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Allelopathic effect of *Ageratum conyzoides* L. on protein content of the mungbean (*Vigna radiata* L.) plants

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Abstract

The effect of aqueous extracts of various parts viz. leaves, stem and roots of *Ageratum conyzoides* L**.** was studied on the protein content of mungbean (*Vigna radiata* L**.**) plants at different stages of its growth. Healthy and treated plants were analyzed after every 15 days for protein estimation using Lowry's method. A decrease in the protein content was observed in all the treated plants as compared to control during all the stages of the growth. Maximum reduction in protein content was observed in the plants treated with leaf extract while the plants treated with root extract did not show much change in these contents.

Key words: Allelopathy, *Ageratum conyzoides*, mungbean (*Vigna radiata*), aqueous extracts, protein content.

Several studies have been conducted on allelopathy and a considerable amount of literature is available that implicates allelopathy as an important form of plant interference[11,8]. Allelochemicals may interfere with various physiobiochemical processes of seed germination, root elongation, plant growth as well as various biochemical contents and metabolic activities of crop plants[4,10]. However, various parts of the same weed may show different behaviour in exerting their allelopathic effects on crops[5].

Mungbean, *Vigna radiata* (L.) is one of the most important pulse crops. It is grown in almost all parts of our country. It has been grown in India since ancient times. Mungbean is grown widely for use as a human food.

Ageratum conyzoides (Billygoat Weed) is a common weed found in agriculture fields. It is a short-lived annual weed, exhibiting extreme plasticity and quick flowering. Thus the present work was undertaken to study the allelopathic effect of *A. conyzoides* on chlorophyll content of mungbean (*V. radiata*), which is an important crop grown in many parts of Madhya Pradesh.

The mungbean plants were raised by seeds (PDM-11 variety, obtained from M. P.

State Seed Corporation, Bhopal) in polythene bags and kept in open field. These were treated with aqueous extracts (1/10 w/v) of leaf, stem, and roots of *Ageratum conyzoides* on alternate days. The extract was obtained by submerging 1 gram of the leaves, stems and roots of the weed separately per 10 ml of water for 24 hours. A control was also maintained, which was irrigated with water only.

For estimation of plant protein content healthy and treated plants of 15, 30, 45 and 60 days were taken. One gram of plant material was weighed, ground with 5 mL of 0.2 M phosphate buffer (pH 7) and filtered using Whatman's No. 1 filter paper. The filtrates were subjected to protein estimation by Lowry's method[6] with absorbance measured at 660 nm. with the bovine serum albumin as standard.

The values presented in the experiment are means of three independent experiments. In figures SEM (standard error of means) values were used.

It was observed that the plant protein content was found to be reduced in all the treatments as compared to control. The decline continued till the end of the experiment. Maximum protein content (1.47 mg/g f.w.) was observed in the control plants 60 DAS, while the protein content decreased in all the other treated plants with a minimum of 1.08 mg/g fresh weight in plants treated with leaf extract followed by plants treated with stem extract (1.19 mg/g f.w.). Minimum reduction in protein content, was caused by root extract and thus the plants treated with these extracts were observed to have protein content (1.36 mg/g f.w.) next to control (Fig. I).

There is much evidence that *A. conyzoides* inhibits germination and growth of other plants through chemicals produced by its root and shoot systems. The quantitative analysis of phytotoxins in the rhizosphere soil showed it contained nearly six times more phenolics than the control soil. The main allelochemicals in the rhizosphere soil of *Ageratum conyzoides* were isolated and identified to be p-coumaric acid, gallic acid, ferulic acid, p-hydroxybenzoic acid, and anisic acid[2].

Padhy *et al.*,[9] have reported that the leaf litter leachate of *Eucalyptus globulus* decreased the protein content in both root and shoot of finger millet. Generally allelochemicals cause a decrease in the content of total proteins on test crops[1]. These findings strongly support the present observations.

Abu-Romman *et al.*,[12] recorded decreased amount of protein in wheat seedlings by allelochemicals while studying allelopathic effects of spurge (*Euphorbia hierosolymitana*) on wheat (*Triticum durum*).

Verma and Rao[14] however, reported that total protein content (mg/g f wt.) in different varieties *of Glycine max* was increased with all the weed extracts of *Ageratum conyzoides* L. as compared to control.

Einhellig[3] reported that normal ways of protein synthesis are inhibited in lettuce seedlings (*Lactua sativa*) when treated with cinnamic acid. The findings in the present investigations are also in conformation with these reports.

The reduction of protein content under

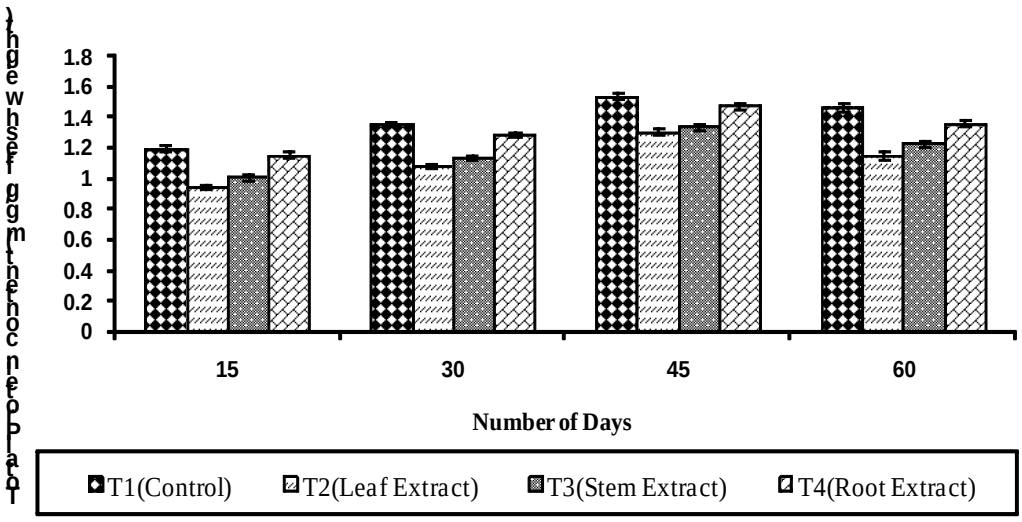

Fig. 2. Allelopathic effects of different parts of *A. conyzoides* on Protein content of *V. radiata*

various treatments could be attributed to impairment of various metabolic activities by leachates, which inhibit the protein synthesis and/or stimulate the degradation as suggested by Mersie and Singh[7], or it could be due to protease activity as reported by Singh *et al*[13].

Differential inhibitory effects of various parts of the same plants are likely due to variability in the amount of phytotoxic compounds in different plant tissues.

The study suggests that the weed *Ageratum conyzoides* may contain compounds that are phytotoxic in nature and cause a reduction in protein content in mungbean plants by inhibiting their biosynthesis or enhancing their degradation. However these phytotoxic compounds are present in varying concentrations in different parts of the weed.

The data so generated is of immense value in the development of bioherbicide from these weeds. This study indicates the potential to use allelopathic species to suppress the growth of other weeds. It can further be used as a tool to formulate new eco-friendly bioherbicides to control weeds in agro-ecosystems and natural ecosystems.

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