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EFFECT OF GROWTH REGULATORS ON GROWTH, YIELD AND ECONOMICS OF LINSEED

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ABSTRACT

To find out effect of different growth regulators on growth, yield attributes, yield and economics of linseed, the present experiment was conducted under AICRP on Linseed, College of Agriculture, Nagpur. Growth regulator shows significant effect on growth, yield attributes and yield of linseed.Plant height and number of capsules per plant was observed highest and significantly superior after application of 75 ppm salicylic acid followed by application of 400 ppmgibberellic acid(GA) and application of 0.1 % Tebuconazole. Number of branches per plant was found non-significant as influenced by various plant growth regulators. The seed yield of linseed was recorded significantly higher after application of 75 ppm salicylic acid and it was at par with treatment application of 400 ppm GA. Test weight was found similar i.e. 4.6 g after application of 75 ppm salicylic acid and 400 ppm GA growth regulators.The gross monetary return, net monetary return and B:C ratio was found maximum in treatment having application of 75 ppm salicylic acid.

Key words : *Linseed, growth regulator, gibberellic acid,salicylic acid, tebuconazole, growth and yield.*

Linum genus, belonging to the *Linaceae* botanical family, consists of approximately 300 species, most of which are wild, a few are grown as ornamental plants, some fibrous forms have become of local significance; however, only one species of flax *i.e. Linum usitatissimum* is commonly cultivated in India. Flax is commonly called as Linseed. Flax was, and still is, a very valuableand economically important plant. Moreover, every part of the plant is potentially useful: the stem is the source of fibers, while the seed capsules provideseeds and chaffs. As far as the textile industry is concerned, flax is the only source of cellulosic fiber in the countries with temperate climate. Furthermore, it can be successfully applied in many branches of construction industry, and used as a fodder component in animal feed. Linseed, on the other hand, is a component used in the oil, pharmaceutical, cosmetic and food industry (1, 2).

Linseed is largely a crop of temperate climate confined mainly to low elevations, but it can be grown successfully up to 770 meters. Linseed has long been used as a cash crop and is mainly grown for its oil, which is continuously being utilized for various industrial purposes and also as a food supplement (3).

A major alteration in demand of linseed oil and its other byproducts was observed in the last decade, which has elevated in recent times due to its increased demand as functional food and higher industrial uses. Its low productivity is ascribed to non-availability of superior cultivars to suit the diverse agro climatic environment. The commercial importance of linseed (*Linum usitatissimum* L.) has attracted breeders to increase its seed yield using various breeding approaches. Plant growth regulators (PGRs) have a significant role in enhancing yield and its related traits in linseed.

Plant growth regulators are indicator molecules that are produced by plants and control a wide range of plant growth and developmental processes at low concentrations. There is different plant growth–regulating hormones that show different effects on plant growth such as reproduction, stimulating defensive responses, development and cell division or seed germination, and inhibiting stem elongation.Linseed is rabbi oilseed crop responding to plant growth hormones. They promote cell division, cell enlargement, flowering, fruiting and seed formation. They play a key role in different physiological processes related to growth and development of crops. It is obvious that changes in the level of endogenous hormones due to biotic and abiotic stress alter the crop growth and any sort of manipulation including exogenous application of growth substances would help for yield improvement or at least sustenance of the crop.

MATERIALS AND METHODS

An experiment was designed by choosing “PKV NL 260”, a high yielding variety of linseed (*Linum usitatissimum* L.). The experiment was conducted at the experimental field ofAICRP on Linseed, College of Agriculture, Nagpur. (in the Rabi Season of 2018-19). The experimental soil was medium black soilThe seeds were sown in three replications with randomized block design spaced 30 cm between rows and 10 cm between plants. Four growth hormones, IBA, salicylic acid, Tebuconazoleand GA, were used individually and in combinations. The hormones were dissolved in water in different concentrations. The eight treatments arebeing set as T_1: 1.0 ppm Auxin, T_2: 2.0 ppm Auxin, T_3: 200 ppm GA, T_4: 400 ppm GA. T_5 : 75 ppm T_6: 0.1 % Tebuconazole, T_7: 1.0 ppm Auxin + 200 ppm GA, T_8: Control (water spray), All the treatments were given

Table-1 : Growth parameters and Seed yield (q/ha) as influenced by various treatments

Treatments	Plant height (cm)	No. of branches/ plant	No. of capsules/ plant	Test weight (g)	Seed yield (q/ha)
1.0 ppm Auxin	63.67	2.92	59.47	3.4	11.91
2.0 ppm Auxin	64.27	2.85	56.93	3.3	11.80
200 ppm GA	65.00	2.95	57.33	3.8	12.09
400 ppm GA	70.93	3.52	65.00	4.6	14.63
75 ppm salicylic acid	71.73	3.58	76.80	4.6	16.46
0.1 % Tebuconazole	68.73	3.25	63.73	4.5	13.87
1.0 ppm Auxin + 200 ppm GA	65.20	3.18	59.60	4.3	12.58
Control (water spray)	62.40	2.85	49.33	3.1	11.54
SE +	2.01	0.32	2.46	-	0.67
CD (P=0.05)	6.07	NS	7.42	-	2.02

Table-2 : Seed yield (q/ha) and economics as influenced by various treatments

Treatments	Seed yield (q/ha)	GMR(Rs/ ha)	NMR (Rs/ ha)	B:C ratio
1.0 ppm Auxin	11.91	59560	45309	4.18
2.0 ppm Auxin	11.80	58983	44647	4.11
200 ppm GA	12.09	60472	41806	3.24
400 ppm GA	14.63	73172	50006	3.16
75 ppm salicylic acid	16.46	82302	68068	5.78
0.1 % Tebuconazole	13.87	69369	53903	4.49
1.0 ppm Auxin + 200 ppm GA	12.58	62903	44152	3.35
Control (water spray)	11.54	57717	43551	4.07
SE +	0.67	-	3341	
CD (P=0.05)	2.02	-	10087	

through sprayer on the apical tip of stem. The first spray was applied at vegetative and second at reproductive stage. Final data on plant height, tillers/plant, secondary branches/plant, capsules/plant, seeds/ capsule, dry weight/plant, seed yield/plant and vegetative (biomass) yield/plant were recorded at the time of maturity.

RESULTS AND DISCUSSION

Growth and yield attributes : Plant height increased considerably in relation to the control plants. By application of different PGR, the mean values for plant height and number of capsules/ plant at harvest was 66.49 and 61.02 respectively. Plant height and number of capsules per plant was observed highest and significantly superior in treatment T_5: 75 ppm salicylic acid i.e., 71.73 cm and 76.80 cm respectively followed by T_4: 400 ppm GA and T_6: 0.1 % Tebuconazole. Number of branches per plant was found non-significant as influenced by various plant growth regulators.

Seed yield : It was observed that application of growth hormones increased seed yield. The seed yield of linseed was recorded significantly higher in T_5: 75 ppm salicylic acid i.e. 16.64 q/ha and it was at par with treatment T_4: 400 ppm GA i.e., 14.63 q/ha. Test weight was found similar i.e., 4.6g after application of 75 ppm salicylic acid and 400 ppm GA growth regulators.

Economics : The gross monetary return, net monetary return and B:C ratio was found maximum in treatment T_5: 75 ppm salicylic acid. The seed yield was at par when 400 ppm GA application, but the net monetary return and B:C ratio was resulted in minimum due to the market cost of GA.

An apparent association seems to exist between growth hormones and growth parameters in linseed in the present study.Mean values for different observations showed that the cultivar “PKV NL 260” responded positively to all four growth regulators. The doses of growth hormone which enhanced the number of secondary branches/plant, capsules/plant and test weight ultimately enhanced seed yield.

The present study clearly indicated that growth hormones have the potentiality to increase seed yield, as

also reported by (4, 5) reported that seed yield was strongly influenced by various growth components, *i.e.,* plant height, seeds/capsule, capsules/plant and branches/plant. It was noticed that plant height was strongly associated with seed yield in linseed. (6) reported that increase in plant height indirectly affects seed yield via number of nodes and sympodia in cotton. Plant height increases effectively by IAA application in other oilseed crops, like mung bean (8, 9). In contrast, (10) showed that application of GA_3 increased plant height, while in the case of auxin, plant height decreased, probably due to the increase in stem diameter, which lowers down the shoot growth. In this field trial, combined doses of auxin and gibberellins were effective for the enhancement of tillers, secondary branches and capsules per plant, while auxin alone was effective for seeds per capsule.

CONCLUSION

The present investigation clearly indicated that growth hormones, whether alone or in combination, have a major impact in the stimulation of various growth parameters in linseed. It was concluded that plant growth hormones could be successfully employed for enhancement of seed yield, directly or indirectly, through its components. Based on the findings, it is concluded that Foliar application of 75ppm Salicylic acid as growth regulator resulted in significantly superior in yield for enhancing productivity and profitability of Linseed.

REFERENCES

1. Duguid S.D. (2009). Flax, In: Oil crops, handbook of plant breeding 4, ed. *Vollmann J., Rajcan I., Springer Science – Business Media, New York,* pp. 233-254.
2. Cullis C. (2011). Linum, In: Wild crop relatives: genomic and breeding resources, *oilseeds, ed. Kole C, Springer-Verlag, Heidelberg-Berlin,* pp. 177-189
3. Chauhan M.P., Singh S. and Singh A.K. (2009). Post harvest uses of linseed. *Journal of Human Ecology 28:* 217-219.
4. Faizanullah, Bano A. and Nosheen A. (2010). Role of plant growth regulators on oil yield and biodiesel production of linseed (*Linum usitatissimum* L.). *Journal of Chemical Society of Pakistan 32:* 668-671.
5. Rahimi M.M., Zarei M.A. and Arminian A. (2011). Selection criteria of flax (*Linum usitatissimum* L.) for seed yield and yield components and biochemical composition under various planting dates and nitrogen. *African Journal of Agriculture Research 6:* 3167-3175.
6. Copur O., Demirel U. and Karakus M. (2010). Effects of several plant growth regulators on the yield and fiber quality of cotton (*Gossypium hirusutum* L.). *Notulae Botanicae Horti Agrobotanici Cluj 38:* 104-110.
7. Quaderi R.S., Shah M.A.I., Hossain A.F., Hoque M.M. and Haque M.S. (2006). Influence of seed treatment with indole acetic acid on mungbean cultivation. *International Journal of Botany 2:* 42-47.
8. Arsia S.K., Rawat Subhash, Dongre Mukesh and Malviya Deepak (2018). *In vivo* evaluation of fungicides against alternaria leaf blight of tomato incited by *Alternaria solani*. *Progressive Research-An International Journal, Vol. 13(4) :* 352-354.
9. Thakur Srishti and Murthy C. (2018). Factors influencing price of important timber species in Uttara Kannada District of Karnataka. *Progressive Research-An International Journal, Vol. 13(4) :* 361-368.
10. Ayala Silva T., Akin D.E., Foulk J. and Dodd R.B. (2005). Effect of growth regulators on yield and fiber quality and quantity in flax (*Linum usitatissimum*L.). *Plant Growth Regulation Society of America 33:* 90-100.

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