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Performance of linseed (*Linum usitatissimum* L.) varieties under Northern hill zone of Chhattisgarh

Cheteshawar Kumar Sahu, RS Sidar and DK Gupta

Abstract
The new appraisal entitled "Performance of linseed (*Linum usitatissimum* L.) varieties under Northern hill zone of Chhattisgarh" was carried out during *Rabi* season 2020-21, at RMD college of Agriculture and Research Station, Ambikapur (C.G.). The experiment was conducted with 5 treatments and 4 replications in Randomized Block Design. Treatment comprised with five varieties *viz.* RLC-148, RLC-133, RLC-92, Deepika and R-4292. The result revealed that the RLC-92 significantly better performance observed as compare to other test varities of linseed with respect to growth parameter and yield attributing characters *viz.* plant height (64.17 cm), Primary branches plant^{-1} (3.70), crop growth rate (0.1529 g plant^{-1}day^{-1}), number of capsules plant^{-1} (56.10), number of seed capsule^{-1} (8.15), test weight (7.28 g), grain yield (1196.90 kg ha^{-1}), net return (43152.33 ₹ ha^{-1}) and B:C ratio (2.20) respectively. The varieties RLC-92 and RLC-148 both are similar to each other but variety RLC-92 was most suitable for northern hill zone of Chhattisgarh.

Keywords: Linseed, varieties, growth and yield parameter

Introduction
Linseed (*Linum usitatissimum* L.) is one of the most versatile and useful crops also known as flaxseed (Genser and Morris, 2003). Linseed oil are rich source of fat and also contains a high level of protein, it provides edible oil (fats) and vanaspati ghee for human use. They give vital fatty acids, as well as beneficial carbohydrates and vitamins. India is the world's fifth-largest producer of linseed it is grown on a global scale across 24.37 lakh ha^{-1}, with a production of 22.0 lakh tonnes and a productivity of 903 kg ha^{-1}. Linseed is cultivated in around 3.30 lakh hectares in India, contributing 1.72 lakh tonnes to the annually. The average productivity of linseed is 523 kg ha^{-1} and it contributes 7 per cent to the world linseed production (Anonymous 2017). Oilseeds production during 2018-19 is 1.77 million tonnes higher over the average 5th year production of oilseeds. (Anonymous 2018-19). Madhya Pradesh, Uttar Pradesh, Chhattisgarh, Bihar, Rajasthan, Orissa and Karnataka are major linseed growing state in India. Chhattisgarh currently cultivates around 28 thousand hectares with a production of 12.58 thousand tonnes and a productivity of 446 kg per hectare (3rd Advance Estimates of DES, 2017-18).
Varieties dissimilar in their yield capabilities depending on various physiological processes regulated by both genetic makeup and environment. It is the fact that, under all environmental conditions, a specified genotype don't exhibit the same phenotypic characteristics and different genotypes respond differentially to a specified environment condition and usually differ in their relative ranking (Ebehart and Russell, 1966) [7]. Cultivar selection is a significant impact that influence linseed yield. The objective of this study was to find out the best variety of linseed crop for higher productivity and profitability for north hill zone of Chhattisgarh and to see the performance on growth parameters, yield attributes and yield.

Materials and Method
The experiment was carried out during *Rabi* season 2020-21conducted at Raj Mohini Devi College of Agriculture and Research Station, Ambikapur (C.G.), which is situated at 23.15º North latitude and 83.15º East longitude and at an altitude of 623 meters above from mean sea level (MSL). The general climate condition of Surguja (Chhattisgarh) is Eastern Plateau and Hilly region with average annual rainfall is about 1356 mm, of which about 82% is, received a short span of four month i.e. between June to September. The experiment was carried out in Randomized Block Design (RBD) with 4 replication and 5 treatments, varieties used as a treatment *viz.*V_1 - RLC-148, V_2 - RLC-133, V_3 - RLC-92, V_4 – Deepika, V_5 - R-4292.

Recommended dose of fertilizer (60:20:20 NPK kg/ha).

Result and discussion

Performance on growth parameters

The data pertaining to varietal performance on growth parameters are presented in Table 1.

Plant height

The plant height of the plant has been incremental with successive crop growth period, the rate of increase in plant height was maximum between 30-60 days, thereafter increase in slow rate The significantly taller plant height was recorded (64.17) in RLC -92 over other varieties, however at par with RLC-148 (62.50) followed by R-4292 (59.24), deepika (58.55) and smaller plant height (56.83) was recorded in variety RLC-133 respectively. The difference in plant height among the linseed varieties might be due to the genetic capabilities to exploit available resources for their growth & development. The finding is conformity with the result of Kumar *et al*. (2016) [12] and Sharma *et al*. (2016) [21].

Primary branches per plant

The maximum number of primary branches plant $^{-1}$ (3.70) was recorded in variety RLC- 92, however similar with RLC-148 (3.25) and lower no. of primary branches (2.55) recorded in variety RLC-133 respectively. The difference found in various variety is due to genetically & phenotypic characters. Similar result were finding by Khan *et al.* (2005) [11] and Kumar *et al.* (2016) [12].

Days to maturity

Days to maturity were found significant difference among the varieties. The more number of days (117.75) taken for maturity with variety R-4292 followed by RLC-92 (113.50) which were at par with RLC-148 (113.00), Deepika (112.00) and early maturity was recorded in variety RLC-133 (109.75) days respectively. Similar trend were reported by Kumar *et al*. (2016) [12].

Crop growth rate (g plant^{-1}day^{-1})

The CGR at 60-90 DAS was maximum over other growth stages and it significant affected by the varieties. The higher CGR (0.1629) was observed in variety RLC-92 however numerically at par with R-4292 (0.1480) followed by RLC-148 (0.1467), deepika (0.1392) and lower (0.1128) was recorded in RLC-133 respectively.

Performance on yield attributes and yield

The varietal performance for yield attributes and yield is discussed in following sub heads and the data presented in Table 2.

Number of capsules plant^{-1}

The mean data of number of capsules per plant was found significant variation among the varieties. The maximum number of capsules (56.10) in RLC-92 and RLC-148 (49.75), however at par to each other's and followed by variety R-4292 (41.9), deepika (40.2) and lower no. of capsules (36.12) were recorded in RLC-133. The variation found might be due to favourable condition for producing primary, secondary branches and genetic constitution of varieties. Similar trend was reported by Sharma *et al*. (2016) [12] and Sahu *et al*. (2020) [17].

No. of seeds capsule^{-1}

The no. of seed was significantly superior among the varieties the more no. of seed (8.15) was recorded in RLC-92 and RLC-148 (7.95) they at par to each other and lower no. of seed (7.10) were recorded in RLC-133 respectively. The variation among the varieties was due to maximum photosynthates translocation from source to sink. Such type of result reported with Mahapatra *et al*. (2009) [14] and Jiotode *et al*. (2017) [10].

Test weight of seed (gram)

The mean data among the varieties showed non-significant to each other's, but the higher test weight (7.28) were recorded in RLC-92 followed by RLC-148 (7.03), RLC-133(7.02), R-4292(7.01) and lower test weight (6.92) was recorded in deepika. Such types of result were also reported with, Roundel *et al*. (2015) [16].

Grain yield (kg ha^{-1})

The data on seed yield was significant influenced among the varieties, the higher grain yield (1196.90) produced with variety RLC-92, however at pat with RLC-148 (1144.97) and followed by variety R-4292(986.41), deepika (930.83) and yield was produced by RLC-133 respectively. Superiority of RLC-92 over other four varieties, respect to seed yield, this was might be inherent genetic ability for efficient utilization of available resources to produce higher no. of branches, capsules plant^{-1}, seeds capsule^{-1}. These result are finding with Chauhan *et al*. (2008) [6] and Singh *et al*. (2013) [20].

Harvest index (%)

Among the difference varieties of linseed showed non-significant variation to each other but the maximum HI (29.62) was recorded in RLC-92 and followed by RLC-148 (29.04), R-4292 (28.61), deepika (28.39) and lower (28.05) recorded in RLC-133 respectively. Similar result were finding of Jiotode *et al.* (2017) [10].

Economics of linseed varieties

The data regarding to economics of different linseed varieties are presented in table 2.

Net return (₹ ha^{-1})

Net income on investment after deduction of all expenditure from the gross income generated by the investment is net return. The net return was significant influenced with the varieties, the maximum net return (43152.30) was achieved by RLC-92 which were at par with RLC-148 (40504.40) and followed by R-4292 (32242.70), deepika (29330.80) and lowest net return (27589.10) was observed in RLC -133. It variation is might be due to higher yield gave higher net return. Similar result was corroborated with Sharma *et al*. (2012) and Roundel *et al*. (2015) [16].

B: C Ratio

Significant difference was found among the varieties in respect to B: C ratio. The higher B: C ratio (2.20) was recorded in RLC-92 and whereas at par with RLC-148 (2.07) and followed by R-4292 (1.64), deepika (1.50) and lowest (1.41) B: C ratio was observed in RLC-133. Similar results were found by Kurrey and Singh (2019) [13], Gaikwad *et al*. (2020) [8] and Sahu *et al*. (2020) [17].

Conclusion

From these results it can be concluded that the RLC-92 variety of linseed is most suitable for northern hill zone of Chhattisgarh which recorded highest value for growth and yield parameters as well as highest productivity (1196.90 kg

ha^{-1}), maximum net return (43152.33 ₹ ha^{-1}) and profitability (2.20%) over other test varieties of linseed.

Table 1: Performance of linseed varieties on growth parameters

Varieties	Plant height (cm)	No. of primary branches/plant	Days to maturity	Crop growth rate g/plant/day
V_1: RLC-148	62.5	3.25	113.00	0.1467
V_2: RLC-133	56.83	2.55	109.75	0.1128
V_3: RLC-92	64.17	3.70	113.50	0.1529
V_4: Deepika	58.55	2.88	112.00	0.1392
V_5: R-4292	59.41	2.95	117.75	0.1480
SEm±	0.57	0.147	0.64	0.009
CD (P=0.05%)	1.75	0.453	1.99	0.026

Table 2: Performance of linseed varieties on yield attributes, yield (kg/ha) and economics

Varieties	Capsules plant^{-1}	Seeds capsule^{-1}	Test weight (g)	Seed yield (kg/ha)	Biological yield (kg/ha)	Stover yield (kg/ha)	Harvest index (%)	Net return (₹ ha^{-1})	B:C ratio
V_1: RLC-148	49.75	7.95	7.03	1144.97	3943.14	2798.17	29.04	40504.43	2.07
V_2: RLC-133	36.12	7.10	7.02	896.66	3194.50	2297.83	28.05	27589.1	1.41
V_3: RLC-92	56.10	8.15	7.28	1196.90	4046.46	2849.56	29.62	43152.33	2.20
V_4: Deepika	40.20	7.20	6.92	930.83	3262.12	2331.29	28.39	29330.8	1.50
V_5: R-4292	41.90	7.65	7.01	986.41	3450.31	2463.90	28.61	32242.7	1.64
SEm±	2.41	0.13	0.16	52.82	167.65	126.77	0.008	3862.04	0.14
CD (P=0.05%)	7.42	0.40	NS	162.76	516.58	390.61	NS	8414.66	0.43

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