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EFFECTS OF FERTILIZER ON LEAF PIGMENTS, CHEMICAL ANALYSES AND CHLOROPHYLL STABILITY INDEX IN SHANKHPUSHPI (*EVOLVULUS ALSINOIDES*)

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Field experiments were conducted during 2000-2001 to study the effects of fertilizer application on leaf pigments, chlorophyll stability index, protein and sugar contents in Shankhpushpi (*Evolvulus alsinoides*). AM, NPK: full dose and NPK: full dose + FYM + Hexameal treated plants showed a significant increase in total pigments, sugars and protein contents, respectively over control.

Keywords : Indian desert; Leaf pigments; Protein; Shankhpushpi; Stability index; Sugar.

Poor availability of nutrients in soluble form in the arid soils is one of the most important limiting factors as compared to moist areas. Fertilizer management is an important agronomic factor that affects the growth parameters and plant yield, which is important to study the eco-physiology of a plant to a great extent. Application of fertilizers to the plants for altering their character and make them better able to withstand the adverse conditions or to alter their growth to produce more of the useful parts, is a new departure in agriculture. Continuous use of chemical fertilizers deteriorates the soil fertility and fertilizer use efficiency[1]. Organic manures have been known for a long time to enhance the physiological efficiency and reduce the requirements of chemical fertilizers. Hence, in the present study experiments were conducted to evaluate the effects of fertilizer management on the different ecophysiological parameters of *Evolvulus alsinoides* (Linn.) Linn. (Fam. Convolvulaceae), an important medicinal plant from Indian Thar desert.

The experiments were conducted at the Ecology field of Botany Department, J.N.V. University, Jodhpur during 2000-2001 in randomized block design (RBD) with 8 treatments in three replication each, viz. control, AM infested soil (100 g $plant^{-1}$), FYM (farmyard manure; 8-10 t ha^{-1}), Hexameal (an organic manure; 25 q ha^{-1}), NPK : full dose (60:40:30 kg ha^{-1}), NPK: full dose + FYM, NPK: full dose + Hexameal, NPK: full dose + FYM + Hexameal. The treatments of fertilizers were given to the experimental plants at an interval of 30 days except for AM, which was given once only. NPK (nitrogen, urea) full dose was split into two equal half doses and given twice a month. The seeds of *E. alsinoides* were collected from University Campus, Jodhpur during October-November 1999. Seeds were mechanically scarified with sandpaper and sown in polybags containing soil mixture of sand: clay: FYM in 1:2:1 ratio under nursery conditions during June 2000-2001. After one month, the seedlings were transplanted in pre-prepared experimental plots. Fresh leaves from set of different treatments were collected for analyses of total pigments and chlorophyll stability index after one month of giving the treatments. The oven-dried leaves (72°C for 48 h) were analysed for sugars and crude protein. These analyses were repeated three times for confirmation and pooled data are presented in tabular form. Total leaf pigments were estimated as suggested by Arnon[2] and chlorophyll stability index by Majumdar[3] and Chawan *et al.*[4]. Sugar was estimated by using Anthrone reagent as described by Plummer[5] and protein by Microkjeldhal method[6]. The experimental data were subjected to analyses of variance after Gomez and Gomez[7].

The data on effects of different fertilizer treatments on various metabolic parameters in *E. alsinoides* are presented in Table 1. The important findings are as follows :

(i) **Total leaf pigments :** The leaf

Table 1. Effect of different treatments on total leaf pigments (mg g^{-1} f. wt.), stability index, protein (% d. wt.) and total sugar contents (mg g^{-1} d. wt.) in *E. alsinoides*.

Treatments	Total pigments	Stability index	Protein	Total sugars
Control	1.269	0.599	21.302	51.199
AM	1.395	2.733	12.708	49.170
FYM	1.378	7.533	16.667	66.078
Hexameal	1.283	11.200	12.760	58.668
NPK : full dose	1.248	7.500	22.656	50.732
NPK : full dose + FYM	1.038	4.766	19.063	60.004
NPK : full dose + Hexameal	1.169	11.900	13.333	62.749
NPK : full dose + FYM + Hexameal	1.261	2.433	13.802	72.988
CD	0.1928*	2.949**	3.4155**	7.402**

* & ** = Significant at 5 & 1 per cent probability levels, respectively.

pigments were higher in AM treated plants followed by FYM and lower in NPK: full dose + FYM treated plants.

(ii) **Chlorophyll Stability index :** It was maximum in control followed by NPK: full dose + FYM + Hexameal and minimum in NPK: full dose + Hexameal treated plants.

(iii) **Protein :** The leaf protein was maximum in NPK: full dose and minimum in AM treated plants.

(iv) **Sugar :** The total sugars were maximum in NPK: full dose + FYM + Hexameal followed by FYM and minimum in AM treated plants.

The data were significant at 1 per cent except for total leaf pigments, which were significant at 5 per cent probability levels.

Plant regulates various aspects of their growth in a synchronized form with a high degree of organization involving coordination of many components. Plant growth and metabolism are regulated through solar energy captured by the chlorophyll pigment. Mathur and Vyas[8] reported increased chlorophyll content in *Ziziphus mauritiana* by different VAM species. *E. alsinoides* also exhibited higher chlorophyll contents in AM inoculated plants as compared to other treatments.

Chlorophyll stability index is a single parameter to measure the frost or drought resistance of a plant species. Higher the index lower is the resistance and *vice-versa*. In the present investigation higher values of stability index was observed in control set of experiments, which indicates that *E. alsinoides* have low resistance towards the harsh environmental conditions.

Protein is an important chemical constituent of cells from both structural and functional points of view. It is suggested that adequate amount of nitrogen helps the plant to maintain normal metabolism under water and heat stresses, which is a major concern for arid zone plants. The application of

nitrogen to arid zone soils increased the protein contents of crop plants[9,10]. The application of NPK also increased protein content in *E. alsinoides*.

Carbohydrate content decreased under the influence of water stress[11]. It has been found that plant leaves subjected to water stress often showed a decrease in their starch content, which is usually followed by an increase in sugar content[12]. In the present study the plants treated with NPK: full dose + FYM + Hexameal showed higher sugar contents than other treatment. This is corroborated with the finding of Prasad *et al.*[13] in *Beta vulgaris*.

It is concluded that AM, NPK: full dose and NPK: full dose + FYM + Hexameal treated plants showed maximum amount of total chlorophylls, protein and sugar contents, respectively. Hence, it is recommended that to increase various plant parameters the seedlings of *E. alsinoides* should be provided with the above treatments.

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