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THE ALLEVIATION OF SALT STRESS BY THE ACTIVITY OF AM FUNGI IN GROWTH AND PRODUCTIVITY OF ONION (ALLIUM CEPA L.) PLANT

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ABSTRACT

AM fungi are balanced mutuailistc association in which the fungus and plant exchange commodities required for growth & survival. AMF have been shown to promote plant growth &nutrient uptake and are particularly important for phosphorus nutrition. We hypothesize the experiments in the present study that AMF reduces salt stress in plant. To prove this we conducted experiments to determine the benefits of mycorrhizal fungi by comparing mycorrhizal fungal inoculated Onion plants to non inoculated plants under different salt concentration in the soil .salinity affects the plant growth with increasing stress rate at higher salt concentration particular in non inoculated plants. AMF containing onion plants were healthier than non mycorrhizal Onion plant. Inoculated plants were healthier than at low salt concentration however higher salt concentration affects the growth. The fresh and dry biomass is more in AMF inoculated plant than non inoculated. The mycorrhizal inoculated plants in salt concentration had higher root mass colonization compared to high salt concentration.

KEYWORDS : AM fungi, root colonization, fresh and dry biomass.

INTRODUCTION

Mycorrhizas are mutuailistc association of certain fungi & the roots of most crop plants .Due to extended network of fine hyphae the fungi can considerable improve the uptake of mineral nutrient to their host plants support the fungus with assimilation products. One of their effects is to increase the surface of root system for nutrition absorption. Approximately 7% of the global land surface is covered by saline plants habitats. Majority of the salt affected areas remain unproductive for many years Revegetation of saline land decreases soil erosion. In Arid & semiarid areas ,salinisation of soil is serious problem & is increasing steadily in many parts of the world (Giri etal., 2003.,Al –Karaki,2006).At present out of 1.5 billion hectors of cultivated land around the world ,about 77 million hectors (5%)is affected by excess salt content High levels of salinity in soil mainly due to the soluble salts in irrigation water & fertilizers used in agriculture. The Effect of salt on the Onion growth may involve- a) Reduction in the osmotic potential of the soil solution that reduces the amount of water available to the plant causing physiological drought to counteract this problem. plant must maintain lower internal osmotic potential in order to prevent water movement from roots into the plant soil(Feng etal.,2002; Jahromi et al.,2008) B)Toxicity of excessive Na+ & Cl- ions towards the cell- the toxic effects include disruption to the structure of enzymes and other macromolecules ,damage to cellorganells & plasma membrane disruption of photosynthesis respiration & protein synthesis is (Juniper &Abbott,1993;Feng et.al.,;2002 . C)Imbalance of nutrients in the onion plant caused by nutrient uptake or transport

to shoot leading to ion deficiencies.AMF have been shown to have a positive influence on the composition of mineral nutrients of plants grown in salt stress condition (al-Karaki and clark,1998) by enhancing and or selective uptake of nutrients. This primarily regulated by the supply of nutrients to the root system and increased transport by AMF.The growth of the plant &it's biomass suffered a Setback under the salt stress. It may be the non availability of nutrients and his expenditure of energy to countract the toxic effect of NaCl.

MATERIAL AND METHOD

This study was conducted at the laboratory of ASC College Lasalgaon Dist Nashik (India) .The experiment t was conducted between Oct. 2011 to Jan.2012. Potting soil was conducted from the Onion field of Yeola and Niphad taluka of Nashik district. The sites were Manori, Katarni, Nilkheda, Patoda of Yeola and Rui and Khedala of Niphad taluka. For this experiment equal sized pots were selected. 2 kg soil was weighed into each pot after 85%filling of the soil in each pot. Approximately 7 gm of AMF inoculums was placed 5cm below the surface of the soil in each AMF inoculated pots. Healthy seedlings were transplanted and there were 4 replication .At the time of transplanting seedlings, the stage of plant was 12-15 cm in height with 4-5 leaflets. In October 2011 seedlings are transplanted. There were two main treatment, AMF inoculation and non inoculation. The sub treatments were four salt concentration, control, and low, medium and high. After transplanting water is given to all 8 pots after every 6 days observations are made.The levels ranging from the control – salt are not added. Low- 1 ds/m, medium-2.5ds/m and high- 5ds/m determined by the use of an electric conductivity meter. These calculations were measured by Onion yield capacity according to salt levels (Mass et al.,1977) the height of plant leaf count, root length biomass of oh bulb were recorded once in a week. Fresh weight of bulb were recorded and placed in oven at 70°c for 2 days .Roots of onion plants were taken into consideration. The roots were cleaned and root lengths were measured. Roots were separated for root staining and root colonization (Phillips and Hayman, 1970). Whatever changes that are take place start from beginning up to 35 days after transplanting. It has been observed that there are some changes particularly in healthiness of plant, colour of leaves, height of plants and loss of biomass of bulb in non inoculated plants.

RESULTS

Within 35 days of transplanting into the pots , significant results are seen in concern with leaf strength, plant height, fresh weight and dry weight of the plant, root colonization etc.

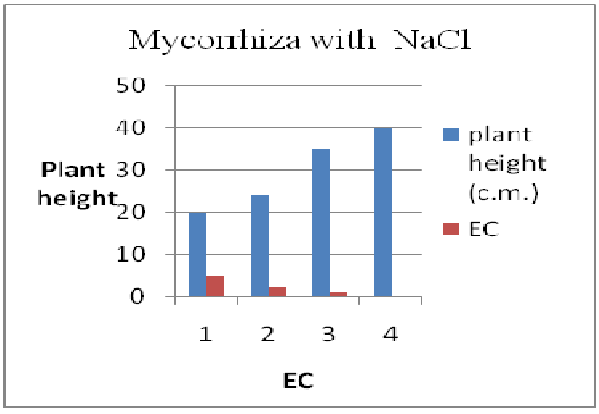
LEAF LENGTH

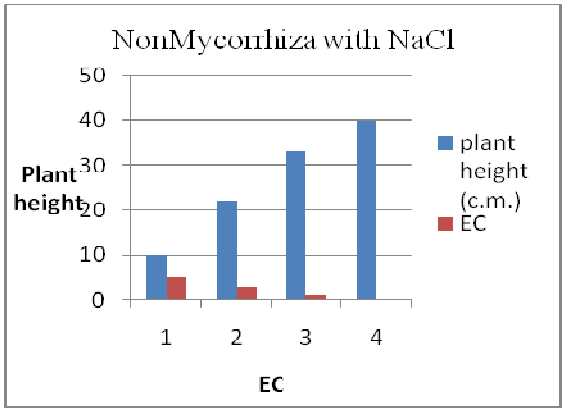
The leaf strength of both mycorrhizal and non mycorrhizal inoculation in control salt levels showed similar growth patterns at the initial stage of plants. In low salt concentration, AMF inoculation showed increase in leaf strength. Medium salt concentrations shows reduce in the length of leaves & unhealthy. The leaves became half yellow and begin to start wilting in control plant while in mycorrhiza treated plant shows healthiness of plant. High salt concen tration treatment shows wilting of leaves at the beginning, but plant died at the end of third week due to salt stress.

PLANT HEIGHT

The height of the experimental plant Onion (Allium cepa L.)Showed difference in growth and development rates of mycorrhizal and non inoculated different salt levels in the potted soil. In first week there were no salt treatment initiated. All the plants in and pots were observed to be normal and there was no significant growth difference between mycorrhizal and non mycorrhizal plants as one week is to early for the establishment of mycorrhizal symbiotic relationship .In the second week AMF plants seem did better than non mycorrhizal plants; however, it is not possible for AMF to show growth response in two weeks. But in the beginning of third week, high salt concen tration treatments was given for both mycorrhizal and non mycorrhizal plants, they were dead because of salt stress. In the nonmycorrhizal treatments the growth seems very slow with increasing salt concentration. The medium salt concentration plants also died at the beginning of third week. This clearly indicates that salt increases stress on plants without mycorrhizal symbiosis. In the

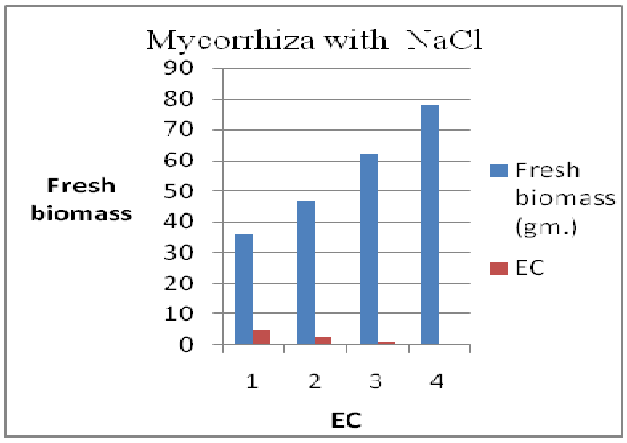
fourth week, the mycorrhizal plants in background, low and medium salt concentration plants grew 8.9 cm tall the background salt without AMF grew 8.5 cm tall followed by the low salt levels with 6.6 cm. The final week before harvest showed that mycorrhizal inoculation increased plant growth with the addition of low to medium salt concentrations.

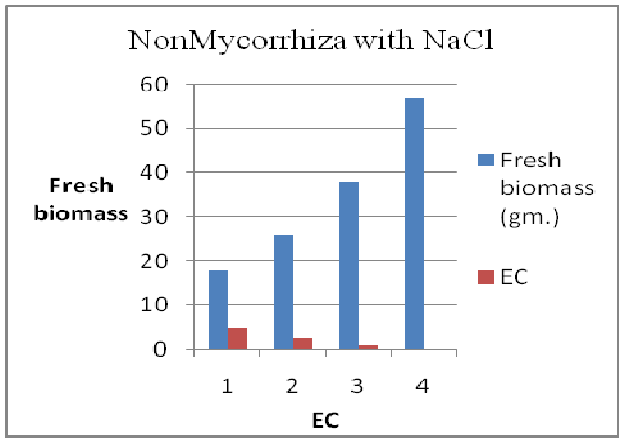


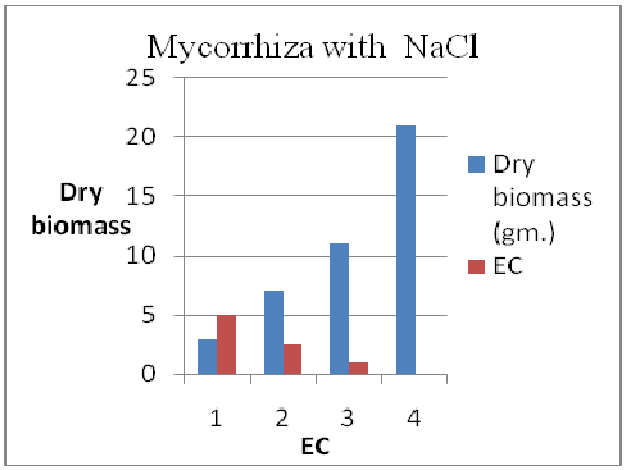


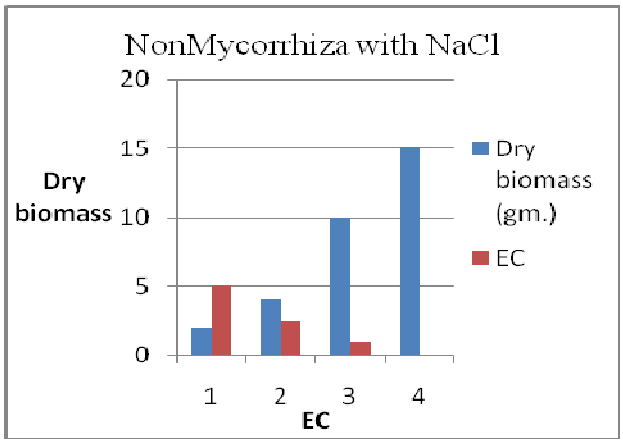
FRESH AND DRY BIOMASS

The biomass of plants is compared in chart. The inoculated plants had a higher fresh biomass with the exception at higher salt concentration. It is also clear from the results that AMF inoculation benefits the plant under low to medium level salt concentrations. However AMF didn't protect the plants at higher salt concentration. In without inoculate treatment; there was a decline in fresh as well as dry biomass with increase in stress as salt level increases. Means a fresh and dry biomass was higher in mycorrhizal treatments than those of non mycorrhizal plants.



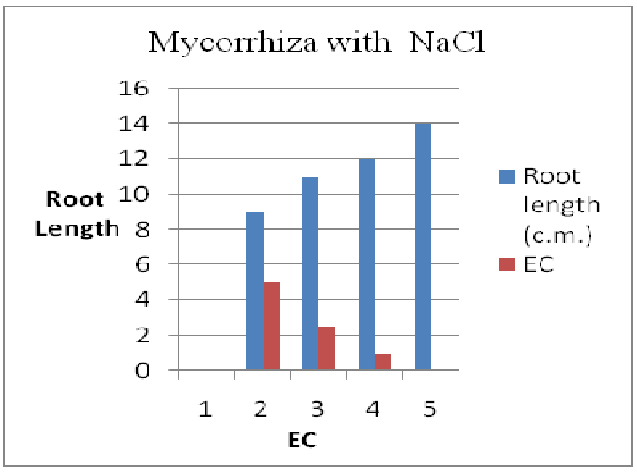


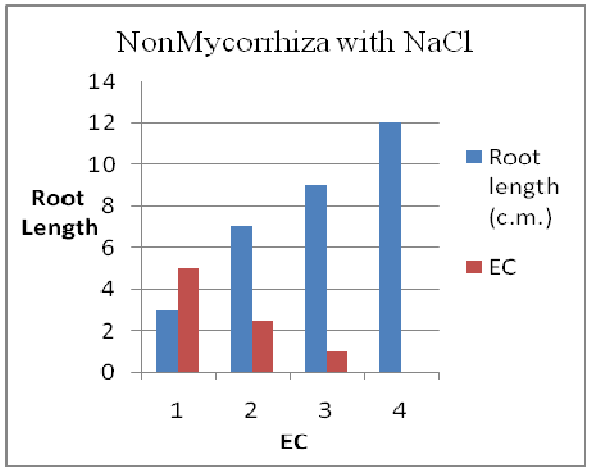




ROOT COLONISATION

Percent of root colonization by AMF is shown as a percentage of total root segments observed. This observation was made specifically in the inoculated plant roots with the exception of high salt concentration treatment that had no measurable amount of secondary roots. The root colonization, the total length, fresh and dry biomass demonstrates that AMF play a significant role in low to medium salt concentration by decreasing salt stress on plants, however AMF did not protect plants from high salt concentration. The interesting observation in this experiment is although AMF inoculated plants in high salt concentration showed poor response, but root colonization was not affected by high salt level.





CONCLUSION

This study has demonstrated that salinity at higher level affects plant. Arbuscular mycorrhizal inoculated plants did well compared to non mycorrhizal plants in every growth parameters with the exception of background salt treatments. The experimental research demonstrates that mycorrhiza protects plants from salt stress at particular levels. Mycorrhizae Onion plant interaction is highly beneficial at background, low, and medium salt concentration in soil. Farmers could benefits by inoculation mycorrhizal fungi to reduce salt stress on plants and increase yield.

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