Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

J P P Journal of Pharmacognosy and Phytochemistry

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(5): 22-26
Received: 15-07-2017
Accepted: 16-08-2017

Pankaj Kumar
Department of Genetics and Plant Breeding (Seed Technology Section) N. D. University of Agriculture and Technology, Kumarganj-224 229, Faizabad (U.P.) India

SC Vimal
Department of Genetics and Plant Breeding (Seed Technology Section) N. D. University of Agriculture and Technology, Kumarganj-224 229, Faizabad (U.P.) India

Sarvjeet
Department of Genetics and Plant Breeding (Seed Technology Section) N. D. University of Agriculture and Technology, Kumarganj-224 229, Faizabad (U.P.) India

Jai Prakash Gupta
Department of Genetics and Plant Breeding (Seed Technology Section) N. D. University of Agriculture and Technology, Kumarganj-224 229, Faizabad (U.P.) India

Correspondence
Pankaj Kumar
Department of Genetics and Plant Breeding (Seed Technology Section) N. D. University of Agriculture and Technology, Kumarganj-224 229, Faizabad (U.P.) India

Enhancement of yield components and seed quality parameters by growth regulators in lentil (*Lens culinaris* Medik.)

Pankaj Kumar, SC Vimal, Sarvjeet and Jai Prakash Gupta

Abstract
The present study were carried out in the Department of Genetics and Plant Breeding, N. D. University of Agriculture and Technology, Kumarganj Faizabad during *rabi* season 2015-16 and 2016-17 entitled "Enhancement of yield components and seed quality parameters by growth regulators in lentil (*Lens culinaris* Medik.)" The objective of the study was To standardize growth regulators optimization seed germination and vigour potential, with the selection of GA_3, Kinetin and NAA for exploitation of its, maximum grain yield in lentil under the agro-climatic conditions. The 19 treatments of growth regulators and seed priming for lentil variety (NDL-1) was evaluated following 13 quantitative characters *viz.,* Days to 50% flowering, Days to maturity, plant height on 30 and 60 days, number of branch on 30 and 60 days number of pods per plant, number of seeds per pod, 1000 seed weight biological yield/plant harvest index (%), seed yield per plant (g), seed germination, seedling length vigour index. The treatment T_3 (GA_3 150 ppm (priming) was found best in, all the treatments. Maximum number of pods per plant (46.69) and seed yield/plant (2.68 g) was recorded with T_3 (GA_3 150 ppm (seed priming).

Keywords: lentil, growth regulator, Priming

1. Introduction
Pulses are the cheapest and most widely consumed source of protein in countries like India, having predominantly vegetarian population. On an average pulse contain around 20-25% protein, which is 2.5 to 3.0 times higher than that of cereals and are correctly called as "poor man's meat". Besides protein, pulses are also rich source of calories, vitamins and minerals essential for human nutrition.
Lentil (*Lens culinaris* Medik) is one of the most nutritious amongst cool season legumes, and belonging to family, *leguminoseae* and sub-family- *papilionaceae,* genus- Lens and species- culinaris with chromosome number 2n = 14. It is of very ancient origin and its native home is regarded to be the countries in eastern Mediterranean littoral, such as Asia Minor, Greece and Egypt, from where it extended eastwards to India. The valleys in the Hindukusk Mountains in India are also claimed as its native regions. It was later introduced in Europe, Africa and America. It is known by at least 30 common names in various parts of the world *viz*., Masoor, Mangu/ Margu, Masura, Renuka, Mangalaya *etc*.
Seed priming is a pre-sowing treatment which involves a controlled hydration of seeds, sufficient to allow pre-germinative metabolic events to take place while insufficient to allow radicle protrusion through the seed coat. This technique has been used to increase yield components and seed quality parameters under unfavorable environmental conditions Treatments were various doses of growth regulators alone and along with foliar spray of growth regulators. Besides, seed priming technique is used for lentil production in some area. Priming can enhance crop establishment, vegetative growth and seed yield of lentil. The factor attributed for low yield of pulses in India as compared to the world productivity are non-availability of quality seeds of improved and short duration varieties, growing of pulses under marginal and less fertile soil with low input and pest and disease management growing of pulses.

Materials and Methods
The field experiments under present investigation were conducted during 2015-16 and 2016-17 at Student Instructional Farm and lab experiments were carried out in Seed Testing Laboratory of Seed Technology Section, N. D. University of Agriculture and Technology, Kumarganj, Faizabad (U. P.). Geographically, Narendra Nagar situated between 26.47^0 N latitude, 82.12^0 longitude and at an altitude of 113 meters above the mean sea level. The climate of district Faizabad is semi-arid with hot summer and cold winter.

Nearly 80 per cent of total rain fall is received during the monsoon the treatment details are presented in Table 1.

Table 1: Treatments used in this study

Treatment No.	Description
T_0	Control (without any biofortification or seed priming)
T_1	GA_3 50 ppm (priming)
T_2	GA_3 100 ppm (priming)
T_3	GA_3 150 ppm (priming)
T_4	Kinetin 50 ppm (priming)
T_5	Kinetin100 ppm (priming)
T_6	Kinetin150 ppm (priming)
T_7	NAA 50 ppm (priming)
T_8	NAA 100 ppm (priming)
T_9	NAA 150 ppm (priming)
T_{10}	seed priming with GA_3 50ppm +Foliar spray
T11	seed priming with GA_3 100ppm +Foliar spray
T_{12}	seed priming with GA_3 150ppm +Foliar spray
T_{13}	seed priming with Kinetin 50ppm +Foliar spray
T_{14}	seed priming with Kinetin 100ppm +Foliar spray
T_{15}	seed priming with Kinetin 150ppm +Foliar spray
T_{16}	seed priming with NAA 50ppm +Foliar spray
T_{17}	seed priming with NAA 100ppm +Foliar spray
T_{18}	seed priming with NAA 150ppm +Foliar spray

Plant to plant distance and row to row distance was 10 and 25 cm, respectively. Fertilizer was applied @ 20:50:50 (kg ha $^{-1}$) N: P: K at the time of sowing. The lentil crop was cultivated using standard agronomic practices. The observations were recorded at days to 50% flowering, plant height (cm) on 30 days, number of branches per plant 30 days, number of pods per plant, number of seeds per pod, biological yield per plant (g), seed yield per plant (g),

Results and discussion

Mean performance

The data presented in table 2, show mean performance of 19 treatments for 12 characters. The grand mean and range for all the traits are also depicted in table 2.

Days to 50% flowering

Perusal of data giving in Table 4.2 clearly indicates that different growth regulators treatments have their pronounced impact on flowering time of lentil. Maximum flowering period of 70.45 days during 2015-16 and 71.45 days during 2016-17 was noted with treatment T_3 (GA_3 50 ppm) Treatment T_3 attended more period than rest treatments during first year while during second year T_3 being on par with T_2 (GA_3 100 ppm) (70.75) achieved more time to flowering that of rest treatments.

Minimum flowering period of 66.75 days was noted with T_7 (NAA 50 ppm) which was at par with T_4 (K-50 ppm) (67.25), T_8 (NAA 100 ppm) (68.05), and significantly superior than T_1 (GA_3 50 ppm) 68.25 and T_2 (GA_3 100 ppm) 69.75. During 2016-17 minimum flowering period 67.80 days was noted with T_7 (NAA 50 ppm) which was significantly followed by T_9 (NAA 50 ppm) 69.70, T_8 (NAA 100 ppm) 68.98, T_6 (K 150 ppm) 70.05, T_4 (K 50 ppm) 68.25,

Plant Height (cm) on 30 DAS

Perusal Table 4.4 revealed indicates different growth regulators treatments have pronounced impact on plant height of lentil on (30 days). Maximum plant height 9.70 cm during 2015-16 and 10.02 cm during 2016-17 was noted with treatment T_3 (GA_3 150 ppm) in both year. Treatment T_3 attended significantly maximum plant height than rest treatments during both years. Minimum plant height 7.27 cm was noted with treatment T_7 (NAA 50 ppm). During 2015-16 and 7.54 cm was observed with treatment T_7 (NAA 50 ppm) in 2016-17. Shukla *et al.* (2011).

Number of branches per plant on 30 DAS

Perusal of data giving in Table 4.6 clearly indicates that different growth regulators treatments have their pronounced impact on plant height of lentil. Maximum number of branches per plant 3.05 on 30 days during 2015-16 and 3.22 during 2016-17 was noted with treatment T_3 (GA_3 150) in both years. Treatment T_3 attended significantly maximum branches per plant than rest treatment during first year and second year.

Minimum branches per plant 2.28 was noted with treatment T_7 (NAA 50 ppm) during 2015-16.While during 2016-17 minimum branches per plant 2.43 was noted with treatment T_7 (NAA 50 ppm).

Number of pods per plant

Table 4.8 data clear cut indicates that different growth regulators applications have pronounced impact on number of pods per plant in lentil. Maximum number of pods per plant 45.19 and 46.69 was noted with treatment T_3 (GA_3 150 ppm) in both year respectively. Treatment T_3 significantly superior to rest of treatments during both year Minimum number of pods per plant 35.44 and 36.74 was noted with treatment T_7 (NAA 50 ppm) during 2015-16 and 2016-17. Lentil production can be increased by applying concentrations of GA_3 between 10 and 50 mg·L^{-1} at flowering Milanesi *et al.* (2008) [6].

Number of seeds per pod

It is clear from Table 4.9 indicates that different growth regulators treatments their pronounced effect on number of seeds per pod in lentil. Maximum number of seeds per pod 1.94 and 2.05 was recorded with treatment T_3 (GA_3 150 ppm) during 2015-16 and 2016-17 respectively. Treatment T_3 significantly superior than all treatment during both years. Minimum number of seeds per pod 1.46 was noted with treatment T_7 (NAA 50 ppm) during 2015-16 while during 2016-17 minimum number of seeds per pod 1.58 was observed with treatment T_4 (K-50 ppm).

Biological yield per plant (g)

Perusal of data giving in Table 4.10 clearly indicates that different growth regulators treatments have pronounced impact on biological yield per plant of lentil. Maximum biological yield per plant 7.41g during 2015-16 and 8.22 (g) during 2016-17 was noted with treatment T_3 (GA_3 150 ppm) in both years respectively. Treatment T_3 significantly superior than rest of treatments during first year, while during second year T_3 being significantly superior than all treatment.

Seed yield per plant (g)

Revealed of table 4.17 data clear-cut indicates that different growth regulators treatments have pronounced impact on seed yield per plant in lentil crop maximum Seed yield per plant 2.41 g and 2.68 g were noted with treatment T_3 (GA_3 150 ppm) in both years separately. T_3 was showed significantly superior than all treatment during first year while during second year T_3 being significantly superior than the rest treatments.

Minimum seed yield per plant 1.35 was noted with treatment

T_7 (NAA 50 ppm) during 2015-16. During 2016-17 minimum seed yield per plant 1.51 g was noted in treatment T_7 (NAA 50 ppm). These results are in collaboration with the earlier finding in lentil Natesh *et al.* (2005) [7].

Table 1: Effect of priming and foliar spray of growth regulators on days to 50% flowering in lentil

S.N.	Character / Treatment	Days to 50% flowering					
		Rabi 2015-16			*Rabi* 2016-17		
		Priming	Priming + spray	Mean	Priming	Priming + spray	Mean
T_1	GA_3 50 ppm	68.00	68.50	68.25	69.00	69.55	69.28
T_2	GA_3 100 ppm	69.50	70.00	69.75	70.50	71.00	70.75
T_3	GA_3 150 ppm	70.20	70.70	70.45	71.20	71.70	71.45
T_4	K- 50 ppm	67.00	67.50	67.25	68.00	68.50	68.25
T_5	K- 100 ppm	68.20	68.70	68.45	69.20	69.60	69.40
T_6	K- 150 ppm	68.80	69.30	69.05	69.80	70.30	70.05
T_7	NAA 50 ppm	66.50	67.00	66.75	67.60	68.00	67.80
T_8	NAA 100 ppm	67.80	68.30	68.05	68.75	69.20	68.98
T_9	NAA 150 ppm	68.40	68.90	68.65	69.40	70.00	69.70
Grand Mean		68.27	68.77	68.52	69.27	69.76	69.52
SEM			CD 5%			CD 5%	
Tvsc		2.466	7.074		2.903	8.326	
Due to Priming		0.822	2.358		0.968	2.775	
Due to foliar spray		1.744	5.002		2.053	5.887	
Due to Intraction of P×FS		2.466	7.074		2.903	8.326	

Table 2: Effect of priming and foliar spray of growth regulators on plant height 30 (cm) days in lentil

S.N.	Character / Treatment	Plant height 30 days					
		Rabi 2015-16			*Rabi* 2016-17		
		Priming	Priming + spray	Mean	Priming	Priming + spray	Mean
T_1	GA3 50 ppm	7.70	7.85	7.78	7.95	8.14	8.05
T_2	GA3 100 ppm	8.80	8.98	8.89	9.00	9.22	9.11
T_3	GA3 150 ppm	9.60	9.79	9.70	9.90	10.14	10.02
T_4	K- 50 ppm	7.40	7.55	7.47	7.60	7.78	7.69
T_5	K- 100 ppm	8.30	8.47	8.38	8.55	8.76	8.65
T_6	K- 150 ppm	9.10	9.28	9.19	9.30	9.52	9.41
T_7	NAA 50 ppm	7.20	7.34	7.27	7.45	7.63	7.54
T_8	NAA 100 ppm	7.80	7.96	7.88	8.10	8.29	8.20
T_9	NAA 150 ppm	8.60	8.77	8.69	8.90	9.11	9.01
Grand Mean		8.28	8.44	8.36	8.53	8.73	8.63
SEM			CD 5%			CD 5%	
Tvsc		0.310	0.888		0.327	0.939	0.327
Due to priming		0.103	0.296		0.109	0.313	0.109
Due to foliar spray		0.219	0.628		0.231	0.664	0.231
Due to Intraction of P×FS		0.310	0.888		0.327	0.939	0.327

Table 3: Effect of priming and foliar spray of growth regulators on branches/plant 30 days in lentil

S.N.	Character / Treatment	Number of branches/plant 30 days					
		Rabi 2015-16			*Rabi* 2016-17		
		Priming	Priming + spray	Mean	Priming	Priming + spray	Mean
T_1	GA3 50 ppm	2.42	2.47	2.44	2.56	2.62	2.59
T_2	GA3 100 ppm	2.76	2.82	2.79	2.90	2.97	2.93
T_3	GA3 150 ppm	3.02	3.08	3.05	3.19	3.26	3.22
T_4	K- 50 ppm	2.32	2.37	2.35	2.45	2.50	2.48
T_5	K- 100 ppm	2.61	2.66	2.63	2.75	2.82	2.78
T_6	K- 150 ppm	2.86	2.92	2.89	2.99	3.07	3.03
T_7	NAA 50 ppm	2.26	2.31	2.28	2.40	2.46	2.43
T_8	NAA 100 ppm	2.45	2.50	2.47	2.61	2.67	2.64
T_9	NAA 150 ppm	2.70	2.76	2.73	2.86	2.93	2.90
Grand Mean		2.60	2.65	2.63	2.74	2.81	2.78
SEM			CD 5%			CD 5%	
Tvsc		0.105	0.301		0.110	0.315	
Due to priming		0.035	0.100		0.037	0.105	
Due to foliar spray		0.074	0.213		0.078	0.223	
Due to Intraction of P×FS		0.105	0.301		0.110	0.315	

Table 4: Effect of priming and spray of growth regulators on number of pods/plant in lentil

S.N.	Character / Treatment	Number of pods/plant					
		Rabi 2015-16			*Rabi* 2016-17		
		Priming	Priming + spray	Mean	Priming	Priming + spray	Mean
T_1	GA3 50 ppm	40.00	41.76	40.88	41.71	43.63	42.67
T_2	GA3 100 ppm	41.46	43.29	42.38	43.02	45.00	44.01
T_3	GA3 150 ppm	44.21	46.16	45.19	45.64	47.74	46.69
T_4	K- 50 ppm	37.61	39.27	38.44	39.09	40.89	39.99
T_5	K- 100 ppm	40.00	41.76	40.88	41.33	43.24	42.29
T_6	K- 150 ppm	42.20	44.05	43.13	43.64	45.64	44.64
T_7	NAA 50 ppm	34.67	36.20	35.44	35.91	37.56	36.74
T_8	NAA 100 ppm	37.06	38.69	37.88	38.53	40.30	39.42
T_9	NAA 150 ppm	39.26	40.99	40.13	40.68	42.55	41.62
Grand Mean		39.61	41.35	40.48	41.06	42.95	42.00
SEM			CD 5%			CD 5%	
Tvsc		1.690	4.848		1.656	4.749	
Due to priming		0.563	1.616		0.552	1.583	
Due to foliar spray		1.195	3.428		1.171	3.358	
Due to Intraction of P×FS		1.690	4.848		1.656	4.749	

Table 5: Effect of priming and foliar of growth regulators on number of seeds/pod in lentil

S.N.	Character / Treatment	Number of seeds/pod					
		Rabi 2015-16			*Rabi* 2016-17		
		Priming	Priming + spray	Mean	Priming	Priming + spray	Mean
T_1	GA3 50 ppm	1.54	1.57	1.56	1.63	1.67	1.65
T_2	GA3 100 ppm	1.76	1.80	1.78	1.84	1.89	1.87
T_3	GA3 150 ppm	1.93	1.96	1.94	2.03	2.08	2.05
T_4	K- 50 ppm	1.48	1.51	1.50	1.56	1.59	1.58
T_5	K- 100 ppm	1.66	1.70	1.68	1.75	1.79	1.77
T_6	K- 150 ppm	1.82	1.86	1.84	1.90	1.95	1.93
T_7	NAA 50 ppm	1.44	1.47	1.46	1.53	1.56	1.54
T_8	NAA 100 ppm	1.56	1.60	1.58	1.66	1.70	1.68
T_9	NAA 150 ppm	1.72	1.76	1.74	1.82	1.87	1.84
Grand Mean		1.66	1.69	1.68	1.75	1.79	1.77
SEM			CD 5%			CD 5%	
Tvsc		0.064	0.184		0.073	0.210	
Due to priming		0.021	0.061		0.024	0.070	
Due to foliar spray		0.045	0.130		0.052	0.149	
Due to Intraction of P×FS		0.064	0.184		0.073	0.210	

Table 6: Effect of priming and foliar spray of growth regulators on biological yield (g) in lentil

S.N.	Character / Treatment	Biological yield (g)					
		Rabi 2015-16			*Rabi* 2016-17		
		Priming	Priming + spray	Mean	Priming	Priming + spray	Mean
T_1	GA3 50 ppm	5.05	5.47	5.26	5.65	6.16	5.90
T_2	GA3 100 ppm	6.01	6.52	6.27	6.63	7.23	6.93
T_3	GA3 150 ppm	7.12	7.71	7.41	7.87	8.58	8.22
T_4	K- 50 ppm	4.52	4.90	4.71	5.01	5.47	5.24
T_5	K- 100 ppm	5.44	5.89	5.67	6.02	6.56	6.29
T_6	K- 150 ppm	6.39	6.92	6.66	7.01	7.64	7.33
T_7	NAA 50 ppm	4.03	4.37	4.20	4.49	4.89	4.69
T_8	NAA 100 ppm	4.69	5.08	4.89	5.26	5.74	5.50
T_9	NAA 150 ppm	5.54	6.01	5.78	6.18	6.74	6.46
Grand Mean		5.42	5.88	5.65	6.01	6.56	6.28
SEM			CD 5%			CD 5%	
TVSC		0.247	0.709		0.253	0.724	
Due to priming		0.082	0.236		0.084	0.241	
Due to spray		0.175	0.502		0.179	0.512	
Due to Intraction of P×FS		0.247	0.709		0.253	0.724	

Table 7: Effect of priming and foliar spray of growth regulators on seed yield/plant (g) in lentil

S.N.	Character / Treatment	Seed yield/plant (g)					
		Rabi 2015-16			*Rabi* 2016-17		
		Priming	Priming + spray	Mean	Priming	Priming + spray	Mean
T_1	GA3 50 ppm	1.63	1.76	1.69	1.83	1.99	1.91
T_2	GA3 100 ppm	1.96	2.13	2.04	2.16	2.36	2.26
T_3	GA3 150 ppm	2.31	2.52	2.41	2.56	2.80	2.68
T_4	K- 50 ppm	1.46	1.57	1.51	1.61	1.77	1.69
T_5	K- 100 ppm	1.76	1.91	1.84	1.95	2.13	2.04
T_6	K- 150 ppm	2.07	2.25	2.16	2.29	2.49	2.39
T_7	NAA 50 ppm	1.30	1.41	1.35	1.44	1.58	1.51
T_8	NAA 100 ppm	1.52	1.64	1.58	1.71	1.86	1.78
T_9	NAA 150 ppm	1.80	1.95	1.88	2.01	2.19	2.10
Grand Mean		1.76	1.90	1.83	1.95	2.13	2.04
SEM			CD 5%			CD 5%	
Tvsc		0.044	0.127		0.061	0.174	
Due to priming		0.015	0.042		0.020	0.058	
Due to foliar spray		0.031	0.090		0.043	0.123	
Due to Intraction of P×FS		0.044	0.127		0.061	0.174	

Conclusion

From the present study it was concluded that plant growth and seed yield of lentil can be improved by priming with growth regulator and spray of growth regulator which could be economically feasible to increase lentil production.

Reference

1. Aslam M, Ahmad E, Saguu AG, Hussain K, Ayaz M, Ullah I *et al*. effect of plant growth regulator (NAA) and available soil moisture depletions on yield and yield components of chickpea. Sarhad J. Agric. 2010; 26(3):325-335.
2. Chovatia RS, Ahlawat TR, Mepa SV, jat G. Response of Cowpea (*Vigna unguiculatal*.) CV. Guj-4 to The Foliar Application of Plant Growth Regulating Chemicals. Veg. Sci. 2010; 37(2):196-197.
3. El-Saeid HM, Abouziena HF, AbdAlla MSA. Effect of some bioregulators on white lupine (*lupinus termis*) seed yield and its components and on endogenous hormones content in seeds. Botany Department, National Research Center. 2011; 14(4):1-8.
4. Giannakoula AE, Ilias IF, Maksimovic DJJ, Maksimovic VM, Zivanovi BD. The effects of plant growth regulators on growth, yield, and phenolic profile of lentil plants. Journal of Food Composition and Analysis. 2012; 2846-53.
5. Kannan K, Jawaharlal M, Prabhu M. Effect Of Plant Growth Regulators On Growth and Yield Parameters Of Paprika cv.KtPl-19. Agric. Sci. Digest. 2009; 29(3):157-162.
6. Milanesi LA, Esposito MA, Martín EA, Lopez-Anido FS Garcia SM, Cointry EL. Rate and Time of GA_3 Application and Irrigation on Plant Morphology and yield of lentil. International Journal of Vegetable Science. 2008; 14(2):139-147.
7. Natesh N, Vyakaranahal BS, Gouda MS, DeshpandE VK. Influence of Growth Regulators on Growth, Seed Yield and Quality of Chill cv. Byadgi Kaddi. Karnataka J. Agric. Sci. 2005; 18(1):36-38.
8. Srimathi P, Sujatha K. Chemical Priming for Improved seed yield and quality in Black gram *(Vigna Mungo (L.) Hepper)* VAR. CO 5. Plant Archives. 2006; 6(1):177-180.
9. Thomson T, Patel GS, Pandya KS, Dabhi JS, Pawar Y. Effect of plant growth substances and antioxidants on growth, flowering, yield and economoics of garden pea, *Pisum sativum* L cv Bonneville. International Journal of Farm Sciences. 2015; 5(1):8-13.