EFFECTS OF TANNERY EFFLUENT AND AM FUNGI *(GLOMUSINTRARADICES)* ON THE GROWTH OF COW PEA *VIGNAUNGICULATA* L(WALP)

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Introduction

Pollution is a detrimental change in the physical, chemical or biological characteristics of air, water or land that will be or may be harmful to human and other life, industrial processes, living conditions and cultural assets. Pollution of air, water and soil is undesirable with the growth of increasing industries in developing countries like India. These industries discharge their wastes that lead to the alteration in physicochemical and biological properties of environment (Lenin and Thamizhiniyan 2009). This alteration obviously has a bearing on the living organisms that exist in the vicinity of the components of environment, which is being altered as a result of discharge of pollutants from the industries, water is affected significantly. Water is one of the most important components required for the very existence of life on earth. Neither human nor the environment cannot survive and sustain without clean water. It is a reality that most of the water resources are being polluted by being a recipient of a large amount of industrial wastewaters and sewage waters. The effluent discharging industries are industrial establishments related to distilleries, detergents, electroplating, fertilizers, paper and pulp, pharmaceuticals, petrochemicals, pesticides, herbicide industries, sugar mills, textile, tannery and dye industries. Among the effluent discharging industries, tannery is a play a major role in creating serious pollution problems than other industries.There are about, 1000 tanneries in India, of which 568 are located in Dindigul, Vellore, Trichy and Vaniyambadi areas in the southernmost state of Tamil Nadu (Indira et. al., 2012). The salts of sodium chloride, sodium sulphate, lime and chromium are commonly used in the tanneries in the process of tanning day in and day out. About 80% of the tanneries in India are engaged in 'chrome tanning processes', whereby nearly 4,000 tonnes of basic chromium is discharged as effluents every year(Ravi Mycin et al., 2012). The physico-chemical analysis of tannery effluent showed that it was acidic in nature and brownish in colour. The higher amount of Alkalinity, COD, TDS and other mineral nutrient content were also present in the effluent. (Sankar Ganesh et. al., 2006). The effluent severally affects crop plants and soil properties when used for irrigation. With the above societal problem as the foundation of the existing research problem, it is pondered that a suitable method of augmenting the metabolism of these plants, cultivated in the area under influence of the tannery effluent for a better yield in such a way that they uptake the metallic pollutants for their survival, need be identified.

Methodology

Seed collection: Cowpea plant (*Vignaunguiculata*(L.)Walp.) is one of the important essential crops, belonging to the family Fabaceae. The crop is widely grown in the Tamil Nadu. The samples were collected from Tamil Nadu Agricultural University (TNAU), Coimbatore.

AM fungi: The AM species *Glomusintraradicies* was utilized for this study, which was obtained from. Department of Agricultural Microbiology, Tamil Nadu Agricultural University (TNAU), Coimbatore.

Effluent and AM Fungi treatment details: The treatment details are as follows: T1 – Control (Untreated), T2 – 5% effluent, T3 – AM + 5% effluent, T4 – 25% effluent, T5 – AM + 25% effluent, T6– 50% effluent, T7 – AM + 50% effluent, T8 – 100% effluent, T9 – AM + 100% effluent, with 500 gram of AM fungi *Glomusintraradicies* culture mixed with soil. The parameters such as root length and shoot length, fresh weight, and dry weight, number of leaves, total leaf area, and root nodules.

Shoot length: The plant shoot length was measured from the point of first cotyledonary node to the tip of the longest leaf and the mean values were expressed in cm.
Root length: The plant root length was measured from the point of first cotyledonary node to the tip of the longest root and the mean values were expressed in cm.
Number of leaves: The total number of leaves in each plant was counted at different growth phases and expressed as number of leaves per plant.
Leaf area: The third whorls of leaves were taken and the leaf area was calculated by using Kemps constant method at 7, 15, and 30 DAS and expressed in cm^2.

$$\text{Total leaf area} = L \times B \times K$$

Where,

L = Length of the leaf
B = Breadth of leaf, K = Kemps constant = 0.66 for dicot

Determination of fresh weight: The seedlings were plugged after 7, 15, and 30 DAS without any damage. After washing the fresh weights were determined by using an electronic balance.

Determination of dry weight: The seedlings were uprooted on the 7, 15, and 30 DAS and washed with tap water. Then they were dried at 80° C in hot air oven for 24 hrs. After drying, the weight was measured in an electronic balance.

Discussion and Conclusion

This may also result in decreasing the toxicity of the effluents there by reduce the rate of depletion of soil and water resources. Keeping this as the prelude, in order to mitigate the toxicity of tannery effluent on plants, a microorganism *Arbuscularmycorrhizal* (AM fungi) is identified and employed. While scientific studies of this kind has not been conducted on edible crops, this is a humble attempt to study the thriving potential of a commercial crop, *viz.,* Cow pea *Vignaungiculata* L(Walp) irrigated with tannery effluent. An assessment of the plant thriving in the severe conditions, augmented by the microorganism can open up the corridors for further scientific investigations. The Arbuscularmycorrhizal (AM fungi) are rhizosphericmicro organisms of significance importance for similar type of operations. These microorganisms can increase plant uptake of nutrients especially relatively immobile elements such as P, Zn and Cu apparently could be visualized with the increase of the root shoot biomass resulting in the overall improvement of the plant growth.(Ryan and Angus, 2003 and Querejeta et al., 2003).With the above as the underpinning of the present study was conducted with the cow pea seeds at different concentration of tannery effluent+ AM fungi like *viz.*, (control, 5%effluent, 5% effluent + AMF, 25% effluent, 25% effluent + AMF, 50% effluent, 50% effluent + AMF, and 100% effluent, 100% effluent + AMF). The germination percentage vigour index, tolerance index and phytotoxicity, the morphological parameters such as shoot length, root length, number of leaves, total leaf area, fresh weight, dry weight, were analyzed in 7th, 15th and 30th

days seedlings. The morphological parameters such as root length, shoot length, leaf area, fresh and dry weight and root nodules were higher in AMF treatment plants when compared with control and other effluent treatment plants. The main reason, it may be due to AMF hyphae net work which is substantiated by the observed increase in nutrient content (Pindi2011;Indira et al., 2012).

These results overwhelmingly indicate that the behavior of AM fungi in the protection of plants from the tannery effluent stress. Finally the paper concluded that by using AM fungi we can improve the soil fertility and we will get higher yield of crop plants.

References

Indira P., M. Lenin, and T. Ravi Mycin 2012. Effects of tannery effluent and Arbuscularmycorrizha and their changes on morphological and pigment content of groundnut (*Arachishypogaea* L.). *Int Jour Sci.*, 125-137.

Lenin. M and P. Thamizhiniyan. 2009. Impact of juice factory spent wash on the growth and pigment content of Lablab purpures sweet. (L.). *J. Phytol.*, 1(1): 13-20.

Pindi P.K. 2011. Influence of five industrial pollutants on mycorrhizal colonization, nodulation and growth of *Acacia nilotica* and *Leucaenaleucocephala*. *Afric Jour of Microbiol Res* 93-95.

Querejeta, J.I., L. Egerton-Warburton and M.F. Allen, 2003. Direct neutral water transfer from oaks to their mycorrhizalsymbionts during severe soil drying. *Oecologic,* 134: 55-64.

Ravi Mycin. T, P. Indira, M. Lenin, R. Sourba and T. Devasena 2012. Influence of tannery effluent on the growth of groundnut (*Arachishypogaea* L.). *Int Jour Sci.*, 138-150.

Ryan, M.H. and J.F. Angus, 2003. Arbuscularmycorrhizae in wheat and field pea crops in a low P-soil: increased Zn-uptake but no increase in P-uptake or yield. *Plant Soil*, 250: 225-239.

Sankar Gannesh. K, P. Sundaramoorthy, ALA. Chidambaram 2006.Chromium toxicity effect of blackgram, soybean and paddy. *Poll.Res.*, 25:757-761.