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Effect of Different Seed Rates on Growth Attributes, Yield and Economics of Linseed

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ABSTRACT
To find out the optimum quantity of seed rate for higher production in irrigated linseed, the present experiment was conducted under AICRP on Linseed, College of Agriculture, Nagpur.The significant effects of seed rates were observed on all yield components reflecting the importance of seeding rate for linseed growth, yield and yield components. The results indicated that growth attributes i.e. number of branches per plant and number of capsules per plant was found significant due to different seed rates, whereas plant height was found non significant. Number of branches was found significantly superior in treatment having seed rate at 12.5 Kg ha^{-1} and number of capsules per plant was found higher in treatment having seed rate at 7.5 Kg ha^{-1} which was at par with treatment having seed rate at 12.5 Kg ha^{-1}, treatment having seed rate at 17.5 Kg ha^{-1} and treatment having seed rate at 22.5 Kg ha^{-1} seed rate. Highest seed yield (17.39 q) per hectare was recorded in treatment having22.5 Kg ha^{-1} which is at par with having25 Kg ha^{-1} seed rate (15.37) and treatment having seed rate at 17.5 Kg ha^{-1} and having seed rate at 12.5 Kg ha^{-1}. Net monetary return was observed maximum in treatment having 22.5 Kg ha^{-1} seed rate (72944 Rs. ha^{-1}) followed by treatment having 25 Kg ha^{-1} seed rate (62707 Rs.ha^{-1}) as well as in B:C ratio. It is concluded that the seed rate of 22.5 Kg ha^{-1} is found optimum for irrigated linseed.
Keywords: -*Linseed, seed rate, growth attributes, yield and economics*

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INTRODUCTION

Linseed (*Linum usitatissimum* L.) is an important oilseed and fiber crop in the world. It is an important *rabi* oilseed crop. India ranks first in terms of area under linseed cultivation and third in production in world. In India, linseed cultivated about 4.68 lakh ha and total linseed production is 1.63 lakh tones [1]. Linseed occupies greater importance among oilseeds, owing to its various uses and special qualities. In India, it is grown mainly for seeds, used for extracting oil. It is a source of complete protein, high-order linolenic acid (an essential polyunsaturated omega-3 fatty acid), complex carbohydrates, vitamins and minerals and lignans [12]. Therefore, it is becoming increasingly popular as a nutritional and functional food especially for vegetarians. Linseed oil is suitable for human consumption and is used as a nutritional supplement. It is rich inomega-3 fatty acids, especially alpha-linolenic acid (C18:3) that was beneficial for heart disease, inflammatory bowel disease, arthritis and a variety of other health conditions. It also contains a group of chemicals called lignans that play a significant role in the prevention of cancer [4]. The meal, which remains after oil extraction, is a valuable feed to animals as a protein supplement and is very good manure. Linseed oil is an excellent drying oil used in manufacturing paints, varnishes, soaps, printing inks, oil cloth and linoleum tiles. Linseed is also used in making papers and plastics. Despite its diverse use and wide production, linseed production in Arsi zone is characterized by low yield and poor product quality mainly due to poor management practices such as lack of proper weed management system, poor seed and field hygiene, poor seed bed preparation, inappropriate seeding rates and methods, improper threshing ground and improper cleaning. Generally speaking, a denser plant stand allows the crop to compete better with weeds. After a certain point, however, the benefits of an increased plant population do not outweigh the cost of additional seed, especially when seed cost is high. In certain cases, however, a high seeding rate may allow farmers to eliminate in-crop herbicide or reduce herbicide rates. Seed rate is management practices that affect flax seed yield. A current national seeding rate

recommendation for linseed production is 25Kg ha^{-1} for row planting and30 to 40Kg ha^{-1} for broadcasting. The same recommendations have been followed for linseed production and trials execution under different research stations. But, several farmers often broadcast more than double and triple rates for linseed production [3]. Farmers are using high seed rates certainly due to many reasons: in order to reduce weeds pressure for many farmers do not carry out weeding practices for they give priority to cereal and pulse crops than to oil crops; majority of farmers mostly use saved seed as seed source, which is relatively poor in quality as compared to certified seed of seed enterprises; farmers do not employ appropriate tillage frequencies and time. Linseed is being produced under rain fed, low input and poor management. The objective of this study was therefore, to determine optimum seed rate of linseed under row planting and broadcasting for linseed production. Concerning seeding rate, studies by Abdlwahed [2] and Kinber *et. al.* [9] revealed that increasing seeding rate found to increase seed and straw yields/m^2. On the other hand, straw and seed yields $plant^{-1}$were decreased by increasing seeding rate. With respect, Casa *et al.* [5] and Hassan and Leitch [7] reported that, plant height was increased by increasing seed rate while, stem diameter was decreased. The main objective of the present Investigation is to find out the optimum quantity of seed rate for higher production in irrigated linseed.

MATERIAL AND METHODS

An experiment was designed by choosing the variety "PKV NL 260", a high yielding variety of linseed (*Linum usitatissimum* L.). The experiment was conducted at the experimental field of AICRP on Linseed, College of Agriculture, Nagpur during the Rabi Season of 2018-19. The experimental soil was medium black soil. The experimental design was randomized block design with four replications and spaced 30 cm between rows and 10 cm between plants with five treatments of different seed rates to find out the optimum quantity of seed rate for higher production in irrigated linseed. The five treatments are being set as T_1 - 7.5 Kg ha^{-1}, T_2 - 12.5 Kg ha^{-1}, T_3- 17.5 Kg ha^{-1}, T_4 -22.5 Kg ha^{-1} and T_5- 25 Kg ha^{-1}. Final data on plant height, tillers $plant^{-1}$, secondary branches $plant^{-1}$, capsules $plant^{-1}$, seeds $capsule^{-1}$, dry weight $plant^{-1}$, seed yield $plant^{-1}$and vegetative (biomass) yield $plant^{-1}$were recorded at the time of maturity.

RESULTS AND DISCUSSION

Growth and Yield attributes: Number of branches was found significantly superior in treatment T_2 i.e Seed rate at 12.5 Kg ha^{-1} and number of capsules per plant was found higher in treatment T_1 i.e. Seed rate at 7.5 Kg ha^{-1} which was at par with treatment T_2 i.e. Seed rate at 12.5 Kg ha^{-1}, treatment T_3 i.e. Seed rate at 17.5 Kg ha^{-1} and treatment T_4 i.e. Seed rate at 22.5 Kg ha^{-1}.

Seed yield: Significant effect of seed rate was observed on crop yield as per observation highest seed yield (17.39) per hectare was recorded in treatment T_4 i.e. 22.5 Kg ha^{-1} which is at par with T_5 i.e. 25 Kg ha^{-1} seed rate (15.37) and treatment T_3 i.e. Seed rate at 17.5 Kg ha^{-1} and T_2 i.e. Seed rate at 12.5 Kg ha^{-1}.

Economics: The data on economics of various herbicidal treatments revealed that the net monetary return was observed maximum when using the seed rate at 22.5 Kg ha^{-1}(72944 Rs ha^{-1}) followed by using the seed rate at 25 Kg ha^{-1} (62707 Rs ha^{-1}). The benefit: cost ratio was also maximum in using seed rate at 22.5 Kg ha^{-1} i.e. 6.20 and 5.43 in using seed rate at 25 Kg ha^{-1}.

DISCUSSION

Growth and Yield attributes

Growth and yield components in the production of flaxseed, namely, number of capsules, number of seeds in capsules and seed weight are different in different seed rate. The same results also reported in studies on the number of seeds to be sowed in the unit area in the oilseed flax found the ideal rate as 200-400 plants m^{-1} for the grain yield [13], same results also reported by [11].Plant density increased the photosynthesis capacity of the plant as a result of the length of the green leaf area during capsule and seed development [6]. In another study, it was observed that high sowing norm increased plant height, leading to the problem of leaning in plants [11]. Leitch and Sahi [10] reported that when the plant density in the unit area increased, the individual plant size decreased, while the total dry matter ratio obtained from the unit area increased. In some studies, on flax, the difference between the numbers of plant parts in the unit area did not make a difference in both dry matter and grain yield as a result of plants' denser branching and filling the existing gaps due to increased plant size [8] (Khan and Bradshaw, 1976). On the other hand, Hassan and Leitch [7] reported that when the plant density increased, plants entered into competition with each other, resulting in fewer and shorter branches with smaller leaves, limited plant growth and decreased number of capsules.

Seed yield

Increase in seed rate found increase in seed yield and found maximum in 22.5 Kg ha^{-1}. Similar findings concerning seeding rate, studies by [2] Abdul Wahed and [9] Kinber M.E.A. revealed that increasing seeding rate found to increase seed and straw yields/m^2. On the other hand, straw and seed yields plant^{-1} were decreased by increasing seeding rate has also been confirmed in scientific studies that the grain yield varies depending on agronomic applications and environmental factors, i.e. while the yield was 3,310-4,360 Kg ha^{-1} in England [13], it was 950-2,795 Kg ha^{-1} in Germany [6].

Economics

The adoption of any technology in modern agriculture can only be feasible and acceptable to farmers if it is economically viable. The gross return obtained by yield of crop varied markedly due to different treatments, which ultimately influenced the net return and benefit : cost ratio. The benefit: cost ratio was also maximum in using seed rate at 22.5 Kg ha^{-1}

Table 1: Growth attributes and Seed yield (kg ha^{-1}) as influenced by various treatments

Treat. No.	Treatments	Plant height (cm)	No. of branches plant^{-1}	No. of capsules plant^{-1}	Test Weight (g)	Seed yield (kg ha^{-1})
1	7.5 Kg ha^{-1}	57.40	3.50	57.00	3.2	10.34
2	12.5 Kg ha^{-1}	58.75	4.30	54.48	3.3	13.45
3	17.5 Kg ha^{-1}	59.20	3.48	48.67	3.4	13.57
4	22.5 Kg ha^{-1}	60.75	3.45	48.40	3.6	17.39
5	25 Kg ha^{-1}	59.60	2.90	39.20	3.6	15.37
	SE ±	1.66	0.23	3.42	-	1.32
	CD (P=0.05)	NS	0.72	10.54	-	4.06
	CV	5.60	13.33	13.81	-	18.80
	Mean	59.14	3.525	49.548		14.02

Table 2: Seed yield (kg ha^{-1}) and economics as influenced by various treatments

Treat. No.	Treatments	Seed yield (Kg ha^{-1})	GMR (Rs ha^{-1})	NMR (Rs ha^{-1})	B:C ratio
1	7.5 Kg ha^{-1}	10.34	51688	38573	3.94
2	12.5 Kg ha^{-1}	13.45	67234	53819	5.01
3	17.5 Kg ha^{-1}	13.57	67866	54150	4.95
4	22.5 Kg ha^{-1}	17.39	86959	72944	6.20
5	25 Kg ha^{-1}	15.37	76872	62707	5.43
	SE ±	1.32	-	4615	0.34
	CD (P=0.05)	4.06	-	14220	1.05

CONCLUSION

On the basis of results summarized it can be concluded from yield and economics that the optimum seed rate for line sowing of linseed is 22.5 Kg ha^{-1}.

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