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Effect of biofertilizer and gibberellic acid on yield contributing character of onion

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ABSTRACT

The present investigation was undertaken during *Rabi* season of 2005-06 at Mahatma Phula Krishi vidyapeeth, Rahuri, with a view to study the effect of combined use of biofertilizer and gibberellic acid on seed production of onion cv Phula Samarth. The yield attributing character such as number and seed weight per umbel and per bulb and seed yield per hactare were significantly increased at higher concentration of gibberellic acid (100 ppm)The yield attributing character such as number and seed weight per umbel and per bulb and seed yield per hectare were significantly higher at lower dose of biofertilizer B_2 (*i.e.*6 kg/ha *Azospirillum* + PSB and 10 kg /ha VAM) while number of flower stalk per bulb increased at higher doses of biofertilizer, G_3 (*i.e.* 12kg/ha *Azospirillum* + PSB and 20 kg /ha VAM). Thus by considering over all performance, it could be concluded that application of gibberellic acid (100ppm) along with biofertilizer *Azospirillium* + PSB 6 kg/ha and VAM @ 10kg/ha was effective in increasing seed yield of onion.

Key words : Onion, Biofertilizer, Gibberellic acid, VAM, *Azospirrillum*

INTRODUCTION

Onion (*Allium* cepa L) is bulbs, biennial herb belonging to family *Alliaceae* and genus *Allium* which is consumed all over the world throughout the year. Onion is good source of vit. A, B and C, protein, phosphorus, calcium, ascorbic acid, etc. medicinally, it has been found that onion promotes appetite, use full against malaria, night blindness, for lowering blood pressure and against dog bites (Perane, 2001). 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. 14.23 lakh metric tones production (Anonymous, 2005)

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, and 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 10.0 q/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 done on use of growth substance as a foliar spray to increase seed production and quality of onion seed. Loper and Waller (1982) showed that GA_3 as foliar spray treatment at higher rate significantly increases bolting and yield.

MATERIALS AND METHODS

The good quality bulb of onion variety Phula Samarth were obtained from the Vegetable Breeder, Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S.). The soil of experimental plot was medium black and well drained with uniform well leveled topography. Design of experiment was FRBD, replications with 3, plot size gross 306x3.3=11.88 sqm, Net 1.8x2.5m=4.5 sqm, Spacing 90x20cm, 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_3 was prepared with distilled water and then required concentrations for spraying were prepared. In spraying treatments the appropriate concentrations were prepared and spraying was done 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

Effect of gibbrerllic acid on number of flower stalk per bulb was statistically non-significant. However, the treatment G_3 (100 ppm) recorded the maximum (7.5) number of flower stalk (Table 1). The number of flower stalk per bulb were significantly influenced by different levels of biofertilizer doses. The treatment B_3 had more number of flower stalk (8.2) than B_1 (5.0) and was at par

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with B_2 (8.02). It is seen (Table 1) that the number of seed per umbel were significantly influenced by different levels of gibberellic acid. The treatment G_3 (100ppm) was given maximum number of seeds (906.02/umbel) and was significantly superior over G_1 (803.11) and G_2(830.66). The treatment G_3 (100ppm) gave maximum number of seeds 6984 per bulb and was significantly superior over G_1 (5658.33) and G_2 (5859.77). Data presented in Table 1 revealed that the effect of GA on number of flower stalk per bulb was not significant; however, numerically application of GA_3@ 100ppm was recorded maximum (7.5) number of flower stalk. Different doses of biofertilizer significantly influenced the number of seeds per umbel. The number of flower stalk per bulb was significantly influenced by different levels of biofertilizer doses. The treatment B_3 had more number of flower stalk (8.2) than B_1 (5.0) and was at par with B_2 (8.02) The treatment B_2 was significantly superior (6981.66) over all the other treatment *i.e.* B_1 (5614.44) and B_3 (5906). The treatment B_2 was significantly superior (900.66) over all the other treatment *i.e.* B_1 (819.11) and B_3 (820.02).The numbers of seeds per bulb were significantly influenced by different levels of gibberellic acid. Table 1 different levels of biofertilizer doses significantly influenced the number of seeds per bulb.

It is seen from Table 2 that the mean seed weight per umbel were significantly influenced by different levels of gibberellic acid the treatment G_3 (100ppm) was given more seed weight (3.80g) per umbel and was significantly superior over G_1 (3.24g) and G_2 (3.49g) Different doses of biofertilizer significantly influenced the number of seeds weight per umbel. The treatment B_2 was significantly superior (3.71) over all other treatment B_1 (3.39g) and (3.44g) Mean seed weight per bulb were significantly influenced by different levels of gibberellic acid the treatment G_3 (100ppm) was given maximum number of seeds weight (25.27 g) over all other treatment G_1 (19.23) and G_2 (21.84g). Different doses of biofertilizer significantly influenced the seeds weight per bulb. The treatment B_2 was significantly superior (24.12) over all the other treatment *i.e.* B_1 (20.85g) and B_3 (21.38g).

It is seen from Table 2 that mean seed yield per heater was significantly influenced by different levels of gibbrerllic acid. The treatment G_3 (100ppm) gave maximum yield (7.35q) over G_1(6.42q) and was at par

Table 1 : Mean number of flower stalk per bulb, number of seed per umbeland number of seed per bulb influenced by different levels of GA and biofertilizer doses

Treatments	Number of flower stalk/bulb	Number of seed/ umbel	Number of seed / bulb
Gibberellic acid (ppm)			
G_1-0ppm (Control)	6.5	803.11[a]	5658.33[a]
G_2- 50ppm	7.1	830.66[a]	5859.77[a]
G_3- 100ppm	7.5	906.02[b]	6984.00[b]
Result	N.S	Sig	Sig
S.E.±	-	15.33	166.21
C.D. (P=0.05)	-	45.97	498.30
Biofertilizers (kg/ha)			
B_1-- 0kg/ha *Azospirillum* + PSB and VAM(Control)	5.00[a]	819.11[a]	5614.44[a]
B_2- 6 kg/ha *Azospirillum* + PSB and 10 kg /ha VAM	8.02[b]	900.66[b]	6981.66[b]
B_3- 12 kg/ha *Azospirillum* + PSB and 20 kg /ha VAM	8.20[b]	820.02[a]	5906.00[a]
Result	Sig	Sig	Sig
S.E.±	0.30	15.33	166.21
C.D. (P=0.05)	0.92	45.97	498.30

Sig = Significant, N.S = Non-significant

Table 2 : Mean number seed weight per umbel, seed weight per bulb and seed yield influenced by different levels of GA and biofertilizer doses

Treatments	Number of flower stalk/bulb	Number of seed/ umbel	Number of seed / bulb
Gibberellic acid (ppm)			
G_1-0ppm (Control)	3.24[a]	19.23[a]	6.42[a]
G_2- 50ppm	3.49[a]	21.84[b]	7.05[b]
G_3- 100ppm	3.80[b]	25.27[c]	7.35[b]
Result	Sig	Sig	Sig
S.E.±	0.08	0.85	0.18
C.D. (P=0.05)	0.26	2.54	0.55
Biofertilizers (kg/ha)			
B_1-- 0kg/ha *Azospirillum* + PSB and VAM(Control)	3.39[a]	20.85[a]	6.52[a]
B_2- 6 kg/ha *Azospirillum* + PSB and 10 kg /ha VAM	3.71[b]	24.12[b]	7.16[b]
B_3- 12 kg/ha *Azospirillum* + PSB and 20 kg /ha VAM	3.44[a]	21.38[a]	7.13[b]
Result	Sig	Sig	Sig
S.E.±	0.08	0.85	0.18
C.D. (P=0.05)	0.26	2.54	0.55

Sig = Significant

with G_2(7.05q). Different levels of biofertilizer doses significantly influenced by the seed yield. The treatment B_2 was significantly superior (7.16q) over B_1 (6.52q) and was at par with B_3 (7.13q).

Yield is the best indicator to see the effect of different treatment. The different yield attributes such as number of flower stalk, number of seed per umbel and per bulb, weight of seed per umbel and per bulb, and yield per hctare were significantly influenced by foliar sprays of gibbrerllic acid. These characters are indirectly responsible to increase or decrease the seed yield. The number and weight of seed per umbel and per bulb were significantly superior over control. Highest increase in number and weight per umbel and per bulb was recorded in G_3 (100ppm). It is universally true that GA_3 has its particular role in induction of flowering and seed setting. GA_3 helped to produced the healthier plant and initiate splitting of bulb (sprouts) and thus helped in increase number of escapes per plant as well as seed yield per umbel and per bulb which finally leads to higher seed yield per hectare (Nehara *et al.*, 1992) G_2 (50ppm). Both the treatment yielded significantly higher than control. Thus we can say that higher concentration of gibberellic acid play important role in increasing the yield per hectare

However, there was no significant effect of gibberellic acid on number of flower stalk per bulb. Though, there is no significant effect the GA (100ppm) play an important role in increasing flower stalk per bulb than control treatment. The highest yield per hector was obtained under treatment G_3 (100ppm) followed by treatment higher than control. Thus we can say that higher concentration of gibberellic acid play an important role in increasing the seed yield per hector. The results obtained in present investigation are in agreement with the results reported by Deore and Bharud (1991), Nehara *et al.* (1992) and Wagh *et al.* (1994).

Conclusion:

The experiment included that total 9 treatment combination comprising thre gibbrerllic acid concentration (0,50,100 ppm) and three biofertilizer does (0, 6 kg *Azospirillum* + PSB and 10 kg /ha VAM, 12 kg *Azospirillum* + PSB and 20 kg /ha VAM). Observation regarding growth, yield were recoded number and weight of seed per umbel and per bulb increases with increase in gibberellic acid concentration and recorded the maximum number and weight of seed at higher concentration G_3 (100 GAppm) followed by G_2 (50ppm). And seed yield per hecter also increased with increased gibberellic acid concentration the maximum seed yield per hector were recorded at G_3 (100 GAppm) (7.35q/ha)On the basis of results obtained in present investigation fowling consultation were made. Number of flower stalk per bulb were recorded maximum (8.2) at B_3 biofertilizer doses.The number and weight of seed per umbel and per bulb and seed yield per hectare were maximum at B_2- 6 kg/ha *Azospirillum* + PSB and 10 kg /ha VAM). However, G_3 (100 GAppm) recoded maximum number of flower stalk per bulb, number of seed per umbel, number of seed per bulb, seed weight per umbel, seed weight per bulb and seed yield per hectare were recombeded at 100 ppm GA. Thus it is concluded that 100ppm GA is effective in increasing the seed production of onion biofertilizer doses B_2- 6 kg/ha *Azospirillum* + PSB and 10 kg /ha VAM) gave maximum seed yield of onion.

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