Original Research Article

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Effect of Different Levels of Fertilizer on Growth and Yield of Okra

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ABSTRACT

The present study was carried out to study the effect of different fertilizer levels on growth and yield of okra crop at Research Farm of Department of Irrigation and Drainage Engineering, College of Agriculture Engineering and Technology, Dr. PDKV, Akola during 03 Dec 2016 to 04 Mar 2017. The experimental was laid in randomized block design (RBD) with seven treatments and three replications (I₁T₁.60% ET_c with Polyethylene mulch and 60% RDF, I₁T₂.60% ET_c with Polyethylene mulch and 80% RDF, I₁T₃.60% ET_c with Polyethylene mulch and 100% RDF, I₂T₁.80% ET_c with Polyethylene mulch and 60% RDF, I₂T₂.80% ET_c with Polyethylene mulch and 80% RDF, I₂T₃.80% ET_c with Polyethylene mulch and 100% RDF and control-100% ET_c without Polyethylene mulch and 100% RDF). Seeds of okra (*Abelmoschus esculentus* L.) of the variety Phule Utkarsha were sown with seed rate of 8 kg/ha⁻¹. The recommended fertilizer dose of 100:50:50 N: P: K Kg/ha and as per treatments was given through fertigation in five equal splits. All the growth and yield parameters were found maximum under treatment I₂T₃ while the quality parameter was found maximum for treatment I₂T₂. The treatment I₂T₃ (80% ET_c with 100% RDF and plastic mulch) has given maximum yield of 116.26q/ha. The lowest yield was observed under control treatment (10.15 q/ha). Okra crop should be grown under polyethylene mulch and drip irrigation at 80% crop evapotranspiration and 100% RDF for highest production.

Keywords

Okra, Vegetable,
India, Nigeria,
Pakistan,
Cameroon, Iraq

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Introduction

Okra, *Abelmoschus esculentus* L. Moench is a popular vegetable in tropical and sub-tropical countries of the world grown for its pod. It is a member of the hibiscus family, Malvaceae and has the typical floral characteristics of that family. Originating from Africa, it is now widely distributed in the tropics including and most popular in India, Nigeria, Pakistan,

Cameroon, Iraq and Ghana. The area and production of okra in world is 1.83 million hectare and 9.62 million tons respectively with the productivity of 5.26 tons per hectare. India is the largest producer of okra in world with area of 0.53 Million hectare, production of 6.35 million tons and productivity of 11.91 tons per hectare (NHB, 2017). Fertilizer is a material that is added to the soil to supply one or more elements required for plant growth and

development (Masarirambi *et al.*, 2012). The application of fertilizer is necessary for enhancing the soil nutrient status and increasing crop yield. Okra requires nutrients such as nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), sodium (Na) and Sulphur (S) for fertility maintenance and crop production. These nutrients are specific in function and must be supplied to plants at the right time and at the right quantity. Lack of sufficient amounts of these nutrients result in poor performance of the crop with growth been affected resulting to low yield (Shukla and Naik, 1993). With the different concentrations of the NPK fertilizers, the yield and growth rate of the plant may also be different, thus there is a need to investigate the effects of different level of NPK fertilizers on growth and yield of okra. The broad objective of this research is to assess the effect of different levels of NPK fertilizer and to study the most appropriate quantity or level of fertilizer for the optimum growth and yield of okra.

Materials and Methods

A field study was carried out during 03 Dec 2016 to 04 Mar 2017 at the field of the Department of Irrigation and Drainage Engineering, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India to study the effect of different level of fertilizers on growth and yield of okra. The climatological data (data on the daily pan evaporation) was collected from Agro Meteorology Centre Department of Agronomy, Dr. PDKV, Akola during the period of investigation

Experimental site (location and climate)

Akola is situated in Western Vidarbha region of Maharashtra state and comes under sub-tropical zone, at an altitude of 307.415 m above mean sea level (MSL) at the

intersection of 20°40' north latitude and 77°02' east longitude. The climate of the area is semi-arid, characterized by three distinct seasons; mainly summer being hot and dry from March to May, the warm and rainy monsoon from June to October and winter with mild cold from November to February. The mean annual maximum and minimum temperature are 48.23°C and 22.05°C in summer and 32.88°C and 14.35°C in winter respectively. Average annual precipitation is 760 mm.

Soil analysis

To study the physical and chemical properties of soil four samples were collected from the corner and one from the centre of the field at depths of 10 cm, 20 cm and 30 cm with the help of auger. Soil samples were tested in laboratory of Department of Agricultural Chemistry and Soil Science, Dr. PDKV, Akola. The results are presented in Table 1. The soil moisture constants in terms of field capacity and permanent wilting point were determined using the standard procedure suggested by Michael (1978) and presented in Table 2.

Experiment design and layout

The experimental was laid in randomized block design (RBD) with seven treatments and three replications, the treatments are I_1T_1 - 60% ET_c with Polyethylene mulch and 60% RDF, I_1T_2 - 60% ET_c with Polyethylene mulch and 80% RDF, I_1T_3 - 60% ET_c with Polyethylene mulch and 100% RDF, I_2T_1 - 80% ET_c with Polyethylene mulch and 60% RDF, I_2T_2 - 80% ET_c with Polyethylene mulch and 80% RDF, I_2T_3 - 80% ET_c with Polyethylene mulch and 100% RDF and Control - 100% ET_c without Polyethylene mulch and 100% RDF. A field of size 31 m x 15.5 m was selected for experimental studies. The field was divided into seven equal

treatment of 55.8 m². The single treatment was again divided in to three replication of equal size (3.6 x 4.5 m) with a buffer strip of 0.3 m between giving plant density of 90 plants per plot. The plastic mulch film (silver up and black down) of 50 µm thickness was used to cover six treatments, and control treatment was kept uncovered.

Seeds of okra (*Abelmoschus esculentus* L.) of the variety Phule Utkarsha were sown with seed rate at 8 kg ha⁻¹. The field was ploughed and levelled properly.

The recommended fertilizer dose of 100:50:50 N: P: K Kg/ha and according to different treatments was given through fertigation in five equal splits. The schedule of fertigation is given in Table 3.

Before sowing, common irrigation was applied on 1st December 2016 to the field to bring the soil to field capacity for better germination. After sowing on 3rd December, 2016, the irrigation was provided on every alternate day by drip irrigation at 60, 80 and 100, per cent ET_c levels.

Results and Discussion

The study of effect of different fertilizer levels on growth and production of okra was carried out by observing and recording the growth, yield and quality parameters of okra crop.

The growth parameters (*i.e.* plant height, number of branches and canopy cover) were recorded 30, 60 and 90 days after germination. The yield parameters (*i.e.* number of fruits per plant, average yield per plant and fruit yield from each plot) and the quality parameter (*i.e.* length of fruit) was recorded at the time of harvest. The field observations on each biometric character was taken and analyzed. The results are discussed below and presented in Table 4.

Biometric observation

Height of the plant (cm)

From the Table 5 it can be seen that the highest plant height (109.67 cm) was observed at 90 DAS for the treatment I₂T₃ (80% ET_c with 100% RDF and PM). Also the lowest plant height (37.13 cm) was observed for control treatment (100 % ET_c without mulch and with 100% RDF) at 90 DAS respectively. After 90 DAS treatments I₂T₃ and I₂T₂ were statistically at par and both were significantly superior over I₁T₁, I₁T₂, I₁T₃, I₂T₁ and control treatments.

Number of branches per plant

It can be observed from the Table 5 maximum number of branches (14.67) were observed in treatment I₂T₂ followed by treatment I₂T₃(14.4) and I₁T₃(13.06) respectively. The minimum number of branches (7.8) were observed in control treatment (100% ET_cwith 100% RDF and without PM). The treatment I₂T₂and I₂T₃ were statistically at par with each other and both were superior over tretmentsI₁T₁,I₁T₂,I₁T₃,I₂T₁ and control.

Canopy cover (cm²)

From Table 5 it is seen that at 90 DAS treatment I₂T₃ recorded highest canopy cover (2873.91 cm²); significantly lowest canopy cover was found in control treatment (564.87 cm²). After 90 DAS treatments I₂T₃ & I₂ T₂ were statistically at par and both were significantly superior over I₁T₁, I₁T₂, I₁T₃, I₂T₁ and control treatments.

Average yield of okra per plant (gm)

From the above Table 5 it is seen that highest yield of fruit weight was recorded in treatment I₂T₃ (408.96gm) followed by I₂T₂ (394.69gm), I₂T₁ (371.26gm), I₁T₃ (368.18gm) and the

lowest value of fruit weight was observed for the control treatment (129.46gm). Treatments I_2T_3 , I_2T_2 , I_2T_1 and I_1T_3 were at par and significantly superior over I_1T_2 , I_1T_1 and control treatments.

Yield per treatment

The treatment I_2T_3 (80%ET_c with 100% RDF and plastic mulch) has given maximum yield of 116.26q/ha. The lowest yield was observed under control treatment (10.15 q/ha). Treatments I_2T_3 , I_2T_2 and I_1T_3 were found statistically at par and significantly superior over I_1T_1 , I_1T_2 , I_2T_1 and control treatments.

Number of fruits per plant

Table 5 shows that the treatment I_2T_3 (80%ET_c with 100% RDF and plastic mulch) yielded with a highest average number of fruits per plant (19.07) followed by treatment I_2T_2 (80% ET_c with 80% RDF and plastic mulch) with 18.66 fruits per plant. Treatments I_2T_3 , I_2T_2 , I_2T_1 and I_1T_3 were found statistically at par and were significantly superior over I_1T_1 , I_1T_2 and control treatments.

Mean fruit length

Table 5 shows that the highest length of fruit (12.80 cm) was recorded in treatment I_2T_2 and lowest in control treatment (10.32 cm). Treatments I_2T_2 and I_2T_3 were at par and also found superior over I_1T_1 , I_1T_2 , I_1T_3 , I_2T_1 and control treatments.

All the growth and yield parameters were found maximum under treatment I_2T_3 and quality parameter *i.e.* length of fruit was found maximum for treatment I_2T_2 . The treatment I_2T_3 (80%ET_c with 100% RDF and plastic mulch) has given maximum yield of 116.26 q/ha. The lowest yield was observed under control treatment (10.15 q/ha). Okra crop should be grown under polyethylene mulch

and drip irrigation at 80% crop evapotranspiration and 100% RDF for highest production.

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