

Influence of different doses and time of application of gibberellic acid on the yield and quality of garden pea

VB GHOGOL, VR CHUDASMA, YD PAWAR and PM SILATAR

**Department of Vegetable Science
College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University
Sardarkrushinagar 385506 Gujarat, India
Email for correspondence: yogesh517.pawar@gmail.com**

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ABSTRACT

The present investigations were carried out during Rabi season of 2014-2015 at horticulture instructional farm, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. There were total fifteen treatment combinations comprising five levels of gibberellic acid viz G_0 (GA_3 0 ppm), G_1 (GA_3 25 ppm), G_2 (GA_3 50 ppm), G_3 (GA_3 75 ppm) and G_4 (GA_3 100 ppm) and three levels of time of application viz S_1 (10 days after sowing), S_2 (20 days after sowing) and S_3 (30 days after sowing). The results of experiment revealed that among different levels of gibberellic acid maximum weight of pods per plant, yield of pods per plot, yield of pods per hectare and thickness of pod were observed in treatment G_4 (GA_3 100 ppm). Whereas maximum number of seeds per pod, length of pod and protein content were recorded in treatment G_3 (GA_3 75 ppm). In case of time of application maximum thickness of pod and protein content were observed in treatment S_2 (20 days after sowing). Maximum number of pods per plant, weight of pods per plant, yield of pods per hectare, number of seeds per pod and length of pods were recorded in treatment S_3 (30 days after sowing). Treatment combination G_4S_3 (GA_3 100 ppm and 30 days after sowing) was found superior with respect to yield and quality of garden pea.

Keywords: GA_3 ; garden pea; quality; yield; gibberellic acid; spray

INTRODUCTION

Vegetables have an excellent dietary value and may be known as protective foods. Vegetable pea is one of the most important leguminous vegetables having more protein than other vegetables.

The food legumes as a builder and restorer of soil fertility have long been recognized due to their unique ability of symbiotic nitrogen fixation. This also makes them the most important and useful component of a cropping system in the present context of energy crisis. They not only meet the nitrogen demand through atmospheric nitrogen fixation but also improve the productivity of soil. However the extent of nitrogen fixation is governed by many factors like crop and soil management particularly of the nutrients.

Looking at the low yield potential of pea good agronomic practices like growing high yielding varieties, providing proper spacing, irrigation, use of fertilizers, optimum sowing time and some advanced yield boosting practices like application of plant growth substances need to be followed in order to increase the productivity and chemical composition. The plant growth substances influence the physiological processes of plants and they have several beneficial effects such as promotion of root growth, internodal length and number of flowers and induction of early and uniform fruit ripening. If plant growth substances are used at different times they hasten yield and quality attributes considerably. So keeping in consideration the above facts the experiment was planned and executed for studying the influence of different doses and time of application of gibberellic acid on yield and quality of garden pea.

MATERIAL and METHODS

The investigations were conducted at horticulture instructional farm of Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat.

The experiment was laid out in four replications with randomized factorial block design. Five levels of gibberellic acid viz G_0 (GA_3 0 ppm), G_1 (GA_3 25 ppm), G_2 (GA_3 50 ppm), G_3 (GA_3 75 ppm) and G_4 (GA_3 100 ppm) and three levels of time of application viz S_1 (10 days after sowing), S_2 (20 days after sowing) and S_3 (30 days after sowing) were taken singly and in combination thus making total number of treatment combinations fifteen. The variety Bonneville was selected for experimentation due to its popularity among farmers of north Gujarat. To raise the crop recommended package of practices was followed. The crop was sown on 21 November 2014. The effect of different treatments was studied on yield and quality parameters of the pea crop on ten randomly selected plants. Yield attributes were determined by number of pods per plant, weight of pods per plant and yield of pods per hectare whereas the quality parameters by number of seeds per pod, length of pod, thickness of pod and protein content. The data were subjected to statistical analysis of variance technique (Panse and Sukhatme 1995).

RESULTS and DISCUSSION

Effect of different doses of GA_3

Treatments were evaluated on the basis of yield and quality characteristics of garden pea. The results revealed that among different levels of gibberellic acid significantly maximum weight of pods per plant (51.52 g), yield of pods per hectare (114.96 q) and thickness of pods (12.26 mm) were observed in treatment G_4 (GA_3 100 ppm) (Table 1 and 2). Maximum number of seeds per pod (7.58), length of pods (8.35 cm) and protein content (21.56%) were recorded in treatment G_3 (GA_3 75 ppm) (Table 2).

It may be due to the reason that GA_3 is recognized as a growth promoter which stimulates the rapid cell elongation in meristematic zone of vegetative plant organs (Pandey et al 2004).

Effect of time of application of GA_3

Significantly maximum thickness of pods (12.62 mm) and protein content (22.08%) were observed in treatment S_2 (20 days after spraying) (Table 2).

This could be due to the reason that plant hormone acts as solely or in part by controlling transcription of genes and thus levels of mRNA which in turn regulates rate of synthesis of specific hormone induced proteins. On the other hand GA_3 possibly either

Table 1. Effect of different levels of gibberellic acid and time of application on yield of garden pea, *Pisum sativum* L cv Bonneville

Treatment	Total number of pickings	Number of pods/plant	Weight of pods/plant (g)	Yield of pods/ha (q)
Gibberellic acid (G)				
G_0	3.55	5.22	31.34	90.60
G_1	3.32	5.48	35.61	99.69
G_2	3.39	6.11	43.05	111.97
G_3	3.56	6.45	45.22	113.25
G_4	3.31	7.21	51.52	114.96
SEm±	0.07	0.15	1.19	2.07
CD _{0.05}	NS	NS	3.41	5.93
Time of spray (S)				
S_1	3.47	5.82	38.11	101.97
S_2	3.43	6.14	41.18	105.27
S_3	3.37	6.26	44.75	110.18
SEm±	0.09	0.15	1.54	2.07
CD _{0.05}	NS	0.43	4.41	5.93
G x S				
SEm±	0.16	0.34	2.66	4.63
CD _{0.05}	NS	NS	NS	NS
CV%	9.38	11.03	12.89	8.74

releases the activity or inactivity of some inhibitory gene which leads to accumulation of more protein in the seeds. These results are supported by the findings of earlier works such as Bora and Sarma (2006) in cluster bean, Chatterjee and Choudhuri (2012) in cowpea, Ngatia et al (2004) in common bean and Fawzy et al (2011) in snap bean.

Interaction effect of GA₃ and time of application

The increase in yield is the manifestation of increased number of pods per plant and pod weight per plant due to application of gibberellic acid as reported

by Ngatia et al (2004) in common bean and El-Shraiyy and Hegazi (2009), Musmade et al (2013) and Shende (1985) in pea.

The data given in Table 2 indicate that highest number of seeds per pod (7.48) and length of pods (8.26 cm) were recorded in treatment S₃ (30 days after spraying). The increase in number of pods per plant by various plant growth substance treatments may probably be due to the increase in flower and pod setting percentage. In the present studies GA₃ was found most effective.

Table 2. Effect of different levels of gibberellic acid and time of application on quality of garden pea, *Pisum sativum* L cv Bonneville

Treatment	Number of seeds/pod	Length of pod (cm)	Thickness of pod (mm)	Protein content (%)
Gibberellic acid (G)				
G ₀	6.42	6.94	10.18	20.98
G ₁	7.30	7.94	11.89	21.42
G ₂	6.92	7.81	11.92	20.02
G ₃	7.58	8.35	12.19	21.56
G ₄	6.91	7.89	12.26	20.46
SEm±	0.15	0.17	0.20	0.19
CD _{0.05}	0.42	0.50	0.57	0.54
Time of spray (S)				
S ₁	6.71	7.86	11.01	20.70
S ₂	6.90	7.24	12.62	22.08
S ₃	7.48	8.26	11.44	19.89
SEm±	0.19	0.23	0.26	0.24
CD _{0.05}	0.55	0.65	0.74	0.70
G x S				
SEm±	0.33	0.39	0.45	0.42
CD _{0.05}	NS	NS	NS	NS
CV%	9.42	10.02	7.68	4.04

Similar results were recorded by Shende (1985) and Musmade et al (2013) in pea and Nabi et al (2014) in cowpea.

CONCLUSION

In the light of the results obtained from present investigations it is concluded that application of GA₃ 100 ppm at 30 days after sowing resulted in maximum yield with superior quality of garden pea cv Bonneville under north Gujarat conditions.

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