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ROLE OF *TRICHODERMA VIRIDE* AND GA_3 IN THE GROWTH OF SUMMER SQUASH

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Abstract

The farmers all over the world face day to day problems, of which sustainability in the crop production is a serious issue. The use of chemicals in the form of fertilizers and pesticides has done more harm than the otherwise, be it the increase in cost of production or the various environmental and health issues. Keeping in mind the aforementioned issues an experiment was conducted to determine the effect of *Trichoderma viride* & Gibberellic acid (GA_3) on the growth of Summer squash. Randomised Block design was followed wherein; the experimental area was divided into 5 treatments having different combinations of *T. viride (5%)* and GA_3 (25ppm, 50ppm, 100ppm) at different concentrations and replicated thrice. Summer squash is a non-climber bushy member of *Cucurbitaceae* while conducting the above experiment two characters were taken into consideration viz., plant height and number of leaves. For plant height Treatment (T2) having *T. viride* + GA_3 (25 ppm) was proven best. However, Treatment (T3) having *T. viride* + GA_3 (50 ppm) emerged best out of all treatments for number of leaves.

Introduction

Summer squash (*Cucurbita pepo* L.) is one among the foremost vital vegetable crop to gourd family i.e., *Cucurbitaceae*. Summer squash known to have various regional names like vegetable marrow, Vilayatikaddu, Kumra, Chappan kaddu, Bush squash etc. Summer squash is a warm season, bushy crop and unlike its winter counterpart i.e., winter squash. The harvesting is done in immature stage before the rinds get harden. Summer squash varieties differs based upon the color and shape *viz.,* Zucchini (cylindrical in shape and different colors), Patty pan(round and flattened), Constricted neck (crook neck).

Summer squash contains carbohydrate of about 6%.It is low caloric vegetable which provides only 17 calories per 100gram of fruit. It contains no fat and protein is about 1%. Fresh summer squash fruit is rich in Vitamin A which provide about 200 IU per 100 grams. Moderate amount of vitamin C and B complex group of vitamins like thiamine, pyridoxine, riboflavin. Summer squash is rich in minerals like Potassium and calcium and moderate amount of minerals like iron, manganese, phosphorus and zinc. Summer squash helps in reduction of constipation, boost the immune system, control diabetes, prevents cancer and improves vision. These benefits compel us to grow and protect summer squash.

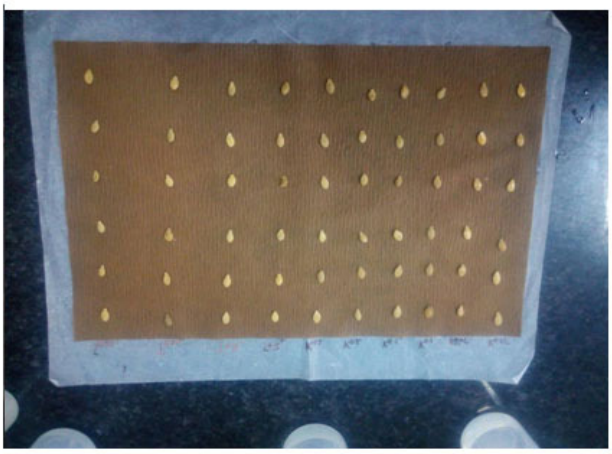
Trichoderma is an avirulent plant fungal antagonist that occurs in all agricultural soils. *Trichoderma* is highly competitive and displays antagonism against other pathogenic fungi. *Trichoderma* is successfully cultured for the use as bio fungicide. It releases compounds that activates a cascade of plant defense. *Trichoderma* spp. release Trichodermin which is effective in controlling *Rhizoctonia solani*. Trichoderma spp. are reported as biocontrol agents due to their high reproductivity, ability survive under adverse conditions, efficiency in utilizing the available nutrients, capacity to modify the rhizosphere , strong aggressiveness against phytopathogenic fungi and efficiency in promoting plant growth and defence mechanisms (Benitez *et al*., 2004).

Apart from the direct defences which *Trichoderma* provides it is also known to enhance the seed germination & root proliferation. Giberellins a multifaceted growth regulator is used to prime the seeds which increase the seedling emergence (Sedghi *et al*., 2008). Spraying with GA_3 25 ppm in four leaf stage at trellis method could be a suitable treatment for enhancing growth and yield of medicinal pumpkin. (Sure *et al*., 2012). Keeping in mind these points an experiment was planned & executed to study the effect of *Trichoderma viride* on the germination and vigour of the summer squash seeds and to study the effect of *Trichoderma* on growth parameters of summer squash. At the end to analyse the interaction of GA_3 and *Trichoderma* on growth and development of summer squash

Material and Methods

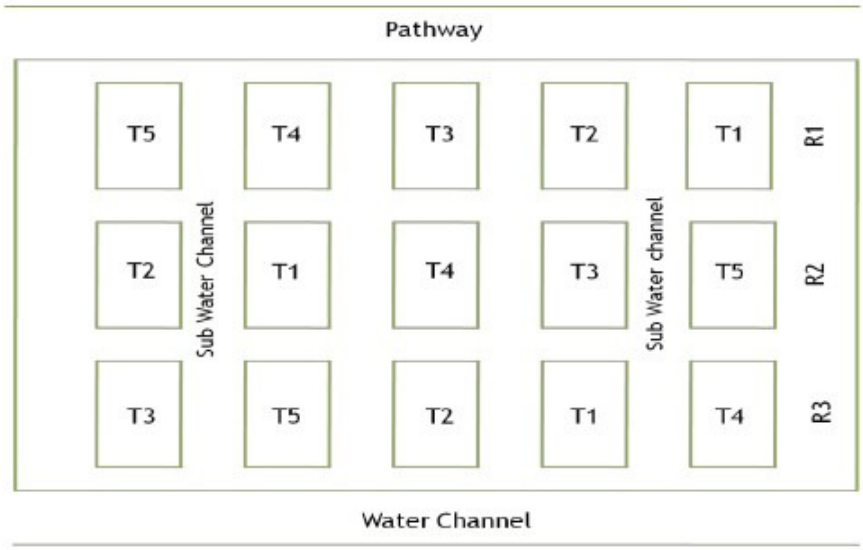
The experiment was divided into two phases i.e.*in vitro* and *in vivo*. *In vitro* condition the seeds are treated with *Trichoderma viride* and GA_3. Seeds were soaked in *T. viride* at concentrations-1%, 2%, 5% & 10% & GA_3 concentrations-10 ppm, 15 ppm, 25 ppm, 50 ppm & 100 ppm. For control seeds were soaked in distilled water. Seeds were allowed to soak for 6 hours. The seeds were then placed on moist germination paper and kept in germination chamber. Later on readings of the per cent germination, vigour, root and shoot length was take. A control set was kept to compare the data.

Soaked seeds with different treatment



Seeds placed on germination paper

Hence, further in vivo studies were carried at LPU farm with five treatments viz., **T1:** control, **T2**: *T. viride* (5%), **T3:** *T. viride* + GA_3 (25ppm)**, T4:** *T. viride* + GA_3 (50 ppm) **& T5:** *T. viride* + GA_3 (100ppm), which were replicated thrice. The land was prepared by adding the appropriate FYM with the following layout given.

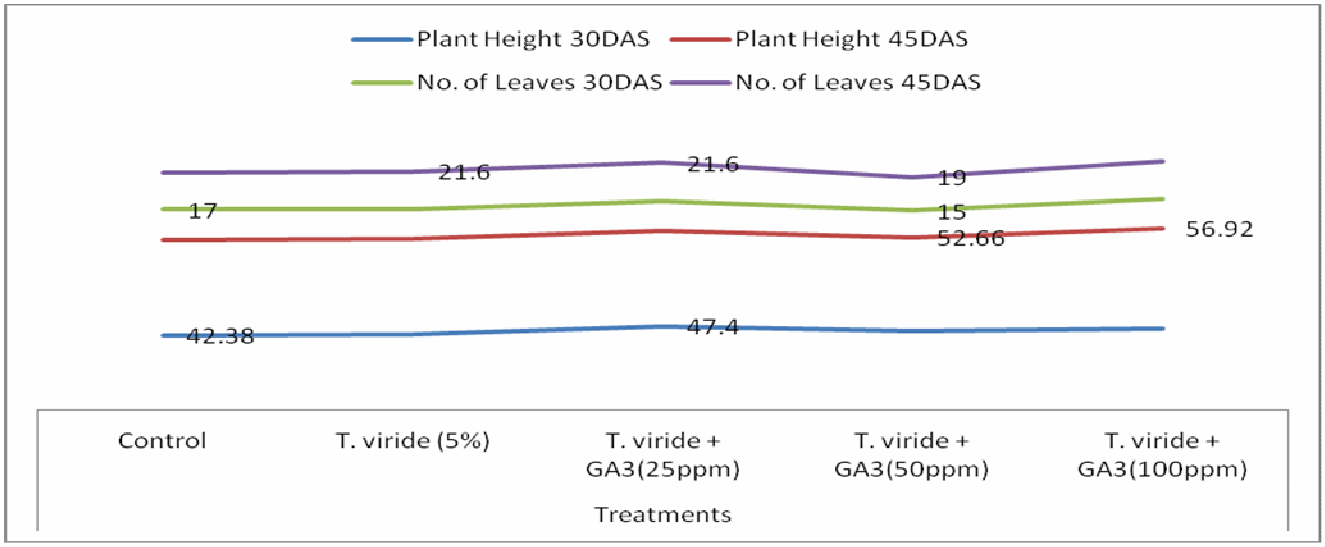


The crop was grown on the flat beds. We had prepared 15 beds with the area of each bed is 4.5m X 1m.For the treatments T2, T3, T4, T5 the seeds are treated with *T. viride* (5%) for 6 hours before sowing. Treated seeds are sown in the soil. After the emergence of plant around 3-4 leaf stage first spray of GA_3 were sprayed according to the treatments planned. The next spray were sprayed after 30 days of sowing. The readings were noted on 30 and 45 days of sowing to analysis the result.

Result and Discussion

In vitro studies showed *T. viride* at 5% enhancing the seed germination & root proliferation similar results were obtained with GA_3 treated seeds at 25ppm, 50ppm & 100ppm. Plants showed different vegetative growth with different treatments. Among all the treatments especially the treatments done with *Trichoderma* and GA_3 had better vegetative growth compared to other treatments. The first sprout that is seen within eight –nine days for *Trichoderma* applied seeds and the germination percentage was 96.1. Seeds which are not treated with *Trichoderma* were germinated after 12-13 days after sowing. *Trichoderma* treated seeds germinated earlier than the normal seeds. So the effect of *Trichoderma* was clearly observed with the given treatments.

Seeds after germination



In *in vivo* the observations are recorded for plant height and number of leaves at 30 and 45 days after sowing. For the parameter plant height, the plants treated with *T. viride* (5%) and GA_3 (25ppm) were best with an average height of 47.4 cms at 30 DAS where as at 45DAS plants treated with *T. viride* (5%) and GA_3 (100ppm) bested out others with 56.92 cms. The least growth was observed in control at 30 DAS & incase of 45DAS in T5 i.e., *T .viride* (5%) and GA3 (50ppm) with 42.38 cms & 52.66 cms respectively. For no. of leaves at 30 DAS the plants which were kept as control had maximum no. of leaves i.e., 17, while plants sprayed with *T. viride* (5%) and GA3(100ppm) had least i.e., 15. The scenario changed after two weeks where T2 & T3 has maximum no. of leaves i.e., approximately 22.

Conclusion

It can be concluded from our present study that in *in vitro* the seeds treated with *T. viride* (5%) and GA_3 (100ppm) showed better results when compared with other treatments. In *in vivo* when we seeing the plant parameters such as plant height and no. of leaves the treatment *T. viride* (5%) and GA_3 (100ppm) were observed as best in both plant height and no. of leaves. For future studies we can compare the growth regulators along with different environmental conditions. The quality parameters such as mineral content and texture can be studied.

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