Original Research Article

Effect of GA_3 and Potassium on Growth and Yield in Red Radish (*Raphanus sativus* L.) under subtropical conditions of Jammu

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ABSTRACT

An experiment entitled, **Effect of GA3and Potassium on growth and yield in Red Radish (*Raphanus sativus* L.) under subtropical conditions of Jammu**was carried out at Vegetable ExperimentalFarm, Division of Vegetable Science, SKUAST Jammu during *Rabi* season of 2022-2023. Theexperiment was laid out under factorial RBD design with three replications comprising of sixteentreatments. The treatments consisted of four doses of Potassium i.e., 40, 50, 60 and 70 kg/ha and fourconcentrations*viz.* 0,100,200 and 300 ppm of GA3.

The growth and yield parameters maximum *viz*. shoot length (34.15 cm), root length(18.73 cm), number of leaves/root (14.30), root weight (220.49 g), shoot weight (119.47 g), root-shoot ratio (2.04), fresh root shoot yield (112.42 q/ha) were recorded with 200ppm GA3application. Similarly, highest shoot length (29.06 cm), root length (17.53 cm),number of leaves/root (11.18), root weight (171.67 g), shoot weight (104.84 g), root-shoot ratio(1.87), fresh root shoot yield (92.31 q/ha), wererecordedwith 50kg/ha K_2O application.

However;highestrootlength(19.20cm), number of leaves/root(14.87),rootweight(226.14 g), shoot weight (123.54 g), root-shoot ratio (2.10), fresh root shoot yield (115.90 q/ha) were recorded with treatment combinationG3K2(200 ppmGA3+ 50 K_2O/ha). Based on the investigation, it can be concluded that the application of 200 ppm GA_3 at three stages in combination with 50 kg potassium/ha resulted in the highest growth parameters and yield.

Keywords: Growthregulator,Potassium,Radish,Rootshootratio

INTRODUCTION

Radish (*Raphanus sativus* L.) is one of the most significant winter vegetable crop grown in both tropical and temperate region. It is popular choice for cultivation as it is easy to grow, fits well in crop rotation, and is rapidly maturing cash and catch crop. It is highly cross-pollinated crop that belongs to the family Cruciferae and finds its origin in Europe and Asia. The most popular edible part of radish is the tuberous root, which is consumed either cooked or raw, and tops can be used as leafy vegetable. It helps in the treatment of gastrodynia, gall bladder issues, sleep disorders, persistent diarrhea, neuralgic headaches, and urinary symptoms (Sandhu, 1993). It is good source of Vitamin C and minerals (i.e., calcium, potassium, and phosphorus) (Zohary *et al.*, 2012). 100 g fresh edible portion of radish contains 0.7% protein, 3.4-6.8% carbohydrates and 0.2% fat and 50 I.U. of vitamin A. Its tender roots provide about 50 mg of calcium, 22 mg of phosphorus and 0.5 mg of iron per 100 g of edible portion.

In India, radish occupied an area of 209 thousand hectares with an annual production of 3347 thousand metric tonnes (NHB, 2021). It is cultivated in almost all states of India. The major radish producing states include West Bengal, Haryana, Punjab, Bihar and Assam. In Jammu & Kashmir, it is grown over an area of 3.20 thousand hectares with an annual production of 116.07 thousand metric tonnes (NHB, 2021).

In the recent past, due to significant increase in area under radish crop, the demand for quality seed has increased manifold. State Government and Government of India have laid out a lot of emphasis to improve availability of quality seed, which has not only increased production and productivity of this crop, however, it also provided new opportunities for export of quality seed. The nation's total production of vegetable seeds is insufficient to fulfil the nation's rising demand. Currently, the demand for quality seeds is met to the extent of 20% only. Farmers themselves meet 75% seed demand through own saved

seeds (Pooniaet *al.*, 2013). India continues to import vegetable seeds from foreign nations, the two main ones being cabbage and pea.

The physiological efficiency of plants, particularly photosynthetic capacity and efficient assimilate partitioning, can be improved by plant growth regulators (Solaimalaiet *al.*, 2001). By promoting the transfer of photo assimilates, vegetable crop productivity can be raised. In particular, it has been noted that GA3 has amazing effects on promoting blooming and raising seed production in vegetable crops. Gibberellins are crucial for many aspects of plant growth and development, including seed germination. Gibberellic acid stimulates the cells of growing seeds to produce mRNA molecules, which controls the activity of hydrolytic enzymes. The use of GA_3 controls a number of physiological processes and causes metabolic changes that have an impact on the quantity and quality of the intended product. An increase in seed quality parameters due to greater accumulation of food reserves by the application of GA_3 has been reported (Ghanome, 2011).The use of potassium fertilizer is an effective way to increase radish productivity. Potassium regulates the opening and closing of stomata. It activates enzymes that are required for generation of ATP. Starch and protein synthesis are facilitated by potassium in plants. It is also required for transport of sugar to the storage organs (Chhetri *et al.*, 2019).That the growth and yield of red radish can successfully be produced under Jammu conditions however, the quantity of the growth and yield is less. Therefore, to increase the quantity and quality of growth and yield through application of growth regulators and nutrients, the present study has been designed.

MATERIALS AND METHODS

The present investigation was carried out on **Effect of GA3and Potassium on the growth and yield in Red Radish (*Raphanus sativus* L.) under subtropical conditions of Jammu** was carried out at Vegetable ExperimentalFarm, Division of Vegetable Science, SKUAST Jammu during *Rabi* season of 2022-2023. The investigation was conducted at Chatha which is located at an elevation of 332 m above mean sea level having geographical bearing of 32.3'' North latitude and 74.53'' East longitude. Theexperiment was laid out under factorial RBD design with three replications comprising of sixteen treatments. The treatments consisted of four doses of Potassium i.e., 40, 50, 60 and 70 kg/ha and fourconcentrations*viz.* 0,100,200 and 300 ppm of GA3.

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List 1: Details of treatment

GA_3application (04)	**Potassium doses (04)**
G_1 : 0 ppm	K_1 : 40 kg/ha
G_2 : 100 ppm	K_2 : 50 kg/ha
G_3 : 200 ppm	K_3 : 60 kg/ha
G_4 : 300 ppm	K_4 : 70 kg/ha

The detail of various cultural operations carried out during the crop growing have been given below:

Land preparation for mother block

The field was ploughed twice followed by planking to attain good tilth. Field layout and preparation of ridges was done manually with the help of rope and spade. Well rotten FYM @ 20 tonnes per hectare was applied in the field before sowing. Recommended dose of N, P @ 60, 30 kg per hectare and four dose of K treatment @ 40,50,60,70 kg per hectare was applied as a basal dose at the time of sowing. The seeds were sown on ridges by dibbling methods in 5 November 2022. The GA_3 were sprayed at 30 Days after sowing in mother block. Proper aftercare operations in respect of irrigation, plant protection was undertaken till the roots were ready for the transplanting.

Preparation of field for transplanting of stecklings

The field was ploughed twice followed by levelling and planking to attain good tilth. Field layout and preparation of pits was done manually with help of rope and spade. Well rotten FYM @ 20 tonnes per hectare was applied in the field before planting. Recommended dose of N, P @ 60, 30 kg per hectare and four dose of K treatment @ 40,50,60,70 kg per hectare was applied as a basal dose at the time of planting. The steckling were prepared by cutting $1/3^{rd}$ of the tops and 1/3 of the roots were transplanted as per the treatment. Other intercultural operations were carried out in accordance with the packaging of practices of radish crop seed production from time to time.

Preparation of spray solution

GA_3 stock solutions of 100 ppm was prepared by dissolving 1 g of pure GA_3 in small quantity of alcohol and then making the final volume up to 1 liter by adding distilled water.

The solutions were prepared fresh at the time of each spray and dilutions of required concentrations were made using stock solution. The GA_3 sprayed at 30 Days after sowing and 15 Days after transplanting of steckling, at the time of siliquae formation.

The growth and yield parameters *viz*. shoot length, root length, number of leaves/root, root weight, shoot weight, root-shoot ratio, fresh root shoot yield.

Statistical analysis

The data recorded on various parameters of the present study after proper tabulation were put to statistical analysis as per the randomized complete block method prescribed by (Panse and Sukhatme, 1989) to draw the inferences of the study. The significance of treatment effects was tested through variance ratio and the significance of difference between any two means was judged with the critical difference (C.D) at 5 per cent level of significance was worked out. Data for the parameters were put to statistical analysis by using OPSTAT software developed by O.P. Sheoran*et al.* (1998) of CCS HAU, Hissar.

RESULTS

Shoot length (cm)

It was evident from table 1 that the Growth regulators (GA_3) and potassium have significantly influenced the shoot length. Maximum shoot length 34.15 cm was in G_3 which was at par with G_4. Lowest shoot length 18.73 cm was recorded in G_1 which was significantly lower that all of the treatments. Similarly, The Potassium levels had significant effect on shoot length. Maximum shoot length was obtained K_2 29.06 cm which had at par results with K_3 and K_4 and Minimum shoot length was recorded in K_1 26.70 cm was recorded in K_1 which was significantly lower that all of the treatments.

However, the interaction between GA_3 and Potassium with respect to shoot length was found to be non- significant.

Root length (cm)

It was evident from table 2 that the Growth regulators (GA_3) and potassium have significantly influenced the root length of red radish. Maximum root length (18.73 cm) was obtained in G_3 which

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exhibited at par results with G_4. Lowest root length 14.78 cm was recorded in G_1 which was significantly lower that all of the treatments. Similarly, The Potassium levels had significant effect on root length. Maximum root length was obtained K_2 dose (40kg/ha) 17.53 cm which had at par results with K_3 and K_4 Minimum root length was recorded in K_1 16.38 cm was recorded in K_1 which was significantly lower that all of the treatments.

Interaction studies depicts that a combination of G_3K_2 maximum root length (19.20 cm) which was at par with the treatment combinations of G_3K_3, G_3K_4, G_4K_3 and G_4K_4. Lowest root length was recorded in a treatment combination of G_1K_1 (13.19cm) which was significantly lower that all of the treatment combinations.

Number of leaves per root

It was evident from Table 3 that the number of leaves per root of red radish was significantly influenced by the Growth regulators (GA_3) and potassium. G_3 had the maximum number of leaves per root 14.30, which was at par with G_4. The Lowest number of leaves per root 6.07, was recorded in G_1, which was significantly lower than all of the treatments. Similarly, the number of leaves per root was significantly affected by the Potassium levels. K_2 had the Maximum number of leaves per root 11.18, which had at par results with K_3 and K4. The Minimum number of leaves per root 10.41, was recorded in K_1, which was significantly lower than all of the treatments.

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The interaction studies depicted that the treatment combination of G_3K_2 had the maximum number of leaves per root 14.87 cm, which was at par with the treatment combinations of G_3K_3, G_3K_4, G_4K_3, and G_4K_4. The lowest number of leaves per root was recorded in the treatment combination of G_1K_1 5.30 cm, which was significantly lower than all of the treatment combinations.

Root weight (g)

It was evident from table4 that the Growth regulators (GA_3) and potassium have significantly influenced the root weight of red radish. Maximum root weight (220.49 g) was in G_3 which was at par with G_4. Lowest root weight (112.33 g) was recorded in G_1 which was significantly lower that all of the treatments. Similarly, The Potassium levels had significant effect on root weight. Maximum root weight was obtained K_2 (171.67g) which had at par results with K_3 and K_4 and Minimum root weight was recorded in K_1 (164.55g) was recorded in K_1 which was significantly lower that all of the treatments.

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Interaction studies depicts that a combination of G_3K_2 maximum root weight (226.14 g) which was at par with the treatment combinations of G_3K_3, G_3K_4, G_4K_3 and G_4K_4. Lowest root weight and shoot weight was recorded in a treatment combination of G_1K_1 (111.17g) which was significantly lower that all of the treatment combinations.

Shoot weight (g)

It was evident from table5 that the Growth regulators (GA_3) and potassium have significantly influenced the shoot weight of red radish. Maximum shoot weight (119.47 g) was obtained in G_3 which exhibited at par results with G_4. Lowest shoot weight (78.20 g) was recorded in G_1 which was significantly lower that all of the treatments. Similarly, The Potassium levels had significant effect on shoot weight. Maximum shoot weight was obtained K_2 dose (104.84g) which had at par results with K_3 and K_4. Minimum shoot weight was recorded in K_1 (99.36g) was recorded in K_1 which was significantly lower that all of the treatments.

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Interaction studies depicts that a combination of G_3K_2 maximum shoot weight (123.54g) which was at par with the treatment combinations of G_3K_3, G_3K_4, G_4K_3 and G_4K_4. Lowest shoot weight was recorded in a treatment combination of G_1K_1 (75.90 g) which was significantly lower that all of the treatment combinations.

Root-Shoot ratio

The root shoot ratio of red radish was significantly influenced by the Growth regulators (GA_3) and potassium as evident from table 6. The maximum root shoot ratio of 2.04 was observed in G_3, which was at par with G_4. The lowest root shoot ratio of 1.38 was recorded in G_1, which was significantly lower than all of the treatments. Similarly, the root shoot ratio was significantly affected by the Potassium levels. The maximum root shoot ratio of 1.87 was obtained in K_2, which had at par results with K_3 and K_4. The minimum root shoot ratio of 1.75 was recorded in K_1, which was significantly lower than all of the treatments.

It was observed from the interaction studies that the treatment combination of G_3K_2 (2.10) was at par with the treatment combinations of G_3K_3, G_3K_4, G_4K_3, and G_4K_4. The lowest root shoot ratio of 1.28 was recorded in the treatment combination of G_1K_1, which was significantly lower than all of the treatment combinations.

Fresh root shoot yield (q/ha)

It was evident from table 7 that the Growth regulators (GA_3) and potassium have significantly influenced the fresh root shoot yieldof red radish. Maximum fresh root shoot yield98.75 q/ha was in G_3 which was at par with G_4. Lowest fresh root shoot yield72.96 q/ha was recorded in G_1 which was significantly lower that all of the treatments. Similarly, The Potassium levels had significant effect on fresh root shoot yield. Maximum fresh root shoot yieldwas obtained K_2 92.06 q/ha which had at par results with K_3 and K_4 and Minimum fresh root shoot yieldwas recorded in K_1 84.69 q/ha was recorded in K_1 which was significantly lower that all of the treatments.

Interaction studies depicts that a combination of G_3K_2 (103.58 q/ha) fresh root shoot yieldwhich was at par with the treatment combinations of G_3K_3, G_3K_4, G_4K_3, and G_4K_4. Lowest fresh root shoot yieldwas recorded in a treatment combination of G_1K_1 (71.83 q/ha) which was significantly lower that all of the treatment combinations.

DISCUSSIONS

It was observed that GA_3 and potassium had a significant effect on the growth traits of red radish. When 200 ppm GA_3 was sprayed and 50 kg potassium per hectare was applied, the shoot length was recorded as 34.15 cm and 29.06 cm, respectively. However, the interaction studies 200 ppm GA_3 + 50 kg potassium per hectare did not show a significant effect on shoot length. Similarly, the root length was significantly affected by both GA_3 and potassium. The maximum root length recorded was 18.73 cm and 17.53 cm when 200 ppm GA_3 and 50 kg potassium per hectare were applied, respectively. The interaction had a statistically significant effect, resulting in a root length of 19.20 cm when the combination of 200 ppm GA_3 and 50 kg potassium per hectare was applied. The number of leaves per root was significantly influenced by both GA_3 and potassium. The highest number of leaves per root (14.30 and 11.18) was recorded when 200 ppm GA_3 and 50 kg potassium per hectare were applied, respectively. The interaction also had a significant effect on the number of leaves per root, with a recording of 14.87 when the treatment combination of 200 ppm GA_3 and 50 kg potassium per hectare was applied.

The increase in shoot length, root length, and number of leaves per root observed in response to GA_3 application may be attributed to the stimulation of cell division, cell size, and metabolic activities in the plant. The enhanced growth observed at optimum levels could be attributed to the pivotal role of potassium in activating enzymes, regulating stomata, and facilitating photosynthesis. These findings are supported by similar results reported by Sharma (2003), Mehta &Patnayak (2005), Jatav *et al.* (2007), Abou EL-Nasr (2008), Kiran (2016), and Shweta *et al.* (2018).

The root and shoot yield traits of red radish were significantly influenced by GA_3 and potassium. The maximum root weight (220.49 g), shoot weight (119.47 g), root-shoot ratio (2.09), and fresh root-

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shoot yield (98.75 q/ha) were recorded when 200 ppm GA_3 was sprayed. Similarly, the maximum root weight (171.67 g), shoot weight (109.89 g), root-shoot ratio (1.87), and fresh root-shoot yield (92.06 q/ha) were recorded when 50 kg potassium per hectare was applied. The interaction effect between GA_3 and potassium was found to be significant for all yield traits. The maximum root weight (226.14 g), shoot weight (123.54 g), root-shoot ratio (2.10), and fresh root-shoot yield (103.58 q/ha) were recorded when the treatment combination of 200 ppm GA_3 and 50 kg potassium per hectare was applied.

The enhancement in yield attributes, such as root weight, shoot weight, root-shoot ratio, and fresh root-shoot yield, can be attributed to the stimulation of cell division, cell size, and expansion resulting from the application of GA_3. Similarly, increased yield attributes observed with an optimum level of potassium can be attributed to its role in carbohydrate synthesis and translocation, cell extension, and improved fertilizer use efficiency. These findings align with the results reported by Sharma*et al.* (2003), Anjaiah & Padmaja (2006), Patel (2007), Bawkar*et al.* (2011), Khan *et al.* (2021), Shweta *et al.* (2018), Nagaich and Mishra (2019).

CONCLUSIONS

Based on the investigation, it can be concluded that the application of 200 ppm GA_3 at three stages (15 daysafter seed sowing, 30 days after steckling planting and at the time of siliqua formation) in combination with 50 kg potassium/ha resulted in the highest growth parameters and yield. This treatment combination significantly improved the highest growth parameters and yield.

Comment [KD11]: Conclusion need more illustration and mention the novelty of the experiments with outcomes

REFERENCES

1. Anjaiah, T. and Padmaja, G.2006. Effect of potassium and farm yard manure on yieldand quality of carrot. *Journal of Research ANGRAU*., **34**(2): 91-93.
2. Sandhu, M. K. 1993. Root crops. In: Vegetable crops (Eds Bose and Som), *Naya Prakash Kolkata*, India, pp: 470-488.
3. Zohary, D., Hopf, M., & Weiss, E. 2012. Domestication of plants in the old world 4th edi. Oxford. *Oxford University Press.*
4. NHB. 2021. Horticulture Statistics At a Glance-2021. National Horiticulture Board, Government of India. Gurgaon, India. www.nhb.gov.in.
5. Poonia, T. C. 2013. History of seed production and its key issues. *International Journal of Food, Agriculture and Veterinary Science*, **3**(1): 148-154.
6. Solaimalai A, Sivakumar C, Anbumani S, Suresh T, Arumugam K.2001. Role of planr growth regulators in rice production- a review. *Agriculture Review,***22**: 33-40.
7. Ghanome, A. A., Saleh, S. A., Read, G. S., Fawzey,Z. F. and El-Abd, S. O. 2011. Enhancement of carrot seed yield and quality by root dipping in gibberellic acid. *Journal of Applied Science Research*, **7**(12): 1821-1827.
8. Chetri, R.K., Panta, R., Shrestha,R. K. 2019. Effect of spacing and Potassium application on growth and yield of radish *Raphanus sativus* cv. mino early. *The International Journal of Biological Research*,**2**: 176-180.
9. Panse, V. G. and Sukhatme, P. V. 1989. *Statistical Methods for Agriculture workers* ICAR, New Delhi.
10. Patel, R., Tomar, B. S., Khan, R., and Yadav, K. 2017. Response of Radish (*Raphanus sativus* L.) to different concentration of Gibberellic acid. *International Journal of Chemical Studies*,**5(**6): 458-459.
11. Sharma, A., Sharma, R. P., Sonia, S. and Shartna J. 2003. Influence of integrated use of nitrogen, phosphorus, potassium and farm yard manure on the yield attributing traits and marketable yield of carrot (*Daucus carota*) under the high hills dry temperate conditions of north- western Himalyas.

*Indian Journal of Agriculture Sciences,***73**(9): 500-503

12. Mehta, S.K. and Patnayak, C. P. 2005. Studies the effect of growth hormone (GA_3) on growth yield attributes of radish (*Raphanus sativus* L.) var. Pusa Deshi. *Journal of Advancements in Plant Science*,**24**(2): 121-126.
13. Shweta., Mal, D., Thakur, V., Dutta, 2018. Effect of different plant growth regulators (GA3 and NAA) on growth and yield parameters of radish (*Raphanus sativus* L.) Var. Pusa Reshmi. *Journal of Pharmacognosy and Phytochemistry,***7**(3): 3434-3437.
14. Nagaich, K.N., Mishra, P. 2019. Response of gibberellic acid on growth and yield of radish (*Raphanus sativus* L.) Cv. Japanese white. *Journal of Pharmacognosy and Phytochemistry,***8**(2): 1521-1523.
15. Khan, B. P., Ara, N., Ali, S., Baigh, K.K., Wahab, A. 2021. Effect of seed priming on radish with different at various soaking durations. *Pakistan Journal of Agriculture Research*,**34**(1): 77-84.
16. Kiran, A., Jilani, M. S., Waseem, K. and Sohail, M. 2016. Effect of organic manures use of inorganic fertilizers on growth and yield of radish of radish (*Raphanus sativus* L.). *Pakistan Journal of Agriculture Research*,**29**(4): 363-372.
17. Jatav, B. S. 2007. Effect of plant growth regulators on growth and yield of Radish (*Raphanus sativus* L.) Var. Japanese white. *M.Sc. (Ag) Thesis*, RVSKVV, College of Agriculture, Gwalior.
18. Bawkar, S. O., Wagh, A. P., Dod, V. N., Das, B. 2011. Effect of spacing and seed soaking with GA3 on growth, yield and quality of carrot. *The Asian Journal of Horticulture*,**6**(2): 373-375.

Table 1 Effect of GA_3 and potassium on Shoot length (cm) in red radish (SJRR-01)

Shoot length (cm)					
Treatments	**K_1**	**K_2**	**K_3**	**K_4**	**Mean**
G_1	17.54	18.66	18.29	20.41	**18.73**
G_2	25.14	26.66	26.62	26.71	**26.28**
G_3	31.92	34.92	34.84	34.93	**34.15**
G_4	32.18	35.98	34.26	33.99	**34.10**
Mean	**26.70**	**29.06**	**28.50**	**29.01**	
	SEm±			**CD (0.05)**	
G	0.62			1.79	
K	0.62			1.79	
(G×K)	1.24			NS	

Table 2 Effect of GA_3 and potassium on Root length (cm) in red radish (SJRR-01)

Root length (cm)					
Treatments	**K_1**	**K_2**	**K_3**	**K_4**	**Mean**
G_1	13.19	15.31	15.33	15.30	**14.78**
G_2	16.10	17.17	17.10	17.07	**16.86**
G_3	18.23	19.20	18.80	18.70	**18.73**
G_4	18.00	18.43	18.67	18.93	**18.51**
Mean	**16.38**	**17.53**	**17.48**	**17.50**	
	SEm±			**CD (0.05)**	
G	0.13			0.37	
K	0.13			0.37	

(G×K)	0.26		0.74

NOTE: G_1-0 ppm, G_2-100 ppm, G_3- 200 ppm, G_4-300 ppm, K_1-40 kg/ha, K_2-50 kg/ha, K_3-60 kg/ha, K_4-70 kg/ha

Table3 Effect of GA_3 and potassium on Number of leaves per root in red radish (SJRR-01)

Number of leaves per root					
Treatments	**K_1**	**K_2**	**K_3**	**K_4**	**Mean**
G_1	5.30	6.20	6.00	6.77	**6.07**
G_2	8.82	9.47	9.20	9.23	**9.18**
G_3	13.77	14.87	14.30	14.27	**14.30**
G_4	13.77	14.20	14.83	14.27	**14.27**
Mean	**10.41**	**11.18**	**11.08**	**11.13**	
	SEm±			**CD (0.05)**	
G	0.11			0.31	
K	0.11			0.31	
(G×K)	0.21			0.62	

NOTE: G_1-0 ppm, G_2-100 ppm, G_3- 200 ppm, G_4-300 ppm, K_1-40 kg/ha, K_2-50 kg/ha, K_3-60 kg/ha, K_4-70 kg/ha

Table 4 Effect of GA_3 and potassium on Root weight (g) in red radish (SJRR-01)

Root weight (g)					
Treatments	**K_1**	**K_2**	**K_3**	**K_4**	**Mean**
G_1	111.17	113.67	113.12	111.34	**112.33**
G_2	124.67	127.75	126.44	126.66	**126.38**
G_3	204.84	226.14	225.74	225.22	**220.49**
G_4	217.52	219.10	219.68	219.50	**218.95**
Mean	**164.55**	**171.67**	**171.24**	**170.68**	
	SEm±			**CD (0.05)**	
G	1.16			3.36	
K	1.16			3.36	
(G×K)	2.33			6.72	

Table 5 Effect of GA_3 and potassium on Shoot weight (g) in red radish (SJRR-01)

Shoot weight (g)					
Treatments	**K_1**	**K_2**	**K_3**	**K_4**	**Mean**
G_1	75.90	79.81	78.43	78.65	**78.20**

G_2	92.88	96.96	95.45	94.52	**94.95**
G_3	110.90	123.54	121.03	122.39	**119.47**
G_4	117.78	119.04	120.54	119.81	**119.29**
Mean	**99.36**	**104.84**	**103.86**	**103.84**	
	SEm±			**CD (0.05)**	
G	0.74			2.13	
K	0.74			2.13	
(G×K)	1.48			4.27	

NOTE: G_1-0 ppm, G_2-100 ppm, G_3- 200 ppm, G_4-300 ppm, K_1-40 kg/ha, K_2-50 kg/ha, K_3-60 kg/ha, K_4-70 kg/ha

Table 6 Effect of GA_3 and potassium on Root-Shoot ratio (weight bases) in red radish (SJRR-01)

Root-shoot ratio					
Treatments	**K_1**	**K_2**	**K_3**	**K_4**	**Mean**
G_1	1.28	1.40	1.42	1.43	**1.38**
G_2	1.76	1.98	1.84	1.91	**1.87**
G_3	1.96	2.10	2.05	2.05	**2.04**
G_4	1.99	2.00	2.09	2.02	**2.02**
Mean	**1.75**	**1.87**	**1.85**	**1.85**	
	SEm±			**CD (0.05)**	
G	0.01			0.04	
K	0.01			0.04	
(G×K)	0.03			0.09	

Table 7 Effect of GA_3 and potassium on Fresh root shoot yield (q/ha) in red radish (SJRR-01)

Fresh root shoot yield (q/ha)					
Treatments	**K_1**	**K_2**	**K_3**	**K_4**	**Mean**
G_1	71.83	75.26	72.50	72.27	**72.96**
G_2	84.95	93.38	92.20	91.96	**90.62**
G_3	87.03	103.58	102.19	102.19	**98.75**
G_4	94.95	96.01	100.20	100.29	**97.86**
Mean	**84.69**	**92.06**	**91.77**	**91.68**	
	SEm±			**CD (0.05)**	
G	1.15			3.31	
K	1.15			3.31	
(G×K)	2.29			6.62	

NOTE: G_1-0 ppm, G_2-100 ppm, G_3- 200 ppm, G_4-300 ppm, K_1-40 kg/ha, K_2-50 kg/ha, K_3-60 kg/ha, K_4-70 kg/ha