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Response of Different Linseed Varieties Under Extended Sowing Dates

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ABSTRACT: *An experiment on effects of extended sowing dates on different linseed varieties was conducted at, Agronomy Farm, College of Agriculture, Pune during the year of 2012-2013 in* rabi *season. The experiment was laid out in split plot design with four sowing times and three varieties replicated thrice. The treatments were of four sowing dates* viz., *S_1 : 44 MW (1^{st} week of November), S_2 : 45 MW (2^{nd} week of November), S_3 : 46 MW (3^{rd} week of November), S_4 : 47 MW (4^{th} week of November) and three varieties viz., V_1 : PKVNL-260, V_2 : NL-97, V_3 : Padmini. The sowing date of 45MW (2^{nd} week of November) was found superior for growth, yield attributes and yield of linseed. Thus, sowing on 45MW (2^{nd} week of November) was suitable for extended sowing dates. The linseed variety the PKVNL-260 variety was found, better under extended sowing dates with regards to growth, yield attributes and yield. Economically, PKVNL-260 linseed variety with 45MW (2^{nd} week of November) sowing date obtained higher gross, net monetary returns and B:C ratio.*

Keywords: *Linseed, extended sowing dates, linseed varieties.*

INTRODUCTION

Linseed (*Linum usitatissimum* L.) is one of the oldest, conventional and important *rabi* oilseed crop of India. It is sixth largest oilseed crop in the World and is one of the oldest cultivated plants. It is herbaceous annual plant, which attains the height of 30-120 cm depending up on the type of cultivar. It is an industrial crop cultivated for its seeds, fibres and oil purpose. All parts of the plant have extensive and varied uses. The oil content of seed varies from 32 to 46 per cent and has an industrial value, it is also used as proteinaceous feed for livestock.

Linseed oil possesses a very healthy fatty acid profile, particularly, Omega-3 (Alpha Linolenic Acid), the richest source only in linseed (58 per cent), ALPHA provides beneficial effects in numerous clinical conditions such as cardiovascular disease, inflammatory disorders, immune function and cancer etc.

An impact of changed climate on crop production is expected for various latitude limits for all the crop seasons and the linseed crop is most affected during winter season. Linseed crop require cool climate and moderate temperature (not exceeds above 32°C). Increase in temperature affects on flowering and causes low yield. Amongst various agronomic practices, the time of sowing plays an important role in influencing the quality and yield of linseed. Normal sowing have longer growth period which consequently provide an opportunity to accumulate more biomass as compared to late sowing hence manifested in higher seed and biological yield (Dixit *et al*. 1992).

MATERIAL AND METHODS

An experiment on effects of extended sowing dates on different linseed varieties was conducted at, Agronomy Farm, College of Agriculture, Pune during the year of 2012-2013 in *rabi* season. The soil of experimental field was clay loam in texture, normal in reaction (7.8) with low available nitrogen (178.48 kg ha^{-1}), high available phosphorous (19.34 kg ha^{-1}) and high available potassium (475.00 kg ha^{-1}).

The experiment was laid out in split plot design with four sowing times and three varieties replicated thrice. The treatments were of four sowing dates *viz*., S_1 : 44 MW (1^{st} week of November), S_2 : 45 MW (2^{nd} week of November), S_3 : 46 MW (3^{rd} week of November), S_4 : 47 MW (4^{th} week of November) and three varieties *viz*., V_1 : PKVNL-260, V_2 : NL-97, V_3 : Padmini. Linseed crop was sown as per sowing treatment 1^{st} sowing on 1^{st} November, 2^{nd} sowing on 8^{th} November, 3^{rd} sowing on 16^{th} November and 4^{th} sowing on 23^{rd} November 2012.The gross plot size was 3.60m x 2.40m and net plot size 2.40m × 1.80m.

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Table 1
Effect of extended sowing dates and linseed varieties on growth and yield contributing characters

Treatment	*Plant height (cm)*	*No. of branches*	*Plantspread (cm)*	*Dry matter (g)*	*Number of capsule/plant*	*No. of seeds/capsule*	*Seed weight plant^{-1}*	*Test weight (g)*
A. Sowing times								
S_1 : 44 MW	64.45	4.20	15.94	8.58	54.00	9.80	4.55	8.43
S_2 : 45 MW	69.51	4.23	16.97	9.87	59.00	10.17	4.71	8.53
S_3 : 46 MW	60.54	4.19	15.73	7.56	51.66	9.56	4.26	8.37
S_4 : 47 MW	44.49	4.18	14.71	7.12	49.10	9.13	2.05	8.36
S.E. m ±	1.71	0.16	0.37	0.05	1.81	0.14	0.12	0.09
C.D. at 5%	5.16	N.S.	1.12	0.17	5.45	0.44	0.38	NS
B. Varieties								
V_1 : PKVNL-260	64.32	4.87	16.93	9.23	62.00	10.02	5.14	8.43
V_2 : NL-97	58.83	3.95	15.83	8.38	51.51	9.77	4.23	8.42
V_3 : Padmini	56.10	3.78	14.75	7.25	46.81	9.20	3.82	8.41
S.E. m ±	0.70	0.17	0.06	0.02	1.02	0.10	0.02	0.07
C.D. at 5%	2.10	0.54	0.18	0.07	3.06	0.31	0.07	NS
C. Interaction								
S.E. m ±	1.43	0.09	0.12	0.04	2.04	0.21	0.04	0.12
C.D. at 5%	N.S.	N.S.	N.S.	0.13	6.10	0.64	0.13	NS
General mean	59.75	4.20	15.83	8.28	53.44	9.67	4.39	8.42

RESULTS AND DISCUSSION

A. Effect of Sowing Times

Growth attributing characters

The sowing of linseed on 45 MW recorded significantly higher plant height and spread which was at par with 44 MW and significantly superior over rest of sowing date. These results indicate that sowing of the linseed in 45 MW was most suitable for plant height and spread. This might be associated with the linseed sown in 45 MW was exposed to low temperature, more dew formation, higher coldness and resulted in higher plant height and spread. The results are in the conformity with those of Abdul EL-Dayem *et al*. (1998) and Naik and Satapathy (2000). The mean number of branches plant^{-1} were found to be non significant for the sowing dates.

The 45 MW accumulated significantly more dry matter plant^{-1} over rest of the sowing dates. The vegetative growth and dry matter production were less in extended sowing dates. This was mainly due to rise in temperature which forced to late sown linseed to mature earlier and this enforced maturity resulted in shorting of growing period. This decreased growth period might have reduced dry matter production with late sowing. These results confirm the findings of Dudhade *et al.* (1994), Kumar and Shaktawat (1991), Ciriciofolo and Bonciarelli (1994), Singh *et al.* (2003) and Singh *et al.* (2002).

Yield Attributing Characters

The number of number of capsule plant^{-1}, seed capsule^{-1} and seed weight plant^{-1} was influenced significantly due to extended sowing dates of linseed at harvest. The sowing of linseed at 45 MW recorded maximum capsule plant^{-1}, seed capsule^{-1} and seed weight plant^{-1} which was at par with 44 MW and significantly superior over rest of sowing dates. The differences in all these yield attributes might be due to different sowing dates expose the linseed crop to climatic condition hence, obstruction in seed filling in capsule of linseed varieties and adversely reflects it in number of seed capsule^{-1} and seed weight plant^{-1}. Results are in agreement with those obtained previously by Dudhade *et al*. (1994), Dixit *et al*. (1990), Shahidullah *et al*. (1997) and Abdul EL-Dayem *et al*. (1998).

Yield

The seed yield was maximum (18.43 q ha^{-1}) at 45 MW which was significantly superior over the rest of sowing dates. Sowing date 45 MW was favorable to high seed production because the post anthesis period coincide with the relatively low temperature. However, late sowing 46 and 47 MW were unfavorable to seed yield since low temperature during early sowing might have adversely affected the initial vigour. The results are in conformity with the findings by Kalita *et al.* (1999) and Shahidullah *et al.* (1997).

The straw yield was maximum (29.76 q ha^{-1}) at 45 MW which was significantly superior over rest of

Table 2
Effect of extended sowing dates and linseed varieties on yield ,quality and economics

Treatment	*Seed yield (q ha^{-1})*	*Straw yield (q ha^{-1})*	*Oil content in seed (%)*	*Oil yield (kg ha^{-1})*	*Gross monetary returns (Rs. ha^{-1})*	*Cost of cultivation (Rs. ha^{-1})*	*Net monetary returns (Rs. ha^{-1})*	*B:C ratio*
A. Sowing times:								
S_1 : 44 MW	17.21	28.68	38.22	657.77	75724	43758	31966	1.73
S_2 : 45 MW	18.43	29.76	37.88	698.13	81092	43758	37334	1.85
S_3 : 46 MW	15.10	24.62	37.77	570.33	66440	43647	22793	1.52
S_4 : 47 MW	14.86	23.72	37.33	554.72	65384	43647	21737	1.50
S.E. m ±	0.12	0.16	0.04	5.61	243.12		148.34	
C.D. at 5%	0.37	0.48	N.S.	16.80	729.37		445.05	
B. Varieties :								
V_1: PKVNL-260	18.12	28.69	38.08	690.00	79728	43702	36026	1.82
V_2 : NL-97	16.04	26.20	37.75	605.51	70576	43702	26874	1.61
V_3 : Padmini	15.04	25.20	37.58	565.20	66176	43702	22474	1.51
S.E. m ±	0.02	0.12	0.06	5.30	285.34		145.12	
C.D. at 5%	0.07	0.38	N.S.	15.50	856.01		435.38	
C. Interaction								
S.E. m ±	0.05	0.24	0.12	10.61	571.68		290.26	
C.D. at 5%	0.16	0.74	N.S.	N.S.	N.S.		N.S.	
General mean	16.39	26.69	37.80	620.14	72160	43702	28458	1.50

sowing dates. The second best sowing date was 44 MW which produced significantly more straw yield (28.68q ha^{-1}) over 46 and 47 MW. Seed yield is directly related to growth and yield attributes. All yield attributes were higher in 45 MW sowing.The reduction in straw yield was due to reduced growth in terms of plant height, number of branches plant^{-1}and dry matter accumulation. In the late sowing 46 and 47 MW the period between anthesis and leaf senescence was curtailed by the onset of relatively higher temperature. Similar results were obtained by Chaudhary *et al.* (1991) and Ciriciofolo and Bonciarelli (1994).

Oil Content and Oil Yield

The sowing of linseed in different meteorological weeks did not influenced the oil content in seed. The linseed sown on 45 MW recorded statistically significant oil yield over rest of the sowing dates. The 45 MW sowing produced higher seed yield resulted in higher oil yield.

Economics

The gross (81,092 Rs. ha^{-1}) and net monetary returns (37,334 Rs. ha^{-1}) and B:C ratio (1.85) were significantly influenced by extended sowing dates. The sowing of linseed in 45 MW recorded significantly higher gross and net monetary returns and B:C ratio than rest of sowing dates. 45MW sowing treatment gave higher yield which ultimately increased gross, net monetary returns and B:C ratio.This might be due to delayed sowing caused significant reduction in seed and straw yield which reflects decreased in gross and net monetary returns and B:C ratio.

B. Effect of Varieties

Growth attributing characters

The highest plant height, spread and number of branches of linseed was observed in PKVNL-260 which was significantly superior over rest of the linseed varieties. Significantly lower growth attributes were recorded in the variety Padmini. The increased in these yield attributes in linseed is genetically governed phenomenon, hormone balance, nutrient absorption capacity and conversion of radiant energy into chemical energy in presence of chlorophyll. Similar results were recorded by Shahidullah *et al.* (1997), Dubey (1999), Dubey (2000) and Moahapatra *et al.* (2007).

The dry matter plant^{-1} of linseed was influenced significantly due to various varieties. The dry matter accumulation is the result of all growth attributes *viz*., plant height, number of branches plant^{-1}, plant spread and yield attributes. Similar results were obtained by Moahapatra *et al.* (2007) and Pali and Tripathi (2000).

Yield Attributing Characters

The linseed varieties were differing in their number of seeds capsule^{-1}, number of capsulesplant^{-1}and seed weight plant^{-1}. The number of seeds capsule^{-1}, number of plants plant^{-1} and seed weight plant^{-1} were

found significantly higher in linseed variety PKVNL-260 which was at par with variety NL-97 and significantly superior over Padmini. This might be because of genetical makeup of these varieties were different for seed settling and seed development in capsule. The mean test weight (*g*) were found to be non significant for the varieties. Similar results were reported by Pali and Tripathi (2000) and El-Refaey *et al*. (2008).

Yield

The seed yield of linseed was influenced significantly due to linseed varieties. The seed and straw yields were significantly higher in PKVNL-260 (18.12qha^{-1} and 28.69q ha^{-1}respectively) and significantly superior over rest of linseed varieties. The variety Padmini recorded significantly lower seed and straw yields. The differences in seed and straw yields in linseed varieties might be due to inherent genetical potential of linseed varieties and source single relationship.

Oil Content and Oil Yield

The varieties PKVNL-260, NL-97 and Padmini were statistically non significant for oil content in seed. The oil content in seed is genetic character of genotype. The linseed variety PKVNL-260 recorded statistically significant oil yield over the varieties NL-97 and Padmini as it has higher seed yield.

Economics

The gross (79728 Rs. ha^{-1}) and net monetary returns (36026 Rs. ha^{-1}) and B:C ratio (1.82) were significantly influenced by linseed varieties. The significantly higher gross and net monetary returns and B:C ratio was observed in linseed variety PKVNL-260. This variety gave higher yield which ultimately increased the gross and net monetary returns and B:C ratio.

Thus, it can be concluded that the sowing date of 45MW (2nd week of November) was found superior for growth, yield attributes and yield of linseed. The linseed variety the PKVNL-260 sown on 45MW (2nd week of November) was suitable for extended sowing dates with regards to growth, yield attributes, yield and economics.

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