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**Evaluating growth and development of *Cuminum cyminum* L
under different fertigations**

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Abstract

A field experiment was conducted to study the effects of chemical fertilizers and biofertilizers on shoot length, root length, number of leaves, number of flowers and fruit yield at different stages of cumin (*Cuminum cyminum* L) plants. Research was focused on improved production of cumin with beneficial way of management of application of chemical and biofertilizers. In chemical treatments urea and ammonia fertilizers which contain high nitrogen content was used, in biofertilizers treatments, liquid biofertilizers i.e., bacterial biofertilizers prepared in laboratory and were used and powder biofertilizers were used. Root length, shoot length, numbers of buds and numbers of fruits was found maximum in biofertilizers treatments. Application of bacterial biofertilizers can fulfill the nutrient requirement of cumin under organic farming condition.

Key-Words: Cumin, *Cuminum cyminum* L, Chemical fertilizers, Biofertilizers

Introduction

Cumin (*Cuminum cyminum* L) is one of the most monetarily valuable herb being export second in after saffron in arid and semi-arid country that is grown (Ehtramyan et al., 2007). Cumin plant (*Cuminum cyminum* L) is among the oldest crops in south Mediterranean Sea, parts of Africa and the Middle East. This plant is compatible with various environmental conditions. Some other specifications such as planting and harvesting dates, low water and fertilizer consumption, lack of compatibility with other crops planting and harvesting time, high economic value and high investment in this crop indicates the importance of planting this plant in crop rotation (Hematikakhaki and Senoi Mohases, 2001). In addition to its common use as spice in our daily life, recent studies have indicated its pharmaceutical and medicinal importance (Aruna and Sivaramakrishnan, 1996). There has been a recent increased demand on cumin while its production is limited and decreased (Abu-Nahoul and Ismail, 1995). India is one of the major producer and consumer of cumin in the world. Almost 80% of the crop cultivated is consumed in India itself. Major producing areas are in Rajasthan and Gujarat.

There are two types of supply for agriculture, basically one is fertilizer and other is pesticide. It can be said that fertilizer is food and pesticide is medicine for the plants. Fertilizers are designed to supplement the nutrients already present in the soil. The advantages need to be integrated in order to make optimum use of chemical and biofertilizer and achieve balanced nutrient management for crop growth (Jen-Hshuan Chen, 2006). Dependence on chemical fertilizers for future agricultural growth would mean further loss in soil quality, possibilities of water contamination and unsustainable burden on the fiscal system. Using of chemical fertilizers since long time the land is full of chemical and hardly damaged and whatever production we are getting from it, it is full of harmful chemicals to the human body. The Government of India has been trying to promote an improved practice involving use of bio-fertilizers along with fertilizers. These inputs have multiple beneficial impacts on the soil and can be relatively cheap and convenient for use (Anonymous, 2008). Biofertilizers are low cost, renewable sources of plant nutrients. In order to improve the use of biofertilizers and to reduce the environmental pollution in agriculture, a number of integrated uses of fertilizers management strategies have been developed. There is further potential to optimize rate and timing of bio-fertilization to better meet the actual requirements of the cumin and thus, reduce chemical fertilization substantially. Generally, all these strategies will

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increase the agronomic nutrient efficiency in plant and soil.

Material and Methods

Plant material

Cumin (*Cuminum cyminum* L) seeds were collected from the APMC market.

Preparation of experimental plot:

A field experiment was conducted in naturally production field at Mandal, Dist.: Ahmedabad (Gujarat) in 2013 - 2014. The treatments in the field were arranged as a split-plot in randomized complete-blocks (RCB) with five replicates. Plot size was of 3mtr×2mtr. 3 plots for each treatment were prepared i.e. control, chemical fertilizer and biofertilizer.

Each main plot consisted of six rows. Chemical fertilizer and bio-fertilizer were applied at different stages of *Cuminum cyminum* L. During the crop ripening ten plants were harvested randomly from each experimental plot and were used to determine the Shoot length (cm), Root length (cm), number of leaves, number of flowers, and number of seeds at 15days intervals.

Treatments in experimental plot:

Treatments for control:

Step-1: Cumin seeds primed irrigation done.

Step-2: After 12 day's irrigation done.

Step-3: After 31-32 days leaves started to growing, at this stage irrigation done.28

Step-4: Flowering started after 63 days.

Step-5: Fruiting stage occurred between 70-80 days, approximately between 90-95 days fruits became mature with colour converting green to yellow.

Treatments for chemical fertilizers:

Step-1: Prepared the plot for the seedling and cumin seeds primed.

Step-2: After 2 days applied irrigation done.

Step-3: After 12 days cumin seeds are germination occurred, at that day urea chemical fertilizers applied with water.

Step-4: After 31-32 days leaves started to grow at this stage ammonia fertilizer was given with watering.

Step-5: Flowering started at 63 days at this stage urea applied through the spray.

Step-6: Fruiting stage occurred between 70-80 days and again powder pesticides applied approximately between 90-95 days fruits became mature with colour converting green to yellow.

Treatments for biofertilizers:

Step-1: First solid bio fertilizer added in the plot and mixed with the soil.

Step-2: After 2 days cumin seeds primed and irrigation done.

Step-3: After 12 days cumin seeds are germination occurred, at that day liquid bio fertilizers applied with water.

Step-4: After 31-32 days leaves started to grow at this stage second dose of liquid bio fertilizers was given with irrigation.

Step-5: Flowering started at nearby 63 days at this stage powder bio fertilizers sprayed. (3 grams in 1 litter water)

Step-6: Fruiting stage occurred between 70-80 days and again powder bio fertilizers sprayed, approximately between 90-95 days fruits became mature with colour converting green to yellow.

In this experiment solid, liquid and powder biofertilizers were used. This comprises the combination of three different types of biofertilizers which were applied at different stages of cumin plant.

Results and Discussion

Plant growth and development:

Seed germination took place after 10 days of sowing in bio fertilizers treatment, 12 days of sowing in chemical fertilizers and 12-13 days of sowing in control condition.

Figure shows the mean values of root length, shoot length, no of leaves, no of buds and no of fruits of the plants of all categories namely control, treated with chemical fertilizers and biofertilizers.

After 30 days there is a significant different in shoot length which are 5.27%, root length 17.86% and numbers of leaves 19.29% higher in plant treated with bio fertilizer has compare to chemical fertilizer.

After 45 days, result shows that there is a significant different in Shoot length which are 5.96%, Root length 15.51% and Numbers of leaves 9.68% higher in plant treated with bio fertilizer has as compare to chemical fertilizer.

After 60 days, result shows that there is a significant different in Shoot length which are 12.66%, Root length 15.56% and Numbers of leaves 6.67% higher in plant treated with bio fertilizer has as compare to chemical fertilizer.

After 75 days, result shows that there is a significant different in Shoot length which are 3.78%, Root length 8.72%, Numbers of leaves 7.27% and Numbers of buds 12.31% higher in plant treated with bio fertilizer has as compare to chemical fertilizer.

After 90 days, result shows that there is a significant different in Shoot length which are 7.62%, Root length 6.52%, and Numbers of fruits 16.25% higher in plant treated with bio fertilizer has as compare to chemical fertilizer and in Numbers of leaves 2.18% less growth in bio fertilizer as compare to chemical fertilizer. Bokhtiar and Sakurai (2005), reported that application

of combination of chemical fertilizers and organic manure increase absorption of N, P and K in sugarcane leaf tissue in the plant and ratoon crop, compared to chemical fertilizer alone. Results showed there was a 25% increase of lettuce yield for the treatment of ½ chemical fertilizers and biofertilizer compared to that of the chemical fertilizers treatment, indicating that at least 50% of chemical fertilizer can be observed as multifunctional biofertilizer was used along with chemical fertilizer. (Young *et al*, 2003). Related work reported by El-Habbasha *et al*, 2007; Yosefi *et al*, 2011 in agricultural production. Khorasani *et al*, (2012) obtained maximum number of umbels per plant on 26 September in caraway using the N- fertilizers. Tuncurk *et al*, (2012), showed the highest yield obtained in application of 60 kg nitrogen fertilizer in black cumin. Patel *et al*, (2014), reported that application of biofertilizers increases the level of micronutrients (Cu, Zn, Fe and Mn) in soil and makes the soil healthy as compared to the chemical fertilizer treatments.

Conclusion

There is significant effect of chemical and bio fertilizers on shoot length, root length, numbers of leaves and numbers of fruits of cumin plants. Comparison of data shows that shoot length, root length and numbers of fruits were optimum in the bio fertilizers a chemical fertilizers and less in control. But numbers of leaves is less in bio fertilizer treatment. The effect of biofertilizers, the highest effect on growth yield of root length, shoot length, number of leaves, number of flowering and fruits and quantity of cumin (*Cuminum cyminum* L) and these variable suggested for cumin production. Use of biofertilizers also brings the green revolution brought impressive gains in food production but with insufficient concern for sustainability. Increased crop production largely relies on the type of fertilizers used to supplement essential nutrients for plants. The sound management of fertilization must attempt to ensure both an enhanced and safeguarded environment; therefore, a balanced fertilization strategy that combines the use of organic or biofertilizers must be developed and evaluated.

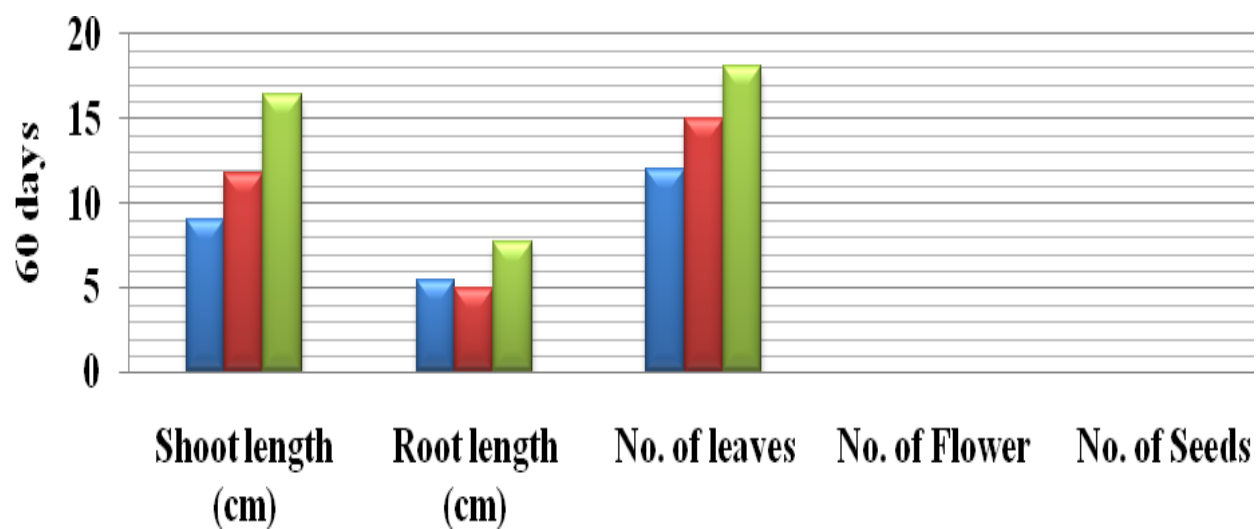
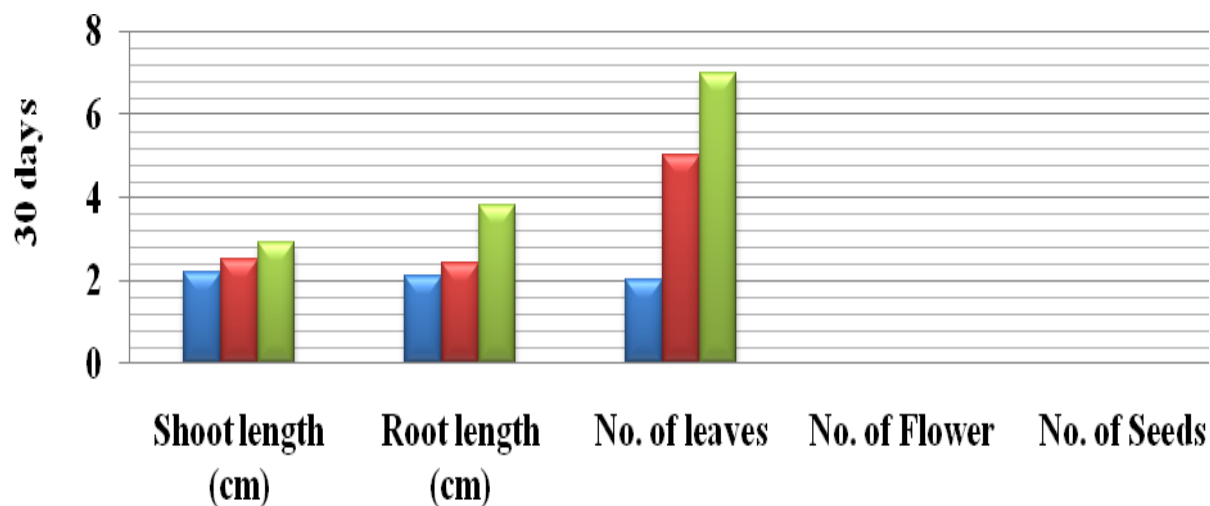
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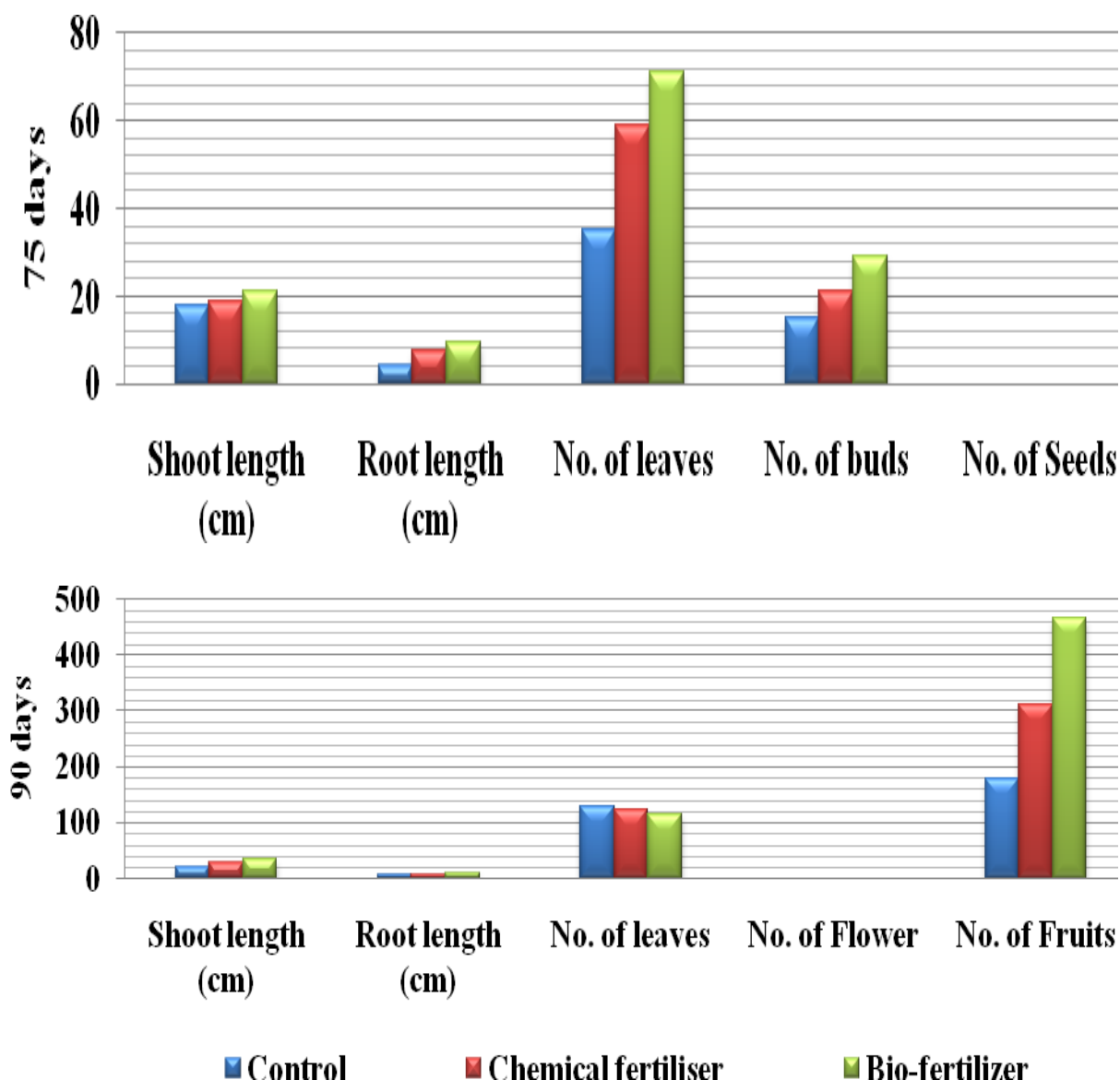
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