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Effect of Salicylic Acid and Potassium Nitrate on Growth and Yield of Lentil (*Lens culinaris* L.) under Rainfed Condition

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A B S T R A C T

A field experiment was conducted at Agricultural Research Farm, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, Utlou, Bishnupur District, Manipur, India during the year 2018-2019 to study the effect of salicylic acid and potassium nitrate on growth and yield of lentil under rainfed condition. Seed priming with salicylic acid (200 ppm) enhanced the plant height, number of branches, fresh and dry weight and number of nodules per plant and yield attributes namely number of pods per plant and seeds per pod. Foliar spray of KNO_3 (2.0 %) foliar application significantly enhanced the growth attributes of lentil for all the growth stages except for 30 days after sowing (DAS). Yield attributes namely number of pods per plant, number of seeds per pod and yield of lentil increased significantly by application of KNO_3 (1.5%). The treatment combination of salicylic acid (200 ppm) and KNO_3 (1.5%) gave the maximum grain yield (1104.88 kg/ha), stover yield (1799.06 kg/ha) and biomass yield (2903.95 kg/ha). It can be inferred that seed priming of salicylic acid (200 ppm) and foliar application of potassium nitrate (2.0 % and 1.5%) increases the growth and yield of lentil.

Introduction

Pulses are among the most important crops which are considered as substitutes for animal protein among the vegetarian population and it also occupy special place in diets of the Indian population. They are known to render significant impact on soil health and considered to be key component for sustainable agriculture. Pulses have the capacity to fix the soil atmospheric nitrogen in their root system, which enables the plants to meet the nitrogen requirement on its own. Lentil is one of the major *rabi* pulses in India which contributes about 6% of the total area under pulse as well as production in India. It

is cultivated in 3.3 million hectares with a production of about 3.1 million tonnes (Singh *et al.,* 2011). In Manipur lentil cultivation has been increasing from the last 3-4 years in Manipur. The HUL-57 is a popular variety of lentil that has been grown successfully under rainfed conditions. This variety is adapted to cool growing conditions and it is found to be tolerant to frost.

Salicylic acid (SA) is an endogenous plant hormone that has been found to play a major role in the regulation of plant growth and development, including seed germination, organ differentiation, stomatal movement, photoperiodic responses, and senescence mediation (Raskin, 1992; Hayat *et al.,* 2010). It has been reported to mitigate the deleterious effects of several environmental stresses on plants including low temperature and chilling (Korkmaz *et al.,* 2007; Horvath *et al.,* 2007), high temperature and drought (Senaratna *et al.,* 2000), and salinity (Yildirim *et al.,* 2008), increase tolerance and defence to pathogen attack (Raskin *et al.,* 1990). Further, it exerts enhancement in rate and percentage of germination and seedling emergence which ensures proper crop stand under a wide range of environmental conditions (Yadav *et al.,* 2018).

Potassium nitrate (KNO_3) is a chemical which can impact on growth, amount of nitrate, its reduction and assimilation in plants. Potassium deficiency reduces the photosynthetic CO_2 fixation and transport and utilization of assimilates. Membrane and chlorophyll degradation are common in potassium deficient plants. Foliar application of potassium can also be considered as one of the alternative in order to reduce such problems. Foliar application of nutrients may result in economic use of fertilizer by virtue of reducing loss through different processes and supplying nutrients instantly to the crop. Under the moisture stress conditions, application of potassium may be considered as one promising option as it influences the water economy and crop growth, through its effect on water uptake, root growth, maintenance of turgor, transpiration and stomatal behaviour (Hsiao and Lauchi, 1986). Considering the above facts, an experiment has planned to study the effect of salicylic acid and potassium nitrate on growth and yield of lentil under the rainfed condition of Manipur.

Materials and Methods

A field experiment was conducted during the year 2018-2019 at Agricultural Research Farm, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, Utlou, Bishnupur District, Manipur, India (Latitude: 24.72°N and Longitude: 93.86°E). The texture, pH, EC and organic carbon of the experimental soil were respectively, clay, 5.5, 0.4 dS/m and 1.0%. The available N, P and K of the soil were 314.0 kg/ha, 47.0 kg/ha and 269.0 kg/ha respectively. The study was laid out in factorial randomized block design (FRBD) with two factors i.e., seed priming with Salicylic acid (S_0: No application, S_1: 150 ppm, and S_2: 200 ppm) as Factor 1 and foliar application of Potassium Nitrate (K_0: No application, K_1: KNO_3 @ 1.5%, and K_2: KNO_3 @ 2.0%) with four replications and nine treatments. The lentil variety HUL-57 was sown in line with seed rate of 45 kg/ha. Foliar application of KNO_3 was scheduled in splits by targeting the active growth stages. Biometric parameters namely plant height, number of branches, fresh and dry weight were recorded periodically at 30, 60 and 90 DAS and at harvest. Number of nodules was recorded at 60 and 90 DAS. Yield attributing parameters like number of pods per plant, number of seeds per pod and test weight were recorded at harvest. Grain and straw yields were recorded plot wise and then expressed as kg/ha. To compare the effect of SA and KNO_3

on growth and yield of lentil, data were statistically analyzed following Gomez and Gomez (1984). The statistical differences of the data generated for each character were tested with least significant difference (LSD) at 5% probability level using analysis of variance technique (ANOVA). The standard error of means (SEm ±) and critical difference (CD) at 5% level of significance were calculated to compare the treatment means. To observe the significance of differences between the treatments, the mean values were compared by the Duncan's Multiple Range Test (DMRT) at probability <0.05 using SPSS software (Version 16.0). The means for groups in homogeneous sets are displayed with similar letters.

Results and Discussion

Growth of lentil

Plant height

The plant height increased with the increasing levels of salicylic acid (SA) (Table 1). The plant heights for the control plot were lowest as compared with the plots where seed priming was done with salicylic acid which recorded to be 4.90 cm, 11.96 cm, 22.01 cm and 27.38 cm respectively at 30, 60, 90 DAS and at harvest. The corresponding values for the plots where 200 ppm of salicylic acid has been applied were respectively, 5.79 cm, 14.29cm, 28.66 cm and 32.94 cm. The increased in plant height under increasing levels of salicylic acid might be due to water soluble antioxidant compound of salicylic acid which regulate the plant growth. These findings are in good lines with those obtained by Misra and Saxena (2009) and Muthulakshmi and Lingakumar (2016). The individual effect of potassium nitrate (KNO_3) on plant height was significant for all the growth stages except for 30 DAS. The plant height increased with the increasing levels of potassium nitrate. The plant heights for the control plot were lowest which recorded to be 5.19 cm, 12.25 cm, 23.58 cm and 28.52 cm respectively at 30, 60, 90 DAS and at harvest. The corresponding values for the plots where 2% of potassium nitrate has been applied were respectively, 5.38 cm, 13.83 cm, 27.20 cm and 32.06 cm. The increase in plant height under increasing level of potassium nitrate might be due to the foliar application of KNO_3 which have been reported better tolerance towards moisture stress and in turn might have boosted plant growth effectively. The nutrient status in the plant plays a vital role in improving the resistance of plant to stress conditions (Yadov, 2006). Similar findings have been reported by Bardhan *et al.,* (2007).

Number of branches

The number of branches increased with the increasing levels of salicylic acid (Table 1). The number of branches for the control plot were lowest as compared with the plots where seed priming was done with salicylic acid which recorded to be 1.11, 2.20, 3.40and3.50 respectively at 30, 60, 90 DAS and at harvest. The corresponding values for the plots where 200 ppm of salicylic acid has been applied were respectively 1.79, 3.99, 5.33and 5.43. The increased in number of branches with increasing levels of salicylic acid might be due to the role of SA in enhancing physiological and biochemical aspect which increases the number of branches effectively. These findings are in line with those obtained by Devi *et al.,* (2011). The effect of KNO_3on the number of branches was significant for all the growth stages except for 30 DAS. The number of branches increased with the increasing levels of potassium nitrate. The number of branches for the control plot were lowest which recorded to be 1.45, 2.61, 3.89and3.92 respectively at 30, 60, 90 DAS and at harvest. The corresponding values for

the plots where 2% of potassium nitrate (K_2) has been applied were respectively 1.49, 3.59, 4.91 and 5.09. The increase in number of branches under increasing level of potassium nitrate might be attributed to the fact that potassium enhances plant vigour and strengthens the stalk which might have resulted in better plant growth and more number of branches. Similar findings have been reported by Deotale *et al.,* (2015).

Number of branches

Perusal of the data revealed that the fresh weight increased with the increasing levels of salicylic acid (Table 1). The fresh weight for the control plot were lowest as compared with the plots where seed priming was done with salicylic acid which recorded to be 0.44, 1.18, 5.28and6.53 g respectively at 30, 60, 90 DAS and at harvest. The corresponding values for the plots where seed priming was done with 200 ppm of salicylic acid were respectively 0.73, 2.47, 6.17 and 7.86 g. The increase in fresh weight under increasing level of salicylic acid might be due to the growth promoting effect of SA which increased the level of cell division within the apical meristem of seedling root and caused increase in plant growth.

These findings are in lines with those obtained by Farahbakhsh (2012). The effect of KNO_3on the fresh weight was significant for all the growth stages except for 30 DAS. The fresh weight increased with the increasing levels of potassium nitrate. The fresh weight for the control plot were lowest which recorded to be 0.61, 1.70, 5.56and 6.84 g respectively at 30, 60, 90 DAS and at harvest. The corresponding values for the plots where 2% of potassium nitrate has been applied were respectively 0.62, 2.09, 5.99and 7.65 g. Similar findings have been reported by Jabeen and Ahmad (2011).

Dry weight

The dry weight increased with the increasing levels of salicylic acid (Table 1). The dry weight for the control plot were lowest as compared with the plots where seed priming was done with salicylic acid which recorded to be 0.12, 0.31, 2.19and4.21 g respectively at 30, 60, 90 DAS and at harvest. The corresponding values for the plots where 200 ppm of salicylic acid has been applied were respectively 0.21, 0.69, 3.04and 5.12 g. The increase in dry weight under increasing levels of salicylic acid might be due to the promotive effect of SA on morphological characters which enhanced the photosynthetic rate and also maintained the stability of membrane thereby improving the dry matter production. Similar findings were obtained by Jeyakumar *et al.,* (2008) and Devi *et al.,* (2011). The effect of potassium nitrate on dry weight was significant for all the growth stages except for 30 DAS. The dry weight also increased with the increasing levels of potassium nitrate. The dry weight for the control plot were lowest which recorded to be 0.16, 0.45, 2.46and4.45g respectively at 30, 60, 90 DAS and at harvest. The corresponding values for the plots where 2% of potassium nitrate has been applied were respectively 0.17 g, 0.59, 2.88 g and 4.90 g. The increase in dry weight under increasing level of potassium nitrate might be due to the delayed of flowering by foliar application of KNO_3. As lentil being a long day plant, any delay in flowering would facilitate more dry matter production. Similar findings have been reported by Bardhan *et al.,* (2007).

Number of nodules

The number of nodules increased with the increasing levels of salicylic acid (Table 2). The number of nodules for the control plot was lowest as compared with the plots where seed priming was done with salicylic acid

which recorded to be 19.82 and 26.13 respectively at 60 and 90 DAS. The corresponding values for the plots where 200 ppm of salicylic acid has been applied were respectively 23.27 and 29.35 which is 17.40 % and 8.96 % higher as compared with the control. The increased number of nodules under increasing levels of salicylic acid might be due to increase in the net photosynthetic rate. These findings are in lines with those obtained by Hayat *et al.,* (2012). The individual effect of potassium nitrate on thenumber of nodules was significant for all the growth stages.

The number of nodules increased with the increasing levels of potassium nitrate and it was lowest for control plot which recorded to be 20.64 and 26.98 respectively at 60 and 90 DAS. The corresponding values for the plots where 2% of potassium nitrate has been applied were respectively 22.49 and 28.59 which is 12.32 % and 5.96 % higher as compared with the control. The increase in number of nodules under increasing level of potassium nitrate might be due to the stimulative effect of KNO_3 in producing photosynthate sowing to increased translocation of nutrients in plants. Similar findings have been reported by Msaakpa *et al.,* (2013).

Yield attributes of lentil

Number of pods per plant

The analysed data regarding number of pods increased with the increasing levels of salicylic acid (Table 2). The effect of seed priming with salicylic acid on the number of pods was significant. The number of pods per plant was lowest (64.71) for the control plot and heist for the treatment S_2 (72.36) which is 11.82% more than that of the control. The increase in number of podsper plant under increasing levels of salicylic acid might be due to reduced flower drop due to efficient translocation of photosynthates from source to sink. These findings are in corroboration with those obtained by Ali and Mahmoud (2013). The individual effect of KNO_3 on the number of pods was significant. The number of pods increased with the increasing level of KNO_3 up to 1.5 %. The number of pods for the control plot was lowest (66.28) and highest for K_2 (71.31) which is 7.85 % more than the former.

Number of seeds per pod

The number of seeds per pod increased with the increasing levels of salicylic acid (Table 2). The individual effect of salicylic acid on number of seeds per pod was significant.The number of seeds per pod for the control plot was lowest (1.64) and heist for S_2(1.72) which is 4.87% higher than that of control. The increase in number of seeds per pod under increasing levels of salicylic acid might be due to increased mobilization of metabolites to the reproductive sinks. Similar findings were reported by Sujatha (2001) and Khatun *et al.,* (2016). The effect of potassium nitrate on the number of seeds per pod was significant. The number of seeds per pod statistically improved due to increasing level of KNO_3 up to 1.5 %.

The number of seeds per pod for the control plot was lowest which recorded to be 1.66. The corresponding values for the plots where 1.5% of potassium nitrate has been applied were 1.71 which is 3.01 % more than that of the control. The increase in number of seeds per pod might be due to the foliar application of KNO_3 which have active biochemical functions in plants, enzyme activation, photosynthesis and cell division that increased the number of seeds per pod. Similar findings have been reported from foliar application of KNO_3 experiments conducted by Golezani *et al.,* (2011).

Table.1 Effect of salicylic acid and potassium nitrate on plant height (cm), number of branches, fresh and dry weight (g) per plant of lentil

Treatment	Plant height (cm)				No of branches/plant				Fresh weight/plant (gram)				Dry weight/plant (gram)			
	30 DAS	60 DAS	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	Harvest
S_0	4.90	11.96	22.01	27.38	1.11	2.20	3.40	3.50	0.44	1.18	5.28	6.53	0.12	0.31	2.19	4.21
S_1	5.11	13.22	26.10	31.33	1.53	3.30	4.69	4.81	0.67	2.12	6.11	7.56	0.16	0.59	3.01	4.88
S_2	5.79	14.29	28.66	32.94	1.79	3.99	5.33	5.43	0.73	2.47	6.17	7.86	0.21	0.69	3.04	5.12
SEd (±)	0.11	0.10	0.14	0.30	0.05	0.07	0.07	0.10	0.02	0.10	0.14	0.12	0.01	0.02	0.19	0.15
CD(P=0.05)	0.24	0.20	0.29	0.62	0.10	0.15	0.15	0.20	0.04	0.22	0.29	0.24	0.01	0.05	0.39	0.30
K_0	5.19	12.25	23.58	28.52	1.45	2.61	3.89	3.92	0.61	1.70	5.56	6.84	0.16	0.45	2.46	4.45
K_1	5.23	13.39	25.99	31.08	1.49	3.28	4.61	4.73	0.61	1.99	6.01	7.46	0.17	0.55	2.91	4.86
K_2	5.38	13.83	27.20	32.06	1.49	3.59	4.91	5.09	0.62	2.09	5.99	7.65	0.17	0.59	2.88	4.90
SEd (±)	0.11	0.10	0.14	0.30	0.05	0.07	0.07	0.10	0.02	0.10	0.14	0.12	0.01	0.02	0.19	0.15
CD(P=0.05)	NS	0.20	0.29	0.62	NS	0.15	0.15	0.20	NS	0.22	0.29	0.24	NS	0.05	0.39	0.30

S_0 = 0 ppm Salicylic Acid, S_1 = 150 ppm Salicylic Acid, S_2 = 200 ppm Salicylic Acid, K_0 = KNO_3 0%, K_1 = KNO_3 1.5%, K_2 =KNO_3 2.0%

Table.2 Effect of salicylic acid and potassium nitrate on number of nodules per plant, seeds per pod, pods per plant and test weight (g) of lentil

Treatment	Number of nodules/plant		Number of seeds/pod	Number of pods/plant	Test weight (g)
	60 DAS	90 DAS			
Salicylic acid levels					
S_0	19.82	26.13	1.64	64.71	20.79
S_1	22.33	28.64	1.70	69.80	21.12
S_2	23.27	29.35	1.72	72.36	21.21
SEd (±)	0.15	0.33	0.004	0.38	0.21
CD (P=0.05)	0.31	0.68	0.01	0.80	NS
Potassium nitrate levels					
K_0	20.64	26.98	1.66	66.28	20.97
K_1	22.29	28.55	1.71	71.31	21.05
K_2	22.49	28.59	1.69	69.27	21.10
SEd (±)	0.15	0.33	0.00	0.38	0.21
CD (P=0.05)	0.31	0.68	0.01	0.80	NS

S_0 = 0 ppm Salicylic Acid , S_1 = 150 ppm Salicylic Acid, S_2 = 200 ppm Salicylic Acid , K_0 = KNO_3 0%, K_1 = KNO_3 1.5%, K_2 =KNO_3 2.0%

Table.3 Effect of salicylic acid and potassium nitrate on grain yield (kg/ha) of lentil

Treatments		Potassium nitrate levels			Mean S
		K_0	K_1	K_2	
Salicylic acid levels	S_0	723.78	821.30	809.32	784.80
	S_1	847.16	946.93	902.08	898.72
	S_2	883.75	1104.89	1080.09	1022.91
	Mean K	818.23	957.71	930.49	
		SEd (±)	CD (P=0.05)		
	Factor (S)	12.33	25.59		
	Factor (K)	12.33	25.59		
	Factor (S X K)	21.35	44.32		

S_0 = 0 ppm Salicylic Acid , S_1 = 150 ppm Salicylic Acid, S_2 = 200 ppm Salicylic Acid , K_0 = KNO_3 0%, K_1 = KNO_3 1.5%, K_2 =KNO_3 2.0%

Table.4 Effect of salicylic acid and potassium nitrate on stover yield (kg/ha) of lentil

Treatment		Potassium nitrate levels			Mean S
		K_0	K_1	K_2	
Salicylic acid levels	S_0	1,392.77	1,540.88	1,482.30	1,471.98
	S_1	1,561.55	1,714.10	1,647.75	1,641.13
	S_2	1,598.88	1,799.07	1,746.66	1,714.87
	Mean K	1,517.73	1,684.68	1,625.57	
		SEd (±)	CD (P=0.05)		
	Factor (S)	19.54	40.56		
	Factor (K)	19.54	40.56		
	Factor (S × K)	33.84	NS		

S_0 = 0 ppm Salicylic Acid , S_1 = 150 ppm Salicylic Acid, S_2 = 200 ppm Salicylic Acid , K_0 = KNO_3 0%, K_1 = KNO_3 1.5%, K_2 =KNO_3 2.0%

Table.5 Effect of salicylic acid and potassium nitrate on biomass yield (kg/ha) of lentil

Treatment		Potassium nitrate levels			Mean S
		K_0	K_1	K_2	
Salicylic acid levels	S_0	2,116.55	2,362.18	2,291.62	2,256.78
	S_1	2,408.70	2,661.03	2,549.83	2,539.85
	S_2	2,482.63	2,903.95	2,826.75	2,737.77
	Mean K	2,335.96	2,642.39	2,556.06	
		SEd (±)	CD (P=0.05)		
	Factor (S)	22.09	45.86		
	Factor (K)	22.09	45.86		
	Factor (S × K)	38.26	79.44		

S_0 = 0 ppm Salicylic Acid , S_1 = 150 ppm Salicylic Acid, S_2 = 200 ppm Salicylic Acid , K_0 = KNO_3 0%, K_1 = KNO_3 1.5%, K_2 =KNO_3 2.0%

Table.6 Effect of salicylic acid and potassium nitrate on harvest index (%) of lentil

Treatment		Potassium nitrate levels			Mean S
		K_0	K_1	K_2	
Salicylic acid levels	S_0	34.22	34.80	35.35	34.79
	S_1	35.15	35.60	35.38	35.38
	S_2	35.60	38.05	38.22	37.29
	Mean K	34.99	36.15	36.32	
		SEd (±)	CD (P=0.05)		
	Factor (S)	0.43	0.89		
	Factor (K)	0.43	0.89		
	Factor (S × K)	0.74	NS		

S_0 = 0 ppm Salicylic Acid , S_1 = 150 ppm Salicylic Acid, S_2 = 200 ppm Salicylic Acid , K_0 = KNO_3 0%, K_1 = KNO_3 1.5%, K_2 =KNO_3 2.0%

Test weight

Irrespective of scaling up of SA up to 200 ppm and increasing the concentration of KNO_3 up to 1.5 % the test weight was found non-significant for both salicylic acid and potassium nitrate (Table 2). The test weight for the control plot was lowest as compared with the plots where seed priming was done with salicylic acid which recorded to be 20.79 g. The corresponding value for the plots where 200 ppm of salicylic acid has been applied was 21.21 g. The effect of potassium nitrate (KNO_3) on test weight for the control plot was lowest which recorded to be 20.97 g. The corresponding values for the plots where 1.5% of potassium nitrate has been applied were 21.10 g.

Grain yield

The grain yield of the lentil has been found to be lowest for control plot *i.e.* S_0K_0 (723.78 kg/ha) and highest for the treatment S_2K_1 (1104.98 kg/ha) which is 52.66 % more than that of the control followed byS_2K_2 and S_1K_1 which are statistically at par (Table 3). The effect of salicylic acid and potassium nitrate on grain yield of lentil has been found to be significant both for individual and combined effects. Scaling up of SA up to 200 ppm caused significant enhancement in yields of lentil. Similarly, increasing the concentration of KNO_3 up to 1.5 % led to marked improvement in yields of lentil. It was reported that application of SA has a positive effect in ameliorating the oxidative damages in plant and increase the yield. Similar findings were also corroborated by Devi *et al.,* (2011) and Hossain *et al.,* (2015). decrease grain yield under higher level of KNO_3 might be due to the toxic effect of KNO_3 at higher concentration. These findings are in consistency to those achieved by Singh *et al.,* (2017). The interaction of SA and KNO_3 is effective in improving the yield parameters under moisture stress conditions by delaying maturity due to enhancement of biochemical and physiological processes (Rhman and Attia, 2016).

Stover yield

The analysed data showed that the stover yield of the lentil has been found to be lowest for control plot *i.e.* S_0K_0 (1561.55 kg/ha) and highest for the treatment S_2K_1 (1799.07 kg/ha) which is 29.17 % more than that of the control followed byS_2K_2 and S_1K_1 which are statistically at par (Table 4). The individual effect of salicylic acid and potassium nitrate on stover yield of lentil has been found to be significant but the combination effects has been found to be non-significant. Scaling up of SA up to 200 ppm caused significant enhancement in yields of lentil. Similarly, increasing the concentration of KNO_3 up to 1.5 % led to marked improvement in yields of lentil. Increased in stover yield might be due to the growth promoting effect of SA which increased the level of cell division within the apical meristem of seedling root and caused higher plant growth and increased the dry matter production.

Similar findings were also corroborated by El-Hedek *et al.,* (2013) and Ahmad *et al.,* (2014). Increase in stover yield under decreasing level of KNO_3 might be due to the toxic effect of KNO_3 at higher concentration. This might be due to the foliar application of KNO_3 which has positive effects of N and K at right time enhancing plant growth and dry matter accumulation. These findings are in consistency to those achieved by Nandakumar *et al.,* (2004). Investigators indicated that potassium played a key role in the osmotic adjustment (stomatal opening) of plants under water stress and yield may be improved due to foliar potassium application to plants (Foyer *et al.,* 2002).

Biomass yield

The biomass yield of the lentil has been found to be lowest for control plot *i.e.* S_0K_0 (2116.55 kg/ha) and highest for the treatment S_2K_1 (2903.95 kg/ha) which is 37.20 % more than that of the control followed by S_2K_2 and S_1K_1 which are statistically at par (Table 5). The combined effect of salicylic acid and potassium nitrate on biomass yield of lentil has been found to be significant both for individual and combined effects. Scaling up of SA up to 200 ppm caused significant enhancement in yields of lentil. Similarly, increasing the concentration of KNO_3 up to 1.5 % led to marked improvement in yields of lentil. This might be due to the cumulative effect of yield attributing characters and enhanced photosynthetic efficiency and greater diversion of assimilates towards reproductive organs. Similar findings were also reported by Farjam *et al.,* (2014). Increase in biomass yield under decreasing level of KNO_3 might be due to the toxic effect of KNO_3 at higher concentration. Exogenous application of KNO_3might have a positive effect of N and K in increasing its dry matter synthesis and yield attributing characters during the course of development with higher partitioning efficiency. These findings are in consistency to those achieved by Khan *et al.*, (2012).

Harvest index

Results showed that the harvest index of the lentil has been found to be lowest for control plot *i.e.* S_0K_0 (34.22 %) and highest for the treatment S_2K_2 (38.21 %) followed by S_2K_1 and S_2K_0 which are statistically at par (Table 6). The individual effect of salicylic acid and potassium nitrate on harvest index of lentil has been found to be significant but the combination effects has been found non-significant. Similarly, increasing the concentration of KNO_3 up to 2.0 % led to marked improvement in yields of lentil. This might be due the physiological index reflecting the percentage of assimilates mobilization from vegetative organs of plant into grains. Similar findings were also reported by Devi *et al.,* (2011).Foliar application of KNO_3 at optimum dose probably caused proportionately greater increase in economic part than the non-economic parts, which might have resulted in higher harvest index. These findings are in consistency to those achieved by Duraisami and Mani (2002).

Based on the results from the experiment it can be concluded that seed priming of salicylic acid @ 200 ppm and foliar application of potassium nitrate @ 2.0 % increases the growth attributes and salicylic acid @ 200 ppm and foliar application of potassium nitrate @ 1.5 % increases the yield attributes, and ultimately yield of lentil.

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