit of flax seed and straw yield (Sakha1 and Sakha 3 varieties)

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مقارنة بين ثلاث نظم لإعداد الأرض وزراعة محصول الكتان

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أجريت التجارب بهدف دراسة تأثير ثلاثة طرق مختلفة لتجهيز وخدمة الأرض للزراعة وثلاث طرق مختلفة لزراعة محصول الكتان فى موسمى 2005/2006 ، 2006/2007 بمزرعة مركز ميكنة الأرز بميت الديبة لصنفين من الكتان سخا 1 ، سخا 3 ، وكانت نظم خدمة الأرض كما يلى: 1- خدمة تقليدية: محراث حفار مرتين+ تسوية بالقصابية العادية 2- خدمة متوسطة : محراث حفار مرتين + تنعيم بالمشط القرصى + تسوية بالقصابية العادية 3- خدمة متقدمة : محراث حفار مرتين + تنعيم بالمحراث الدورانى + تسوية بالقصابية الليزر . أما طرق الزراعة كانت : 1- بدار يدوى ، 2- بدار ميكانيكى بالة نثر بالطرد المركزى ، 3- بدار ميكانيكى بالة نثر مطورة

وكانت أهم النتائج المتحصل عليها كما يلى:

1- أعطت طريقة الخدمة المتقدمة والزراعة بالة النثر المطورة اعلى قيم لنسب الإنبات (90.97 و90.25 %) واقل قيم لمعامل الاختلاف (12.3 ، 13.6 %) لكل من صنفى الكتان سخا1 ، سخا3 على التوالى.
2- كانت اعلى قيم لإنتاجية القش (4.71 ، 4.52 طن/فدان) والبذور (575 ،421 كجم/فدان) لكل من صنفى الكتان سخا1 ، سخا3 عند استخدام طريقة الخدمة المتقدمة والزراعة بالة النثر المطورة.
3- أدى استخدام طريقة الخدمة المتقدمة إلى تقليل الطاقة بنسبة 10.89% ، 5.75% مقارنة بطريقة الخدمة التقليدية والمتوسطة على التوالى.
4- زادت تكاليف التشغيل بنسبة (7.29 ، 5.6%) باستخدام طريقة الخدمة المتقدمة مقارنة باستخدام الخدمة التقليدية والمتوسطة على التوالى فى حين زاد صافى الربح بنسبة (61.31 ، 77.49 %) و (22.82 ، 35.68%) لكل من صنفى الكتان سخا1 ، سخا3 على التوالى.
5- يوصى باستخدام طريق الخدمة المتقدمة (حفار وجهين + روتارى + تسوية ليزر) والبدار الميكانيكى بالة النثر المطورة من اجل توفير الطاقة المستهلكة فى عملية الإعداد والزراعة بالإضافة إلى تعظيم إنتاجية محصول الكتان من القش والبذور.