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Linseed (*Linnum usitatissimum* L.): An oilseed crop with used in different ways

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Abstract
A field investigation was conducted at Agronomy research farm A. S. (P.G) College, Lakhaoti, Bulandshahr during rabi seasons of 2006 and 2007. The treatments consisted of combination of four cropping systems viz. chickpea sole (M1), linseed sole (M2), chickpea+ linseed 2:1 ratio (M3) and pigeonpea + linseed 4:2 ratio (M4) in main plots; two irrigations viz. two irrigations at vegetative stages (30-40 days) and flowering stage (70-75 days) (S1) and one irrigation at flowering stage (70-75 days) (S2) in sub plots and three levels of phosphorous viz. control (L1), 30 kg P_2O_5/ha (L2) and 60 kg P_2O_5/ha (L3) in sub-sub plots in split plots design replicated thrice during the rabi season. The linseed variety neelam were used in the cropping systems during rabi season. The soil of the experimental site was low in organic carbon (0.47 and 0.48 kg/ha) and total nitrogen (154.0 and 155.1 kg/ha). It was low in available phosphorus (9.2 and 9.24 kg/ha) and medium in available potassium (203.0 and 203.6 kg/ha) and sandy loam in texture having alkaline reaction (pH 7.5). The weather during the both years of the experiment was by and large normal and devoid of any extreme conditions. The net return was found to be maximum under chickpea: linseed in 4:2 row ratio with two irrigations and 60 kg P_2O_5/ha. (Rs. 21,632 and Rs. 22,128) followed by sole chickpea with two irrigation and 60 kg P_2O_5/ha. Due to relatively higher gross return. The maximum B:C ratio of 1.87 and 1.91 was obtained from chickpea: linseed in 4:2 with one irrigation at flowering and 60 kg P_2O_5/ha, because of reduced cost of on irrigation and higher gross return of the system.

Keywords: Oil content, cropping system, irrigation, levels of phosphorous, linseed

Introduction

Flax, also known as common flax or linseed, is a flowering plant, *Linum usitatissimum*, in the family Linaceae. It is cultivated as a food and fiber crop in regions of the world with temperate climates. Textiles made from flax are known in English as linen and are traditionally used for bed sheets, underclothes, and table linen. Its oil is known as linseed oil. In addition to referring to the plant, the word "flax" may refer to the unspun fibers of the flax plant. The plant species is known only as a cultivated plant [2] and appears to have been domesticated just once from the wild species *Linum bienne*, called pale flax [3]. The plants called "flax" in New Zealand are, by contrast, members of the genus *Phormium*.

lntercropping is an agronomic refinement of the old practice of crop mixture, where in the crop components, usually two are sown in separate rows, their population ratios are know and they can be harvested singly and produce recorded separately. The crop components often have. Different growth period and growth habits, statistical analysis and interpretation of the total and individual products is, thus, possible and valid, for drawing conclusion of the propriety or otherwise of the system in a given region. Among various measures adopted for improving the productivity of oil seed crops, one technique may be to grow these crops with legumes. It has been observed that intercropping of oil seed with cereals, pulses and fibers is one of the best techniques to increase production. Phosphorus is the most vital nutrient, which contributes directly to both yield and quality of chickpea. It plays an important role to various physiological processes. Moreover, it is constituent of ADP, ATP, nucleic acids and nucleo proteins and several co-enzymes, which are of great importance in energy transformation and metabolic activities of the plant. Phosphorus deficiency is usually the key factor for poor yield of pulses on most of the soils. In absence of inadequate supply of phosphorus sometimes, other nutrient elements also become ineffective for plant use.

good supply of phosphorus to the plants helps in better root development and hastens maturity. Optimum levels of phosphorus increases growth, nodulation and nitrogen fixation in legumes. However, there is a considerable variation in its requirement, which need careful study before making any recommendation for getting economical yield.

Materials and Methods

A field investigation was conducted at Agronomy research farm A. S. (P.G) College, Lakhaoti, Bulandshahr during rabi seasons of 2006 and 2007. The treatments consisted of combination of four cropping systems viz. chickpea sole (M1), linseed sole (M2), chickpea+ linseed 2:1 ratio (M3) and chickpea + linseed 4:2 ratio (M4) in main plots; two irrigations viz. two irrigations at vegetative stages (30-40 days and flowering stage (70-75 days) (S1) and one irrigation at flowering stage (70-75 days) (S2) in sub plots and three levels of phosphorous viz. control (L1), 30 kg P_2O_5/ha (L2) and 60 kg P_2O_5/ha (L3) in sub-sub plots in split plots design replicated thrice during the rabi season. The linseed variety neelam were used in the cropping systems during rabi season. The soil of the experimental site was low in organic carbon (0.47 and 0.48 kg/ha) and total nitrogen (154.0 and 155.1 kg/ha). It was low in available phosphorus (9.2 and 9.24 kg/ha) and medium in available potassium (203.0 and 203.6 kg/ha) and sandy loam in texture having alkaline reaction (pH 7.5). The weather during the both years of the experiment was by and large normal and devoid of any extreme conditions. The experiment was conducted as per the standard procedures and all the pre and post-harvest observations were recorded and analyzed as per the prescribed statistical procedures. The experimental data pertaining to each character were subjected to statistical analysis by using the technique of analysis of variance (ANOVA) and their significance was tested by "F" test. Standard error of means (SEm+) and least significant difference (LSD) at 0.05 probabilities were worked out for each character studied to evaluate differences between treatment means.

Table 1: Potassium content and its uptake by linseed as influenced by cropping systems, irrigation and phosphorus levels

Treatments	K content in seed (%)		K content in stover (%)		K uptake in seed kg/ha		K uptake in stover kg/ha		Total K uptake kg/ha	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
Cropping Systems										
Sole linseed	1.03	1.03	1.382	1.390	13.18	13.48	36.21	37.56	49.39	51.05
Chickpea + Linseed (2:1)	1.04	1.05	1.403	1.410	6.00	5.95	20.63	20.15	26.64	26.10
Chickpea + Linseed (4:2)	1.04	1.05	1.388	1.398	5.56	5.71	17.40	17.78	22.96	23.49
SEm±	0.01	0.01	0.02	0.01	0.06	0.08	0.19	0.18	0.30	0.38
CD at 5%	NS	NS	NS	NS	0.20	0.24	0.59	0.58	0.94	1.21
Irrigation										
Vegetative + Flowering stage	1.04	1.04	1.392	1.400	8.82	8.93	26.00	26.26	34.82	35.19
Flowering stage	1.03	1.04	1.390	1.399	7.68	7.83	23.49	24.07	31.17	31.91
SEm±	0.01	0.01	0.01	0.01	0.05	0.06	0.15	0.15	0.24	0.31
CD at 5%	NS	NS	NS	NS	0.16	0.19	0.48	0.47	0.77	0.99
Phosphorus levels (kg/ha)										
Control	1.03	1.03	1.377	1.383	7.46	7.59	23.00	23.42	30.46	31.01
30 kg P_2O_5/ha	1.04	1.05	1.392	1.400	8.51	8.54	25.28	25.40	33.79	33.94
60 kg P_2O_5/ha	1.05	1.05	1.405	1.415	8.77	9.01	25.97	26.67	34.74	35.68
SEm±	0.01	0.01	0.01	0.02	0.09	0.11	0.33	0.40	0.41	0.53
CD at 5%	NS	NS	NS	NS	0.27	0.34	0.98	1.17	1.20	1.54

Table 2: Oil content and oil yield of linseed as influenced by cropping systems, irrigation and phosphorus levels

Cropping systems		Oil content (%)		Oil yield kg/ha)
	2006-07	2007-08	2006-07	2007-08
Cropping Systems				
Sole linseed	35.45	35.60	452.32	464.84
Chickpea + Linseed (2:1)	37.03	37.20	213.06	211.13
Chickpea + Linseed (4:2)	37.90	38.02	203.02	207.09
S.Em.±	0.35	0.30	1.99	2.21
CD at 5%	1.10	0.95	6.28	6.96
Irrigation				
Vegetative + Flowering	36.57	36.71	305.86	311.05
Stage				
Flowering stage	37.02	37.17	273.07	277.66
S.Em.±	0.29	0.25	1.63	1.80
CD at 5%	NS	NS	5.13	5.68
Phosphorus levels				
(kg/ha)				
Control	36.17	36.28	260.20	265.15
30 kg P_2O_5/ha	37.05	37.18	299.91	301.45
60 kg P_2O_5/ha	37.17	37.35	308.29	316.47
S.Em.±	0.44	0.54	3.85	4.61
CD at 5%	NS	NS	11.23	13.45

Discussion

The oil content of seed of linseed was not improved by different planting patterns in inter-cropping systems. The higher seed yield in sole crop resulted in maximum oil yield in sole crop than 2:1 and 4:2 ratio which recorded lower seed yield.

Oil content in linseed showed decreasing trend with the application of phosphorus. However, the difference were found non-significant among fertilizer levels. The oil yield increased with the increasing phosphorus levels upto 60 kg P2O5/ha. It was interesting to note that the oil content in seed decreased with increasing levels of phosphorus, whereas an increase seed yield was recorded with increasing fertilizers 60 kg P2O5/ha. The increasing seed yield with increasing P levels is responsible for producing higher oil yield. These results are in conformity with the results of Yadav *et al*. (1990) [5] and Kumar and Singh (2006) [1].

Crop irrigated at vegetative and flowering stages significantly improved the growth of linseed in both the years. Two (vegetative + flowering) produced taller plants and higher dry matter accumulation as compared to irrigation at sowing stage in both the years. This could be attributed to availability of more water in the root zone and favourable effect of cell formation and enlargement of plants on the other hand, supply of irrigation water induced proper plant growth and helped development of yield attributes and yield. This observation is supported by Malik *et al*. (2001) [2].

Conclusion

In recent decades several studies have revelated that one irrigstion and phosphorus level in resulted maximum oil content.

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