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Effect of Different Levels of Drought on Growth, Morphology and Photosynthetic Pigments of Lady Finger (*Abelmoschus esculentus*)

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Abstract: This research was carried out to determine the effect of drought on the morphology, growth and photosynthetic pigments of Lady Finger (*Abelmoschus esculentus*). Seeds of lady finger were sown in Botanical garden of University of Gujrat, Paksitan during the year 2015. Different drought levels i.e. 0, 25 and 50% were maintained after 21 days of germination. Experiment was laid down in completely randomized design (CRD) with three replicates. Effect of drought were measured of different parameters i.e. shoot and root lengths, shoot and root fresh and dry weights, leaf area, number of leaves per plant and photosynthetic pigments. It was noted that drought reduced the plant lengths, no. of leaves, leaf area and photosynthetic pigments. Maximum reduction in growth, morphology and photosynthetic pigments was observed at higher levels of drought (50%) than low levels. It was concluded that drought upto 50% could be fatal for lady finger but plantss can survive at low levels of drought.

Key words: Lady finger · Growth · Morphology · Drought

INTRODUCTION

Okra or lady finger (*Abelmoschus esculentus*) is a yearly, regularly cross pollinated vital vegetable of tropical and subtropical regions. It was started in India however now developed in numerous parts of world including the Middle East, Africa, Brazil, Turkey [1] and southern conditions of almost all parts of okra plant are consumed, as crisp okra natural products are utilized as vegetable, roots and stem are for clearing the cane juice [2] and leaves and stem are utilized for making fiber and ropes. Okra seeds containing great quality consumable oil and high protein are utilized to supplement other protein sources [3]. The okra units contain adhesive, which is contained a blend of pectin and sugars, which is utilized as a thickener as a part of sustenance commercial ventures [4].

Okra flour is a successful food added substance in wheat flour for heating bread with great mechanical are tangible qualities [1]. There are diverse types of water stress contingent on the development phase of plant at which it happens [5].

The stress that happens at seedling stage or amid advancement stage may be called as right on time dry season. Such kind of dry spell as a rule diminishes the yield stand and accordingly it harms yield because of low Water anxiety diminishes harvest yield paying little heed to the development stage at which it happens [6]. Though, farmers usually reply to this drought by regrowing their crops [7]. Drought happening during vegetative growth period is called as vegetative phase drought. This type of drought disturbs plants assimilatory organs, which usually decrease in number and size resulting in lower photosynthetic production [8]. As a result yield decreases due to less amount of assimilate available to the developing pods. Drought stress causes various physiological and biochemical changes in plants like decreased leaf size, shoot length, root length, reduced water use efficiency [9].

The aim of this research was to evaluate the drought stress on morphological and photosynthetic pigments at seedling stage in Okra, which in turn can be useful to measure the growth rate and yield.

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MATERIALS AND METHODS

Pot experiment was conducted at Hafiz Hayat campus, University of Gujrat, Pakistan during 2015. Seeds of okra/ Lady finger were taken from Agriculture shop, Hafizabad, Paksitan. It was sown in pots containing sandy loam soil. Following levels of drought were applied after 21 days of seed.

- T_0=Control
- T_1= 50% level of drought
- T_2= 25% level of drought

Levels of drought were maintained by saturation percnetage of soil. There were three levels of drought with three replicates. Experiment was laid down in completely randomized design (CRD). Different attributes were studied after 21 days of treatment. Shoot and root lengths (cm) were measured with the help of a meter rod from stem base to the top. Shoot fresh weight (g) was calculated with an electrical balance. Plant samples were placed in oven at 65°C. After 4-days shoot and root dry weight (g/pot) was calculated with the help of electric balance. Photosynthetic pigments were calculated by the following fomrula:

- Chlorophyll a(mg/g)=12.7xOD663-2.69xOD645xV/1000xW
- Chlorophyll b(mg/g)=22.9xOD645-4.68xOD663xV/1000Xw
- Carotenoids(mg/g)=OD480+(0.114xOD663-0.638xOD645)

Analysis of variance technique was employed for carrying out statistical analysis of data collected [10]. Various treatment means were compared with Duncan's New Multiple Range (DMR) Test.

RESULTS AND DISCUSSION

The recorded data of lady finger under different levels of drought is given in table 1 and 2. It was noted that most of the morphological attributes reduced under drought conditions. Effect of drought was significant on root fresh, shoot and root dry weights, shoot and root lengths (Table: 1). Comparison means of DMRT are given in figures 1-7. It was noted that all the pramaters reduced significantly under different levels of drought excpet shoot fresh weight and leaf area. In the case of root lenght maximum reduction was noted at 25% level of drought, while minimum shoot lenght was present at 50% level of drought (Fig. 1-2). Shoot and root fresh weights are given in Figure 3-4. Fresh weights decreased with the increase in drought levels. Similar ternds were noted in dry weights of shoot and root (Fig. 5-6). Figure 7 shows the data of leaf area per plant, it also decreased with in the increase of water stress (drought).

In case of photosynthetic pigments of okara, there was a non-significant effect of drought on Chlorophyll a,b and carotenoids (Table 2). Data for chlorophyll a,b and carotenoids is given in figures 8-10. Minor reduction in photosynthetic pigments were observed at all levels of drought but it was not significantly affecetd.

Water is one of essential mineral for plant growth. Drought effect Okra at early stage. But less at the middle stage Drought effect plant height, leaf area, number of leaves, root length [11]. Reported that percent fresh and dry weights of roots and shoots and mean shoot length and leaf area were significantly higher in Okra. The number of branches plays an important role in yield increase by bearing more numbers of pods and the similar reduction in number of tillers in wheat was reported by Bhatti *et al*. [12, 13]. It was noted that drought reduced the plant lengths, no. of leaves, leaf area and photosynthetic pigments. Maximum reduction in growth, morphology and photosynthetic pigments was observed at higher levels of drought (50%) than low levels. It was concluded that drought upto 50% could be fatal for lady finger but plant can survive at low levels of drought.

Fig.1. Effect of Drought on root length (cm) of Lady Finger

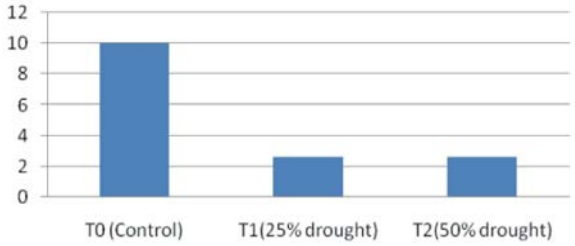


Fig.2. Effect of Drought on shoot length (cm) of Lady Finger

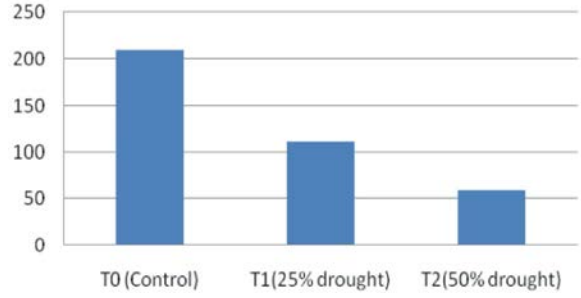


Table 1: Effect of drought on different morphological attributes of Lady Finger

		Means Suqares (MS) of different attributes						
S.O.V	df	Shoot fresh weight (g)	Root fresh weight (g)	Shoot dry weight (g)	Root dry weight (g)	Shoot length (cm)	Root length (cm)	Leaf area (cm^2)
Drought	2	15.400 ^{ns}	0.173**	0.0582**	0.006**	20.541**	53.777**	17940.777^{ns}
Error	6	5.672	0.009	0.003	5.452	0.781	2.888	4579.777
Total	8							

Table 2: Effect of drought on different photosynthetic pigments of Lady Finger

		Means Suqares (MS) of different attributes		
S.O.V	df	Chlorophyll a	Chlorophyll b	Carotenoids
Drought	2	26.821^{ns}	78.475^{ns}	0.804^{ns}
Error	6	10.056	29.859	0.272
Total	8			

Fig.3. Effect of Drought on shoot fresh weight (g) of Lady Finger

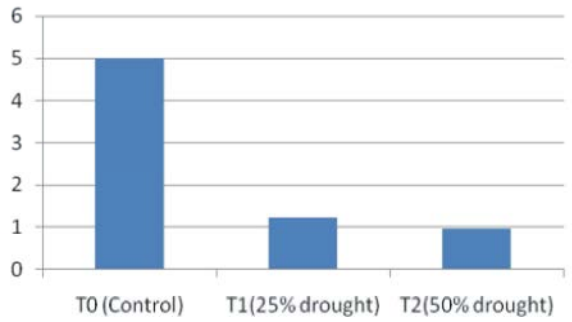


Fig.4. Effect of Drought on root fresh weight (g) of Lady Finger

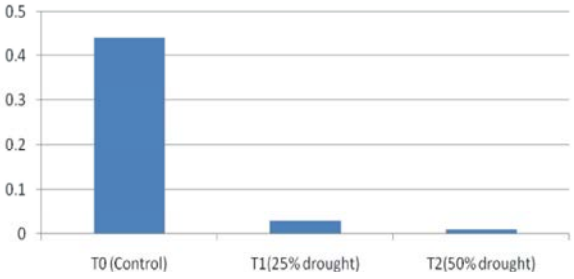


Fig.5. Effect of Drought on shoot dry weight (g) of Lady Finger

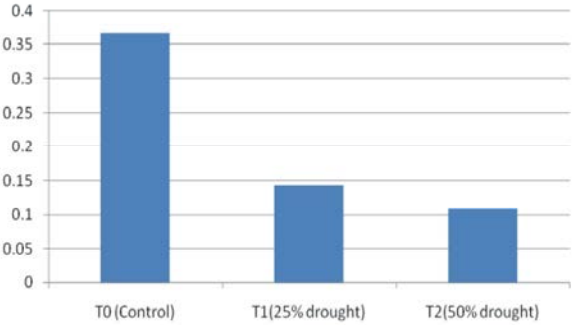


Fig.6.Effect of Drought on root dry weight (g) of Lady Finger

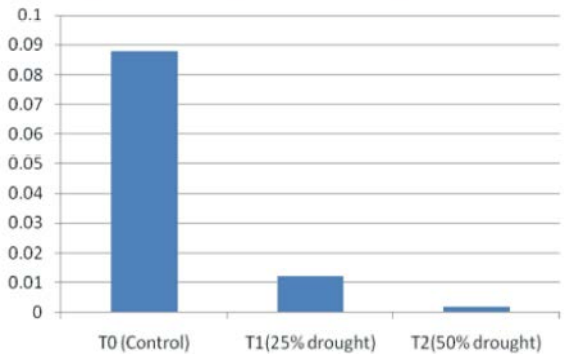


Fig.7. Effect of drought on Leaf area (cm^2) of Lady Finger

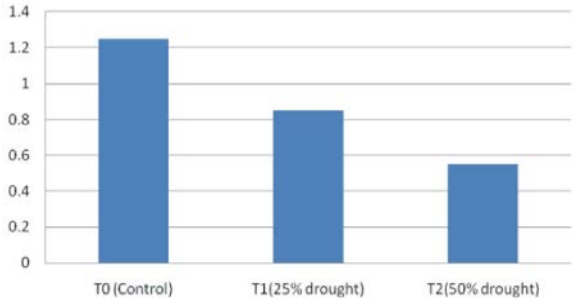


Fig.8. Effect of drought on cholrophyll a contents (mg/g) of Lady Finger

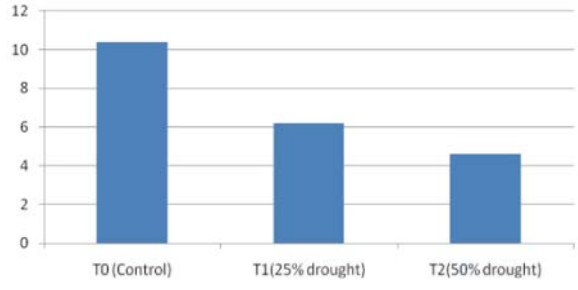


Fig.9. Effect of drought on cholrophyll b contents (mg/g) of Lady Finger

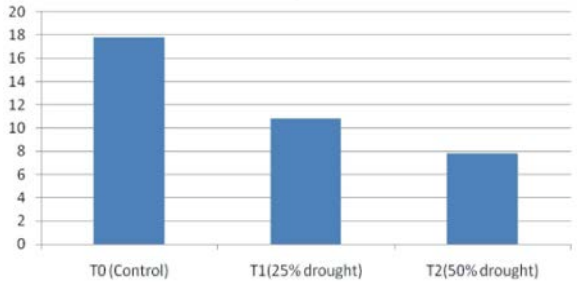
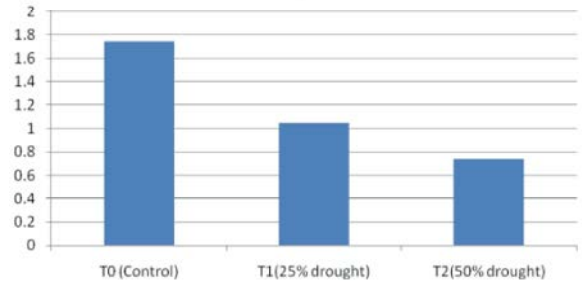


Fig.10. Effect of drought on carotenoids a contents (mg/g) of Lady Finger



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