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Pre-sowing treatments of botanicals, chemicals and plant growth regulators on seed growth, yield and yield attributes of lentil (*Lens culinaris* M.) var. Co-8

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ABSTRACT

The field experiment was carried out during rabi season of 2020 to study the effect of pre sowing treatments of botanicals, chemicals and plant growth regulators on seed growth, yield and yield attributes of lentil (Lens culinaris M.) cv. Co-8. The experimental plot was of sandy loam soil nearly neutral in pH, medium in organic carbon, with available N:P:K 20:40:20 (kg ha^{-1}). It was subjected to 13(12+1) treatments each replicated thrice. The result showed that growth parameters viz, field emergence per cent (92.57%), plant height (55.14cm) at 120 DAS, number of branches plant^{-1} (4.97) at 120 DAS, days to 50% of flowering (66.77) were recorded superior with application of IAA @1%. The yield observations viz, number of pods plant^{-1} (181.2), number of seeds pod^{-1} (1.43), seed yield plant^{-1} (3.85g), seed yield plot^{-1} (5.73 g), biological yield (17.87), harvest index (32.5) were recorded maximum with IAA@1% .

Keywords: Botanicals, IAA, lentil, pre sowing, plant growth regulators

Lentil (*Lens culinaris* M.) is diploid with chromosome number (2n=2x=14), autogamy and annual species of grain legume. It is included in the order Fabales and Fabaceae family. The fruit is 6-20mm long, 3-12mm wide, pod having up to 3 seeds. Seeds are of lens shaped with 2-9mm long, 2-3mm wide. Cotyledon colour is red, but seed coat colour may differ which may be grey, brown or red. Seed coat colour may change due to various climatic conditions before and after harvesting.

Pulses play an important role in implementing the modern farming system. Lentil plant fix their own nitrogen which is adequate to improve the plant growth and lentil is a versatile pulse crop in India which provide lots of financial benefits to farmers in various cropping system. Lentil is grown throughout the world, highest production of lentil primarily was obtained from Canada, India and Australia. About 30% of lentil production is from India. Red lentil is also called as Masoor and Persian lentil. It is one of the oldest crop originated in south western Asia. It grows mainly in sandy loam soil with minimal salinity to access sufficient soil moisture, it requires free draining soil and it is hydrophobic which means it doesn't tolerate waterlogging.

The cultivation of lentils by agricultural producers is not so perfect in existing varieties, the complexity of lentil is determined by some biological characteristics of the crop such as problem of water logging, low tolerance of herbicides, poor stability against weeds, biotic and abiotic stresses. Due to improving usage of lentils, it is important to increase the sowing area and production by isolating its area and breeding of climatic stree resistant varieties with maximum productivity and better quality.

Increasing lentil production is one of the finest points in agriculture by solving provision of food security of our population. Lentil protein contains all the essential amino acids which are useful in daily basis.

Seed priming with optimal concentrations of growth hormones, such as IAA (Auxin) and ethylene improves the germination performance as well as growth and yield of many crop species under both normal and stress conditions.

Polyethylene glycol and Potassium nitrate treatments improve the germination rate, shoot, and seedling dry weight (Ghasemi-Golezani *et al.*,2013).

With this experiment we can standardize the optimum pre-sowing seed treatment favourable for lentil and to evaluate the effect of botanicals chemicals and plant growth regulator treatments on plant growth, yield and yield attributes of lentil.

The experiment was carried out in RBD with 13(12+1) treatment combinations each replicated thrice. Treatments were randomly arranged in each replication, divided into 39 plots. Experiment was conducted during *rabi* season of 2020 in Central Research Field (CRF), SHUATS, Prayagraj (U.P.)

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After preparing solution of Potassium nitrate, Polyethylene glycol$_{6000}$, Potassium chloride, Sodium chloride, Indole acetic acid, Lemon extract, Neem extract and Coconut water, lentil seeds were soaked in necessary medium up to 9 hours at 25^{0}C temperature. Untreated seeds were termed as control. After 9 hours of soaking the medium was drained out from the beaker and pre-soaked seeds were air dried to attain its weight and then placed for germination under favourable climatic condition (20-25^{0}C). After seed treatments, seeds were sown in field for taking field observations like field emergence, plant height, days to 50% of flowering, number of pods plant^{-1}, number of seeds pod^{-1}, seed yield plant^{-1}, seed yield plot^{-1}, biological yield and harvest index . The data were subjected to statistical analysis.

Treatments	Concentration	Duration
T_0	Untreated (control)	-
T_1	Neem extract @ 0.3%	9 Hours
T_2	Lemon extract @ 2%	9 Hours
T_3	Coconut water @ 3%	9 Hours
T_4	NaCl @ 0.5%	9 Hours
T_5	IAA @ 1%	9 Hours
T_6	IAA @ 2%	9 Hours
T_7	KCl @ 1%	9 Hours
T_8	KCl@ 3%	9 Hours
T_9	KNO_3 @ 1%	9 Hours
T_{10}	KNO_3 @ 3%	9 Hours
T_{11}	PEG_{6000} @ 2%	9 Hours
T_{12}	PEG_{6000} @ 4%	9 Hours

All the treatments were significantly differed from each other.

The observations on field emergence per cent of lentil were statistically analysed. The higher amount of field emergence (92.57%) was recorded with T_5 i.e.(IAA @1%) followed by T_9 i.e KNO_3(87.03%) and T_6 i.e. IAA@ 2% (84.23%) and lowest field emergence was under T_0 (control) (73.13%) (Table 1). Seed priming with optimal concentrations of growth hormones, such as IAA (Auxin) and ethylene improves the germination as well as growth and yield of many crops species under both normal and stress conditions.

The observations on plant height at 40 DAS of lentil were statistically analysed. Maximum plant height (19.53 cm) and minimum 14.82cm of plant height at 40 DAS were recorded (Table 1). The higher plant height was observed in T_5 i.e. IAA @1%(19.53 cm) followed by T_1 i.e. Neem extract @ 0.3 %(18.06 cm) and lowest (14.82) was recorded in T_0 (control). At 80 DAS, significantly higher plant height was observed in T_5 i.e. IAA@ 1 % (32.64 cm) which is statistically *at par* with the application in T_4 i.e. NaCl @ 0.3% (32.23 cm) and T_8 i.e. KCL @ 3% (31.53cm) the lowest was obtained in T_0 (control) (28.06 cm). At 120 DAS, significantly higher plant height was obtained in T_5 i.e. IAA@ 1% (55.14cm) followed by T_6 i.e. IAA@ 2% (54.70cm) and lowest plant height was observed in T_0 (control) with 43.32cm. The maximum plant height may be due to stimulation of cell elongation, division and enlargement. The results are in conformity with Jafar *et al.* (2007). Seed treatment with indole acetic acid resulted the highest plant height and number of seeds pod^{-1} in green gram (Quaderi *et al.,*2006).

T_5 i.e. IAA@ 1% took higher days to 50 % flowering (66.77) followed by T_4 i.e.NaCl @ 0.5% (63.67) and lowest days of 50 % flowering was in T_0 (control) (54.27). This experiment provided information about days to 50 % flowering increased when it was treated with IAA@ 1% and NaCl @ 0.5%. Similar findings were reported by Rathod *et al.* (2016) and Dezfuli *et al.*(2008) on the application of growth regulators (Gibberellic acid, IAA, NAA 50, 100 ppm, 200 ppm) towards development of leaf area**,** yield and yield contributing traits.

The higher number of branches per plant were seen in T_5 i.e.IAA@ 1% (4.97) followed by T_3 i.e.Coconut water @ 3% (4.78) and lowest number of branches per plant was in T_0 (control) (1.46). Similar findings were seen for IAA as reported by Dmytruk *et al.* (2016).

Highest number of pods plant^{-1} were observed in T_5 i.e. IAA@ 1% (181.2) which was statistically at par with the application of T_4 i.e. NaCl @ 0.5% (174.7) and minimum number of pods plant^{-1} were seen in T_0 (control) with 148.0. Seed treatment with indole acetic acid resulted the highest plant height, number of seeds pod (7.73) in green gram (Quaderi *et al.* (2006) and similar finding was reported by Kelen *et al.* (2004).

Observations on number of seeds pod^{-1} were statistically analysed and the higher number of seeds pod^{-1} were seen in T_5 i.e. IAA@ 1%(1.43) followed by T_6 i.e. IAA @ 2% (1.36), T_1 i.e. Neem leaf extract (0.5%) (1.18) and lowest was in T_0 (control) with (1.11). Maximum germination percentage of seeds were observed when seeds were primed with Neem leaf extract (50%) in lentil (Bhateswar *et al.,* 2020).

Maximum seed yield plant^{-1} was observed in T_5 IAA@ 1% with (3.85 g) which was statistically at par with the application of T_6 i.e. IAA @ 2% (3.41 g), T_3 i.e. Coconut water@ 3% (3.28 g), T_8 i.e. KCl@ 3% with (3.07) and lowest seed yield plant^{-1} were observed in T_0 (control) (2.01 g).The observations on seed yield plot^{-1} were statistically analysed. Maximum yield of seed

Table 1 : Mean performance on yield attributes of various treatments

Treatments	Field emergence (%)	Plant height at 40 DAS	Plant height at 80 DAS	Plant height at 120 DAS	Day to 50 % flowering	Number of branches plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	Seed yield plant^{-1} (kg ha^{-1})	Seed yield plot^{-1} (kg ha^{-1})	Biological yield	Harvest index
T_0	73.13	14.82	28.06	43.32	54.27	1.46	148	1.11	2.01	4.13	14.07	25.1
T_1	78.73	18.06	28.11	47.38	57.8	2.73	152.8	1.18	2.62	4.33	14.67	29.4
T_2	82.4	15.8	28.63	43.63	58.33	3.6	154.5	1.26	2.57	4.57	15.9	28.7
T_3	82.4	17.95	31.15	48.88	59.7	4.78	153.4	1.16	3.28	5.13	15.9	29.6
T_4	81.5	17.57	32.23	54.37	63.67	3.66	174.7	1.26	2.79	4.93	16.73	32.2
T_5	92.57	19.53	32.64	55.14	66.77	4.97	181.2	1.43	3.85	5.73	17.87	32.5
T_6	84.23	16.75	29.81	54.7	60.33	1.52	159.2	1.36	3.41	5.07	16.4	31
T_7	80.57	15.84	30.09	50.1	61.13	1.92	166.4	1.24	2.51	4.23	17	29.5
T_8	79.63	16.56	31.53	49.76	59.97	3.6	164.1	1.21	3.07	4.43	15.4	28.8
T_9	87.03	14.9	31.38	48.59	62.1	2.43	171.4	1.16	2.16	4.4	16	27.4
T_{10}	81.5	16.42	30.6	45.79	59.4	1.61	163.5	1.23	3.23	5.1	16.2	31.5
T_{11}	79.67	15.11	28.76	45.71	57.63	1.59	164.9	1.33	2.43	4.67	15.37	30.3
T_{12}	77.8	15.77	30.01	44.8	58.43	1.86	159.9	1.21	2.9	4.4	16.2	27.3
Grand Mean	**81.63**	**16.54**	**30.23**	**48.63**	**59.96**	**2.75**	**162.6**	**1.24**	**2.83**	**4.7**	**15.98**	**29.5**
LSD (0.05)	**3.175**	**0.714**	**1.489**	**1.489**	**2.546**	**0.134**	**7.13**	**0.044**	**0.044**	**0.198**	**0.703**	**1.406**
SEm(±)	**1.081**	**0.243**	**0.507**	**0.507**	**0.867**	**0.046**	**2.428**	**0.015**	**0.015**	**0.067**	**0.239**	**0.479**
SE(d)	**1.529**	**0.344**	**0.717**	**0.717**	**1.226**	**0.065**	**3.434**	**0.021**	**0.021**	**0.095**	**0.339**	**0.677**
C.V.	**2.294**	**2.545**	**2.905**	**2.905**	**2.505**	**2.881**	**2.587**	**2.085**	**2.085**	**2.484**	**2.596**	**2.811**

plot^{-1} was seen in T_5 i.e. IAA@ 1% (5.73) followed by T_3 (Coconut water @ 3%) (5.13), T_{10} i.er. KNO_3 @ 3% (5.10) and lowest seed yield plot^{-1} was in T_0 (control) (4.13).

Study showed that the highest biological yield was seen in T_5 i.e.IAA@ 1% with (17.87g), T_7 i.e. KCl@ 1% (17.00g), T_4 i.e. NaCl@ 0.5% (16.73g) and lowest biological yield was seen in T_0 (control) (14.07g).

The significantly highest harvest index was observed in T_5 i.e. IAA @ 1% (32.5) which was statistically at par with the application of T_4 [NaCl @ 0.5%] (32.2), $T_{10[}KNO_3$ @ 3%] (31.5), T_6 [IAA @ 2%] (31.0) and lowest yield in T_0 (control) (25.1). Rathod *et al.* (2016) reported that the application of growth regulators (gibberellic acid, IAA, NAA 50, 100 ppm, 200 ppm) is effective towards development of yield and yield contributing traits.

On the basis of one season experimentation, the treatment with the application of indole acetic acid @ 1% was found more productive followed by NaCl@ 0.5% for 9 hours as compared to control (untreated). The conclusion is drawn based on the one season data only which requires further confirmation for recommendation.

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REFERENCES

Bhateswar, D.C., Prabha, D., Jangid, D. and Salman, M. 2020. 'Effect of seed priming with botanicals on plant growth and seed yield of lentil (*Lens culinaris* M.)'. *Int. J. Curr. Microbiol. Appl. Sci. ,* **(7):** 3484-3499.

Dezfuli, P.M. , Sharif – Zadeh, F. and Jan Mohammadi 2008. Influence of priming techniques on seed germination behaviour of maize inbred lines (*Zea mays* L.). *J.Agric. Biol. Sci.,* 3**(3) :** 22-25.

Dmytruk, M.V., Vasyliv, N.V. Derkach, I.V, Mykiyevych, I.M. and Romanyuk, N.D.. 2016. Effects of seed priming with growth regulator biolan on salt tolerance of *Pisum sativum* L.**10**(34):107-118.

Ghasemi-Golezani, K., Japparpour-Bonyadi, Z., Shafagh-Kolvanagh, J. and Nikpour-Rashidabad, N. 2013**.** Effects of water stress and hydro-priming duration on field performance of lentil. *Int. J. Farm. Allied Sci.,* **2:**922-925.

Kelen, M.E, , Demiralay, C., Sen, S. and Ozkan, G. 2004. Separation of abscisic acid, indole acetic acid, gibberellic acid in 99R (*Vitis berlandieri Vitis rupestris*) and rose oil (*Rosa damascena* Mill.) by reverse phase liquid chromatography. *Turkish J. Chem.,* **28**(5):60-63.

Quaderi, R.S., Islam Hossain A.F.M.G.F. and Hoque, M.M. 2006. Influence of seed treatment with indole acetic acid on mung bean cultivation. *Asian Network Scientific Info.,* **2**(1): 219-222.

Rathod, P., Patil, D.H. and Dodamani, B.M. 2016. Effect of seed priming on growth and productivity of chickpea (*Cicer arietinum* L.) under rainfed conditions of Karnataka."