

## RESEARCH PAPER

# Row Spacing and Seeding Rate Effect on Growth Parameters of Flax (*Linum usitatissimum* L.).

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### ABSTRACT:

Many factors effect on growth parameters of crops. During this current study row spacing and seeding rate were selected as main factors to improve growth parameters of flax (Thorshansity 72, "Poland cultivar"). The study was carried out in Gardarasha Field, Faculty of Agricultural Engineering Sciences, Salahaddin University – Erbil. It was done on 15<sup>th</sup> November 2018. Results indicated that both factors and interaction between them significantly affected some studied characteristics. The highest plant height was recorded in the situation of (C1S1) row spacing and seeding rate (8cm and 3g/m<sup>2</sup>), respectively it was by (73.7cm). Additionally, row spacing significantly affected of technical stem length and fruit zone length. Once more, the best value for both parameters were recorded when row spacing 8cm so the values were (56.5 and 17.5cm), respectively. Interaction between the factors were highly significant affected a number of capsules/plant so the best value was recorded with the situation of (C1S1) by (17.0) capsules/plant. According to the results can conclude that row spacing and seeding rate are more important to improve growth parameters and then fiber yield of flax.

KEYWORDS: Flax, Row Spacing, Seeding Rate. Improve Growth Characteristics.

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### INTRODUCTION:

Flax (*Linum usitatissimum* L.), also known as common flax or linseed, is a member of the genus *Linum* in the family Linaceae. It is also one of the trades and industry crop which plays an impact role in regional policy through its local fabrication as well as exportation (Khalifa *et al.*, 2011). Nevertheless, it is one of the most important medicinal plants; therefore, human consumption of the flax is increasing rapidly for food and industrial benefit (Khourang *et al.*, 2012). Additionally, which is a multipurpose crop that can be harvested for seed to extract oil and for the fiber (Martin *et al.*, 2006). Other products substitute for linseed oil in paints. However, the health benefits of flaxseed consumption have helped strengthen markets for the crop.

Seeding rate and row spacing independently influenced flax yield. Additionally, flax seeding rate was an important component of integrated weed management (Stevenson and Seeding rate and row spacing independently influenced flax yield. Additionally, flax seeding rate was an important component of integrated weed management (Stevenson and Wright 1996). The manipulation of crop seeding rate and row spacing can maximize yield when weeds are controlled with herbicides (Gubbels and Kenaschuk 1989; Lafond 1993). Results by Shiv Bahadur (2015) showed that the row spacing effected on growth and yield parameters of linseed.

This current study was done to investigate the effect of both factors; row spacing and seeding rate on growth characteristics of flax. It was to decide which of the factors is interested based on the results and also reached to the optimal seeding rate and spacing to the purpose above.

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## 1. MATERIALS AND METHODS

### 1.1. Field Experimental

The study was carried out in Gardarasha Field, College of Agricultural Engineering Sciences, Salahaddin University – Erbil. It was done on 15<sup>th</sup> November 2018. The experimental design used was Factorial Randomized Complete Block Design (RCBD). Twenty seven treatments were established in three replications. Each treatment was applied 1m<sup>2</sup> plots (1m × 1m) (Figure 1). The variety of flax used was (Thorshansity 72, “Poland cultivar”), seeds were planted in 3 row spacing (C) which was (8, 16 and 24 cm). For the 8 cm row spacing, 9 rows were sown an individual parcel, for the medium spacing 16 cm, 5 rows were sown, and for the 24 cm row spacing 4 rows were sown which was with 3 rates of seed (S): (3, 6 and 9 g/m<sup>2</sup>) as can be seen clearly in the (Figure 2).



**Figure 1.** Field prepares (Grdarash Field, Dept. Field Crops, College of Agricultural Engineering Sciences, Salahaddin University-Erbil).



**Figure 2.** Number of rows on individual parcel.

### 1.2. Data Collection

Ten plants were selected randomly as samples, it was at full maturity stage from every experimental unit to estimate these characteristics: plant height (cm), technical stem length (cm), fruit zone length (cm), number of fruiting branches/plant and number of capsules/plant. All parameters above are more important since it effects on end yield and quality of the fiber.

## 2. RESULTS AND DISCUSSION

Based on the table 1 (ANOVA), and referring to all figures (3,4,5, 6 and 7) there were highly significant effect ( $p \leq 0.01$ ) of different row spacing, seeding rate and interaction between them found on some growth parameters.

**Table 1.** The analysis of (ANOVA) for the effect of row spacing, seeding rate and their interactions on some growth parameters of flax.

Source of Variation	*DF	PH	TSL	FZL	NFB/P	NC/P
<b>Mean Square</b>						
C	2	74.83	18.30	22.90	0.14	37.52
S	2	28.84	2.10	22.41	0.89	18.59
C × S	4	21.65	10.21	11.04	0.06	22.12
<b>F. value</b>						
C	2	18.02	9.07	9.45	0.70	34.00
S	2	6.94	1.04	9.25	4.55	16.84
C × S	4	5.21	5.06	4.56	0.30	20.04
<b>P. value</b>						
C	2	0.00	0.00	0.00	0.51	0.00
S	2	0.01	0.38	0.00	0.03	0.00
C × S	4	0.01	0.01	0.01	0.87	0.00

Significant occurs when  $P \leq 0.05$

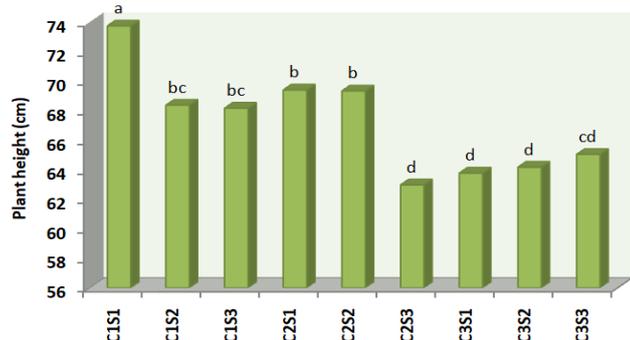
DF= degree of freedom, C= Row spacing, S= Seeding rate, PH= Plant height, TSL= Technical stem length, FZL= Fruit zone length, NFB/P= Number of fruiting branches/plant, NC/P= Number of capsules/plant

### 2.1. Plant Height (cm)

Plant height was significantly affected by row spacing and seeding rate. The highest plant high was recorded when row spacing (C) and seeding rate (S) just about (8cm and 3g/m<sup>2</sup>), respectively the value was 73.7cm, while it was reduced to 63.0cm which was in the situation of C2S3 (16cm and 9g/m<sup>2</sup>), respectively (Figure 3).

These results may relate to the type of flax which was referred to fiber class. The standard row spacing for this class of flax is about 8cm

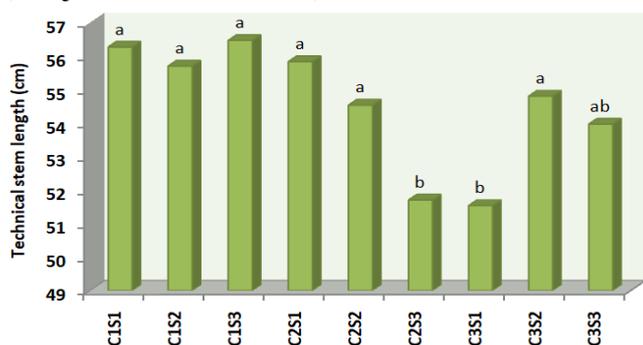
between rows, while for the class of linseed oil the best row spacing is about 24cm. Some sources introduced that the row spacing 6 to 10 cm was appropriate to the fiber type of flax (Kocjan and Trdan 2008).



**Figure 3.** Effect of row spacing, seeding rate and their interaction on plant height.

## 2.2. Technical Stem Length (cm)

Figure 4 shows the impact affected by interaction among row spacing and seeding rate of technical stem length. Additionally, the best value for this parameter was recorded when row spacing and seeding rate by (8cm and 9g/m<sup>2</sup>), respectively. So, the value was (56.5 cm). Despite that, seeding rate alone was not significant affected. Based on this result can be reported that small distance between rows for the fiber type of flax causes to receive a high amount of end fiber yield. It is because technical stem length related to end yield. 8.5 or 17 cm were suggested to the farmers as the best row spacing of some types of flax to have the highest amount of stem yield which was by (Kocjan and Trdan 2008).

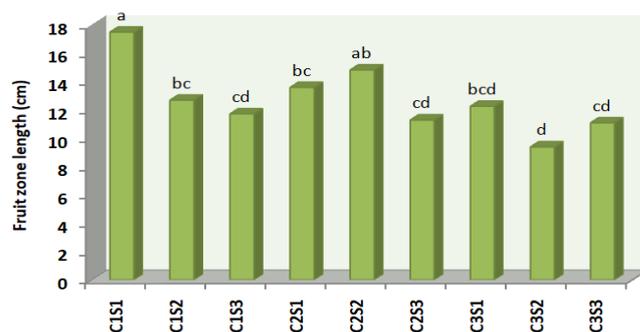


**Figure 4.** Effect of row spacing, seeding rate and their interaction on technical stem length.

## 2.3. Fruit Zone Length (cm)

Also, the fruit length was significantly affected the interaction between both factors were considered in this current study. The value was (17.5cm) which was in the situation of (C1S1). Each factor alone also significantly affected of the above growth parameter. 14.4cm which was under

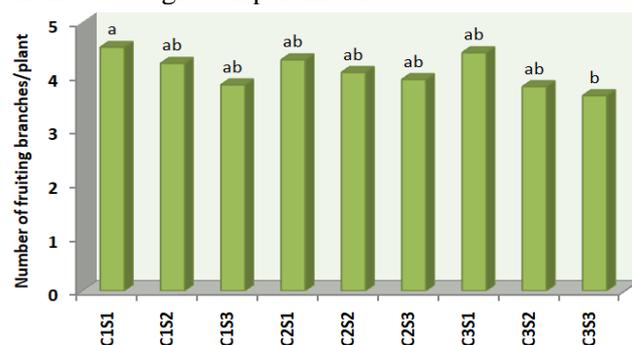
situation of seeding rate (3g/m<sup>2</sup>), and 14cm when row spacing just about (8cm), (Figure 5).



**Figure 5.** Effect of row spacing, seeding rate and their interaction on fruit length.

## 2.4. Number of Fruiting Branches.Plant<sup>-1</sup>

Number of fruiting branches.plant<sup>-1</sup> was not significantly affected by row spacing but also by seeding rate so the best value of this parameter was approximately (4.5) as can be seen in the (Figure 6). Same results were found by Jakusko *et al.*, (2013). Actually, they used sesame plant a plant material in their study, so they found that row spacing did not significantly affect the number of primary branches.plant<sup>-1</sup>. Moreover, this value was reduced with increasing seeding rate of 6 to 9g/m<sup>2</sup>, which about (4.0 and 3.8) fruiting branches.plant<sup>-1</sup>, respectively. These results may also relative to the type of the flax was used in this current study. On the other hand, with increasing seeding rate may ability of plants to make more branches decreased which was because did not obtain sufficient sunlight and it might be caused to competition between plants for getting water and nutrients. In the end, all factors could negatively affect on the above growth parameter.

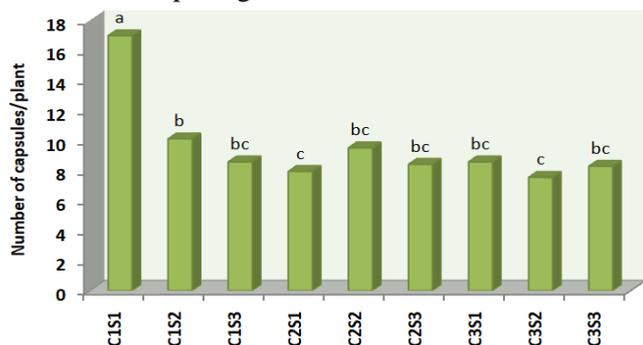


**Figure 6.** Effect of row spacing, seeding rate and their interaction with a number of fruiting branches.plant<sup>-1</sup>.

## 2.5. Number of Capsules.Plant<sup>-1</sup>

Row spacing, seeding rate and interaction between them were highly significant affected of number of capsules.plant<sup>-1</sup>. The best value was recorded with the situation of C1S1 by (17.0) capsules.plant<sup>-1</sup> followed by C1S2 which the value was by (10.0) capsules.plant<sup>-1</sup> (Figure 7).

Jakusko *et al.*, (2013) observed significant response an number of capsules.plant<sup>-1</sup> of sesame in different row spacing.



**Figure 7.** Effect of row spacing, seeding rate and their interaction on number of capsules.plant<sup>-1</sup>.

### 3. CONCLUSIONS

The results indicated to significant affected in most of the studied parameters like plant height, technical stem length, fruit zone length and number of capsules.plant<sup>-1</sup>. Additionally, according to the results can said that row spacing and seeding rate are more important to improve growth parameters and then fiber yield of flax. Moreover, some important notes could suggest to the farmers such as sowing seeds of flax in small row spacing and using it in small rate since both of notes economically acceptable.

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