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PHYTOTOXIC EFFECT OF EUPHORBIA GENICULATA. ORTEG. ROOT AND SHOOT EXTRACT ON THE DEGREE OF NODULATION OF SOYBEAN (GLYCINE MAX. (L.) MERR.)

Botany

DR.S.Maqbool Ahmed Assciate Professor of Botany Department of Botany Maulana Azad National Urdu University Gachibowli, Hyderabad.

ABSTRACT

Soybean (Glycine max (L.)Merr.) is the main crop of the Madhya Pradesh area during Kharif season. A field experiments were conducted with Soybean during rainy season during two consecutive years at Bairagarh, Bhopal to find out the degree of nodulation in Soybean fields infested by Euphorbia geniculata Orteg. The root and shoot extract was used to see their effect on the degree of root nodulation of Soybean plant. In almost all experiments in which the nodule number was significantly reduced, the nodules were small and grey or at least not a bright pink as were in the control nodules. In the present study root extract was significantly reduced the nodule number in comparison to shoot extract.

KEYWORDS:

Phytotoxic, root and shoot extract, nodulation.

INTRODUCTION:

Soybean is the main crop of the Madhya Pradesh area during Kharif season. The crop –weed competition is severe for the first six weeks after sowing. Grases are the major weeds besides sedges and broad leaf weeds. The yield reduction of 10 to 73% (Staniforth and Weber, 1956 and Fleck 1977) due to weed competition has ben observed. There fore every effort has to be made to reduce weed denstity during the growth period of Soybean. Good nodulation is essential for successful cultivation of Soybean (Glycine masx(L.) Merr.) The survey revealed that the following Dicot weeds were commonly encountered in the Soybean fields, like Acalypha indica L. ., Euphorbia geniculata.Orteg., Euphorbia hirta L., Impatiens balsamina L., Justicia diffusa Willd., Lagascea mollis Cav., Melilotus alba Desr., Parthenium hysterophorus L., and Tridax procumbens L.. In the present study Euphorbia geniculata was choosen to see their phytotoxic effect on the degree of nodulation of Soybean plants.

MATERIAL AND METHODS:

The field experiments were conducted with Soybean during rainy season during two consecutive years at Bairagarh, Bhopal. The soil of the experimental plot had pH 7.3. The average maximum temperature 31.0 and 28.5 degree Celsius, minimum temperature 21.2 and 20.9 degree Celsius and relative humidity 81 and 85%. The Climate was humid with moderate temperature.

The root and shoot extract of Euphorbia geniculata was taken with three different concentrations (0.25%, 0.50% and 0.75%) was prepared by dilution method using double distilled water. These above concentrations were used to see their effect on the degree of nodulation of Soybean plant. Observation on nodulation, dry weight of nodules were taken after 55 days after sowing by uprooting 5 random plants from each plot. The roots were washed with water and the intact nodules were detached from the roots and counted. The nodules dried separately in an oven at 60-80 degree Celsius for recording the dry weight.

RESULT AND DISCUSSIONS:

The roots of the uprooted plants were carefully washed with tap water for counting the number of nodules in each plant. On an average the control plants were found to bear 79.2 nodules per plant. How ever there was reduction in the number of nodules in all the treated plants.

There were 65.2, 58.0 and 50.0 nodules in the plants treated with 0.25%, 0.50% and 0.75% concentration of shoot extract. However there was much reduction in the number of nodules in the plant subjected to the root extract treatment. There number was fond to be 61.0 under 0.25%, 52.0 under 0.50% and 49.0 under 0.75% concentration of the root extract of Euphorbia geniculata.

Table -1: Showing the effect of root and shoot extract of E.geniculata on Soybean.

Root nodule	Control	Shoot extract			Rooat extract		
		0.25%	0.50%	0.75%	0.25%	0.50%	0.75%
Fresh weight (g)	2.798	2.700	2.681	2.326	2.921	2.638	2.520
Dry weight (g)	2.457	2.301	2.201	1.922	2.420	2.130	2.101
Nodule (No).	79.2	65.2	58.0	50.0	61.0	52.0	49.0

After counting the root nodules their fresh weight was immediately taken with the help of the digital balance. The average fresh weight of the nodules per plant was found to be 2.798g in control. Whereas there was consistent decrease in their weight with the increasing concentration of the shoot extract and root extract. The corresponding value of the fresh weight under 0.25%, 0.50% and 0.75% concentration of the shoot extract treated plants were 2.700, 2.681, 2.326 g respectively.

In the case of plants treated with root extract of 0.25% it was 2.921g followed by 2.638g under 0.50% and 2.520g under 0.75% concentration. In the case of the oven dry weight of the root nodules it was found that the control plants on an average weight 2.457g. The same parameter for the plants treated with 0.25%, 0.50% and 0.75% concentration of the shoot extract of E.geniculata was found to be 2.301g, 2.201g and 1.922g respectively. Almost a similar trend was noticed in the plants treated with the root extract. The dry weight was 2.420g under 0.25% , 2.130g under 0.50% and 2.101g under 0.75% concentration of the root extract. This indicates that both the shoot and root extracts of Euphorbia geniculata hamper the growth and development of the root nodules.

CONCLUSION:

The present experiments indicates that the inhibitors can leach from living leaves or roots of E.geniculat in suffiecient quatitities to inhibit nodulation in legumes. Nodules of treated plants usually appear smaller and grey colour in contrast to the brighter pink nodules of control plants. The Smaller size of the nodules, inside which Rhizobium species live and carry out the function of nitrogen fixation symbiotically, may not provide sufficient quantities of fixed nitrogen which ultimately leads to the formation of Proteins, thus results in decrease productivity of the plant because of the retarted growth. More over there was abundance of Leg-haemoglobin in the control plants where as there was paucity of this pigment in the nodules of weed extract treated plant. It is believed that the amount and intensity of Leg-haemoglobin varies directly with the amount of nitrogen fixation.

The Leg-haemoglobin is found in the cytoplasm and not in the Rhizobium cells. Whether normal or Bacteroides Leg-haemoglobin is thought to be a plant product which is probably formed by the combined action of the root and Bacterial cell, because none of them is capable of forming it independently. More over for the best growth of Rhizobium species a pH around 7.3 is needed. Whereas the pH of all the extracts of the weeds was slightly on the acidic side there by hampering the growth of these bacteria. Not only this but the leachates seems to be inhibitor of mitotic cell division of the infected cortical cells which by their division results in the formation of outgrowth of nodules. Thus because of acidic pH as well as mitotic division of Rhizobium species also the growth of nodules as well as Bacteria is adversely affected.

It is reported by Mallik & Tesfai (1988) that both living and herbicidally killed quak grass (Agropyron repens) significantly reduced growth, nodulation and N-fixation in Soybean and three other legumes. Rice (1968) reported that root exudates and decaying residue of Sunflower significantly reduced nodulation and growth of red kidney bean leaf leachates of Sun flower and few other weed species were found to significantly reduce nodulation in Korean lespedeza plant. The growth and nodulation of Phaseoulus vulgaris were reduced when grown in close proximity with Parthenium hysterophorus (Kanchan & Jaya Chandra, 1979). Thus the present investigation is in conformity with the findings of the above workers.

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