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Effect of biofertilizer and gibberellic acid on growth and yield of onion

H.S. WAGHMODE, R.S. PATIL AND **B.S. PANDURE**

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See end of the article for authors' affiliations

Correspondence to :

B.S. PANDURE
Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

ABSTRACT

The present investigation was undertaken during *Rabi* season of 2005-06 at Mahatma Phula Krishi vidyapeeth, Rahuri, with a view to work out combined use of biofertilizer and gibberellic acid on seed production of onion cv. PHULA SAMARTH. Result revealed that application of gibberellic acid 50 ppm significantly reduced of number of days for the sprouting, 50 per cent flowering, days for seed harvesting and plant height of flower stalk. Per cent stalk bending was also observed maximum under application of GA 50 ppm. Application of biofertilier (12 kg/ha *Azospirillum* + PSB and 20 kg /ha VAM) significantly improved growth contributing characters such as number of leaves per plant days for bulb sprouting and seed harvesting. Thus by considering over all performance, it is concluded that application of gibberellic acid (100 ppm) along with biofertilizer (*Azospirillium* + PSB 6 kg/ha and VAM @ 10kg/ha) was effective in increasing yield.

Key words : Biofertilizer, Gibberellic acid, Onion, Onion growth, Onion yield

Onion (*Allium* cepa L) is bulbous, biennial herb belonging to family *Alliaceae* and genus *Allium* which is consumed all over the world throughout the year. Promotes appetite, use full against malaria, night blindness, for lowering blood pressure and against dog bites (Perane, 2001). India is the second largest producer of onion next to China. Accounting for 20 per cent of world area and 10 per cent of world production. The area is abut 5.93 lakh hectares with 75.16 lakh metric tones bulb production. In India, Maharashtra, Andhra Pradesh, Assam, Bihar, Gujrat, Punjab, Karnataka, and Tamilnadu, Orissa, Uttar Pradesh are major onion growing states.At present, Maharashtra is a leading state in onion production having an area 1.21 lakh ha and 14.23 lakh metric tones production (Anonymous, 2005)

In Maharashtra, onion grow throughout the year in *Kharif,* late *Kharif* (r*angda*), *Rabi* and late *Rabi* (summer) season. Nasik district alone accounts to more than 30% of stats production (Singhal, 2003). About 70% of total onion exported from India is from Maharashtra state. The yield of onion seed largely depends upon many factors such as time of planting of mother bulb, plant population per unit area, size of mother bulb, storage temperature of mother bulb, mean day length and tempreture, pollinating agent, fertilization, irrigation, cultural practices and time of harvesting also affect seed yield quality. Seed yield is also variable factor in onion. Apart from inconsistent seed yield, genetic purity and purity and low viability are other consistent in onion seed production. The present range of seed yield is 2.5 to 10.0q/ ha. This wields range observed due to variable environmental factors and lack of agro techniques. The increasing tempreture during flowering is the major cause which affects seed production in onion due to flower parameters like number of flower per stalk, number of seed and seed weight per umbel. In onion bulb crop, agro techniques have been standardized, however, meagre research work has been carried out in onion seed production. Hence, the present investigation was planned and conducted during *Rabi* season of 2005-06.

MATERIALS AND METHODS

The good quality bulb of onion variety Phula Samarth were obtained from the Vegetable Breeder MPKV Rahuri. The soil of experimental plot was medium black and well drained with uniform well leveled topography design of experiment Factorial Randomized Block Design, replication 3, plot size gross 306x3.3=11.88 sq. m, net 1.8 x 2.5m= 4.5 sq.m., spacing 90 x 20 cm, Season *Rabi,* 2005-06. The recommended dose of fertilizer 100:50:50kg NPK/ha was applied. 50 per cent N and total dose of P and K was applied as basal dose, while remaining 50 per cent N was top dressed at the time of second earthning *i.e.* 50 days after plantation. Stock solution of GA was prepared with distilled water and then required concentrations for spraying were prepared. In spraying treatments the appropriate concentrations were prepared and sprayed uniformly on plant in the respective plot. Care was taken to see that all leaves, umbel were sprayed properly. A 50 and 100 ppm were sprayed at initiation of flower stalk *i.e*. 50 days after planting.

RESULTS AND DISCUSSION

Data presented in Tabal 1 revealed that biofertilizer

dose for bulb sprouting were significantly affected due to different biofertilizer doses. The treatment B_3 required significantly minimum days (27.66) for bulb sprouting, whereas B_1 required maximum days (31.77) than B_2 and B_3 in (Table 1). The various levels of gibberellic acid were significant on plant height. The treatment G_2 (50ppm) showed maximum height (64.56 cm) and significantly superior over G_1 (56.66 cm) and G_3 (60.34cm). Effect of biofertilizer doses on plant height was non-significant. However, numerically B_3 recorded maximum plant height (61.16 cm).

Data regarding mean number of leaves per plant as influenced by different levels of gibberellic acid and biofertilizer doses are presented in Table 1. Effect of gibberellic acid on number of leaves during full bloom stage was non- significant. However the treatment G_3 recoded the maximum leaves (52.60) per plant. The effect of boifertilizer number of leaves during full bloom stage were significantly affected due to different biofertilizer doses. The treatment B_3 had more number of leaves (54.13) than B_1 (44.02) and was at par with B_2 (48.95).

The days required for 50% flowering were significantly influenced by different gibberellic acid concentration. The treatment G_3 (100 ppm) required less day (70.22) and significantly superior to G_1 (74.22), but it was at par with G_2 (71.44). However, there was narrow difference in GA application treatment and control. Effect of biofertilizer doses for days required for 50% flowering

Table 1 : Growth attributing character of onion as influenced by different treatment

Treatments	Days to bulb sprouting	Plant height (cm)	Number of leaves (75 DAP)	Days for 50 % flowering
Gibberellic acid				
G_1-0ppm (control)	NA	56.66[a]	44.24	74.22[a]
G_2- 50ppm	NA	64.56[c]	50.26	71.44[b]
G_3- 100ppm	NA	60.34[b]	52.60	70.22[b]
Result	-	Sig	N.S	Sig
S.E.±	-	1.14	-	0.43
C.D. (P=0.05)	-	3.42	-	1.30
Biofertilizers				
B_1- 0kg/ha *Azospirillum* + PSB and VAM(Control)	31.77[a]	59.30	44.02[a]	72.33
B_2- 6 kg/ha^{-1} *Azospirillum* + PSB and 10 kg /ha^{-1} VAM	29.33[b]	61.11	48.95[a]	72.00
B_3- 12 kg/ha^{-1} *Azospirillum* + PSB and 20 kg /ha^{-1} VAM	27.66[c]	61.16	54.13[b]	71.55
Result	Sig	NS	Sig	NS
S.E.±	0.46	-	2.35	-
C.D. (P=0.05)	1.37	-	7.04	-

Sig = Significant, N.S = Non-significant

Table 2 : Yield contributing characters and seed yield influenced by different treatment

Treatments	Days required for seed harvesting	Height of flower stalk(cm)	Per cent stalk bending	Seed yield (q/ha)
Gibberellic acid				
G_1-0ppm (Control)	145.44[a]	71.17[a]	1.06[b]	6.42[a]
G_2- 50ppm	142.88[b]	82.96[c]	1.45[a]	7.05[b]
G_3- 100ppm	143.00[b]	80.63[b]	1.44[a]	7.35[b]
Result	Sig	Sig	Sig	Sig
S.E.±	0.52	0.57	0.08	0.18
C.D. (P=0.05)	1.56	1.71	0.25	0.55
Biofertilizers				
B_1-- 0kg/ha^{-1} *Azospirillum* + PSB and VAM(Control)	145.44[a]	77.43	1.24	6.52[a]
B_2- 6 kg/ha^{-1} *Azospirillum* + PSB and 10 kg /ha^{-1} VAM	143.00[b]	78.60	1.31	7.16[b]
B_3- 12 kg/ha^{-1} *Azospirillum* + PSB and 20 kg /ha^{-1} VAM	142.88[b]	78.73	1.42	7.13[b]
Result	Sig	NS	NS	Sig
S.E.±	0.52	-	-	0.18
C.D. (P=0.05)	1.56	-	-	0.55

Sig = Significant, NS = Non-significant

was non-significant. However, the treatment B_3 (71.55) recorded minimum days for 50% flowering.

Data treated in Table 2 revealed that the treatment G_2 (50ppm) required minimum days (142.88), than G_1 *i.e.* (145.44) and was at par with G_3 (100ppm) *i.e.* 143 days. However, there was narrow difference in GA application treatment and control. The days required for seed harvesting were significantly affected by different biofertilizer doses. The treatment B_3 required significantly minimum days (142.88) than B_1 (145.44) and was at par with B_2 (143.00).

It is seen from Table 2 that the height of flower stalk was significantly influenced by different levels of gibberellic acid. The treatment G_2 (50 ppm) showed maximum height (82.96 cm) and significantly superior over G_1 (0 ppm) *i.e.* (71.17 cm) and G_3 (100 ppm) *i.e.* (80.63cm). The effect of different doses of biofertilizer on height of flower stalk was non- significant. However, the maximum height of flower stalk was recorded in the treatment B_3 (78.73 cm).

The per cent stalk bending were significantly influenced by different levels of gibberellic acid. The treatment G_2 (50 ppm) showed significantly more stalk bending (1.45 %) over G_1 (0 ppm) and at par with treatment G_3 (100 ppm) (1.44%). The effect of biofertilizers on per cent bending was statistically non-significant. The biofertilizer treatment B_3 (1.42%) recorded more per cent stalk bending. The growth substances *i.e.* GA significantly influenced the growth character. However, there was no significant effect of gibbrerllic acid on number of leaves. The effect of different treatment on days for the sprouting and 50% flowering significantly required minimum days over the control. Prokhorov and Khomyakov (1972) observed that the earlier the plant flowered, the greater was the number of seed and better their quality in onion. The minimum days for the sprouting and 50% flowering were recorded under treatment G_3 (100 ppm) and days for seed harvesting was minimum under the treatment G_2 (50 ppm). These observations are in agreement with those of Lopper and Waller (1982) and Thruvelavan *et al*. (1995) in onion. The effect of different levels of gibberellic acid on plant height and height of flower stalk revealed that height and height of flower stalk significantly increased over control. The maximum height was observed under treatment G_2 (50 ppm) and was significantly superor to the rest of the treatment. The lowest plant and stalk height observed under the control treatment. Thus GA (50 ppm) proved to be better in incising plant height and height of flower stalk. These results are agreement with finding of Wagh *et al.* (1994).

Effect of gibberellic acid on per cent stalk bending showed significant effect. The treatment G_2 (50 ppm) showed more bending *i.e.* (1.45%), but it was not more than that of G_1 (0 ppm) (1.06 %). Thus, in the present study the height of flower stalk increased but the bending of the flower observed at lower extent.

Authors' affiliations:
H.S. WAGHMODE AND R.S. PATIL, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

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