# SEED QUALITY AS INFLUENCED BY ORGANIC AND INORGANIC FERTILIZERS IN ONION (*Allium cepa* L.)

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## *ABSTRACT*

***A study was carried out in order to find out the influence of organic and inorganic fertilizers on yield and quality of onion cv. GWO-1 seed during Rabi 2013-14. The experiment was laid out in a completely randomized design with eleven treatments with four repetitions. Two kinds of organic manures, Farm Yard Manure (FYM) and Vermicompost (VC), alone and in combination with two biofertilizers (Azotobacter and PSB) and chemical fertilizers (RDF) were tested in comparison with control. The results revealed that the shoot length (cm), root length (cm), shoot fresh weight (g), root fresh weight (g), shoot dry weight (g), root dry weight (g), vigour index length and vigour index mass were significantly influenced by different treatments. Among the treatments combinations, vermicompost alone or vermicompost with PSB and Azotobactor was found to be superior over all the other treatments in respect of seed quality parameters.***

***KEY WORDS: Organic & inorganic fertilizers, seed quality, onion***

## INTRODUCTION

The bulbous vegetable onion (*Allium cepa*, var. *cepa* L.) is the most important species of *Allium* group and is regarded as the single most important vegetable spices in the world after tomato and is considered as top most export commodity among vegetables. It is a short duration and quick growing having various uses such as vegetables, spices and medicinal. Onion bulb is rich in minerals, especially calcium and phosphorus besides having fairly good quantities of carbohydrates, proteins and vitamin C. The pungency in onion is due to a volatile compound known as allyl-propyl disulphide, which is sulphur rich compound (Anonymous, 1978).

Onion seed is usually produced in the temperate and sub-tropical countries. Onion is a biennial crop for the purpose of seed production. In one season, bulbs are produced from seed and in the second season, bulbs are replanted to produce seed. Onion seeds are poor in keeping quality and loose viability within a year. Therefore, it is essential to produce seeds fresh and use the same for bulb production. It is highly cross pollinated crop which is facilitated by protandrous type of flowers; cross pollination is effected by honeybees (Vanangamudi *et al.*, 2006). The quality seed production programmes depends upon quality of seeds, agronomic practices and plant protection measures taken to produce the healthy and vigorous crop. Among

the agronomic practices, nutrient management through organic sources is considered as an important factor for production.

Generally, vegetables require large quantity of major nutrients like nitrogen, phosphorus and potassium, in addition to secondary nutrients such as calcium and sulphur for better growth, fruit, seed yield and quality. The cost of inorganic fertilizers has been enormously increasing to an extent that they are out of reach of the small and marginal farmers. The problem of high cost of chemical fertilizers fully meet out nutrient requirement of crop by single source, therefore, integrated nutrients management such as organic matters like Farm Yard Manure (FYM), vermicompost, poultry manure and biofertilizers use has become necessary. Hence, an attempt has been made to know the impact of organic manure, inorganic fertilizers and biofertilizers on seed quality of onion.

## MATERIALS AND METHODS

The experiment was conducted to study the "Effect of organic and inorganic fertilizers on yield and quality of onion (*Allium cepa* L.) seed". The laboratory experiment was carried out during rabi 2013-14 at Department of Seed Science and Technology, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat. The experiment was laid out in a completely randomized design design with four repetitions and eleven treatments *viz.* $T_1$ = RDF @ 75:60:50 kg NPK / ha, $T_2$ = FYM @ 20 t/ha, $T_3$ = Vermicompost @ 5 t/ha, $T_4$ = RDF + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha, $T_5$ = 50% RDF (37.5: 30: 25 NPK) + 50% FYM (10 t/ha), $T_6$ = 50% RDF (37.5: 30: 25 NPK) + 50% vermicompost (2.5 t/ ha), $T_7$ = 50% FYM (10 t/ha.) + 50% vermicompost (2.5 t/ ha.), $T_8$ = 50% RDF (37.5: 30: 25 NPK) + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha, $T_9$ = 50% FYM (10 t/ha.) + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha, $T_{10}$ = 50% vermicompost (2.5 t/ ha.) + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha and $T_{11}$ = Control, using onion cv. GWO-1. The observations were recorded on 9 characters *viz.*, germination percentage, shoot length (cm), root length (cm), shoot fresh weight (g), root fresh weight (g), shoot dry weight (g), root dry weight (g), vigour index length and vigour index mass. The germination test was conducted in the laboratory as per the ISTA (1996) by adopting "between paper method" in four repetitions of each treatment of 100 seeds drawn at randomly from each treatment combination and uniformly placed on germination paper and were kept in germinator maintaining of $20^0$ C temperature and 90 ± 2 per cent relative humidity. The first and final counts were taken on $6^{th}$ and $21^{st}$ days, respectively. The statistical analysis was carried out according to the method given by Panse and Sukhatme (1985).

## RESULTS AND DISCUSSION

The effects of different organic and inorganic fertilizer treatments in respect to germination percent, shoot fresh weight and vigour index mass in onion were found statistically non-significant.

The shoot length was significantly influenced by different organic and inorganic fertilizer treatments. The shoot length was significantly superior under the treatment vermicompost @ 5 t/ha, in which the highest shoot length (8.60 cm) was recorded and remained at top position followed by vermicompost @ 2.5 t/ha + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha (8.41 cm) treatment. The lowest shoot length (7.5 cm) was recorded in control. The

similar findings were also made by Giraddi (1993), Jayathilake *et al.* (2003) and Bendegumbal *et al*. (2008) in onion.

The root length was significantly influenced by different organic and inorganic fertilizer treatments. The maximum root length (5.89 cm) was recorded from the application of vermicompost @ 2.5 t/ha + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha followed by FYM @ 10 t / ha + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha (5.73 cm), vermicompost @ 5 t/ha (5.68 cm) and FYM @ 20 t/ha (5.64 cm), whereas lowest root length (4.57 cm) was recorded in control. The results are in conformity with the findings of Giraddi (1993), Jayathilake *et al.* (2003) and Bendegumbal *et al*. (2008) in onion.

The root fresh weight was differed significantly due to different treatments of organic and inorganic fertilizers and their combinations. The application of vermicompost @ 2.5 t/ha + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha resulted in significantly the highest root fresh weight (0.019 g), which was at par with FYM @ 10 t/ ha + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha (0.018 g) and vermicompost @ 5 t/ ha (0.018 g), whereas the lowest root fresh weight (0.013 g) was observed in control.

Different organic and inorganic fertilizer treatments showed a statistically significant variation on shoot dry weight. Significantly higher shoot dry weight (0.0098 g) was recorded in the application of vermicompost @ 2.5 t/ha + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha that was closely followed by vermicompost @ 5 t/ ha (0.0093 g), FYM @ 10 t/ha (50%) + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha (0.0093 g) and FYM @ 10 t/ha + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha (0.0093 g),whereas the lowest shoot dry weight (0.0078 g) was observed in control. These results are in agreement with those reported by Warade *et al*. (1996), Varu *et al*. (1997) and Gupta *et al.* (1999) in onion.

The application of vermicompost @ 2.5 t/ ha + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha recorded significantly the highest root dry weight (0.0027 g), which was at par with FYM @ 20 t/ha (0.0026 g) and vermicompost @ 5 t/ha (0.0025 g), whereas the lowest root dry weight (0.0020 g) was observed in RDF @ 75: 60: 50 kg NPK per ha. The results are in conformity with the findings of Warade *et al*. (1996), Varu *et al*. (1997) and Gupta *et al.* (1999) in onion.

A statistically significant variation was recorded in term of vigour index length for different organic and inorganic fertilizer treatments. The maximum vigour index length (1380.30) was recorded in the application of vermicompost @ 2.5 t/ha + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha, which was closely followed by vermicompost @ 5 t/ha (1370.88). The minimum vigour index length (1092.79) was recorded in control. These results are in accordance with findings of Balaraj (1999) in chilli and Goudappalavar (2000) in tomato.

## CONCLUSION

From the above results, it can be concluded that vermicompost alone or vermicompost with PSB and *Azotobactor* was found to be superior over all the other treatments in respect of seed quality parameters of onion, therefore, it is better to use organic fertilizers in place of inorganic fertilizers in quality seed production programme of onion.

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**Table 1: Effect of organic and inorganic fertilizers on seed quality in onion cv. GWO- 1**

| Treatments | Germination (%) | Shoot Length (cm) | Root Length (cm) | Shoot Fresh Weight (g) | Root Fresh Weight (g) | Shoot Dry Weight (g) | Root Dry Weight (g) | Vigour Index Length (Vigour Index I) | Vigour Index Mass (Vigour Index II) |
|---|---|---|---|---|---|---|---|---|---|
| $T_1$ = RDF @ 75:60:50 kg NPK / ha | 91.50 | 8.01 | 4.60 | 0.18 | 0.015 | 0.0083 | 0.0020 | 1141.01 | 0.94 |
| $T_2$ = FYM @ 20 t/ha | 96.25 | 8.06 | 5.64 | 0.19 | 0.014 | 0.0093 | 0.0026 | 1318.62 | 1.14 |
| $T_3$ = Vermicompost @ 5 t/ha | 96.00 | 8.60 | 5.68 | 0.18 | 0.018 | 0.0085 | 0.0025 | 1370.88 | 1.06 |
| $T_4$ = RDF + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha | 91.50 | 8.08 | 5.45 | 0.18 | 0.016 | 0.0083 | 0.0023 | 1237.77 | 0.97 |
| $T_5$ = 50% RDF (37.5: 30: 25 NPK) + 50% FYM (10 t/ha) | 94.00 | 7.82 | 5.16 | 0.18 | 0.014 | 0.0085 | 0.0023 | 1219.65 | 1.01 |
| $T_6$ = 50% RDF (37.5: 30: 25 NPK) + 50% vermicompost (2.5 t/ ha) | 95.25 | 8.08 | 5.44 | 0.18 | 0.014 | 0.0088 | 0.0023 | 1287.78 | 1.05 |
| $T_7$ = 50% FYM (10 t/ha.) + 50% vermicompost (2.5 t/ ha.) | 94.50 | 7.68 | 5.05 | 0.18 | 0.017 | 0.0083 | 0.0023 | 1202.99 | 0.99 |
| $T_8$ = 50% RDF (37.5: 30: 25 NPK) + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha | 91.50 | 7.97 | 5.20 | 0.18 | 0.014 | 0.0085 | 0.0023 | 1205.06 | 0.99 |
| $T_9$ = 50% FYM (10 t/ha.) + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha, | 92.75 | 7.94 | 5.73 | 0.18 | 0.018 | 0.0093 | 0.0023 | 1267.89 | 0.82 |
| $T_{10}$ = 50% vermicompost (2.5 t/ ha.) + PSB @ 5 kg/ha + *Azotobactor* @ 5 kg/ha | 96.00 | 8.41 | 5.89 | 0.20 | 0.019 | 0.0098 | 0.0027 | 1380.30 | 1.20 |
| $T_{11}$ = Control | 90.50 | 7.50 | 4.57 | 0.17 | 0.013 | 0.0078 | 0.0022 | 1092.79 | 0.94 |
| S. Em.± | 1.49 | 0.18 | 0.14 | 0.005 | 0.0005 | 0.0003 | 0.0001 | 20.27 | 0.08 |
| C. D. at 5% | NS | 0.51 | 0.41 | NS | 0.0014 | 0.0009 | 0.0003 | 58.35 | NS |

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