Short communication

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Inhibitory potential of "coffee weed" on *Parthenium*

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The chemical exudates from allelopathic plants play a major role in the allelopathy mode of action. Evidence showed that higher plants release a diversity of allelochemicals into the environment, which includes phenolics, alkaloids, long-chain fatty acids terpenoids and flavanoids (Chou 1995). Carrot weed *Parthenium hysterophorus* L. (Asteraceae) is one of the worst weed of agriculture, environment and human health (Knox and Paul 2013, Sushilkumar 2014). It has been estimated to invade about 35 m/ha land in India including crop land, waste land fallow land and forest land, rapidly displacing native and planted pastures (Sushilkumar and Varshney 2010). In Agra district of Uttar Pradesh (UP), it has distributed well comprisng all types of land. In addition to reducing land productivity; the plant causes acute allergic dermatitis and rhinitis in susceptible humans (Tanner and Mattocks1987).

Cassia occidentalis L., more commonly known as"coffee weed", belongs to the family Caesalpiniaceae. *Cassia* plants are well known for containing a group of chemicals with strong laxative effects called anthraquinones. The most widely used species of *Cassia* in herbal medicine is known as senna (*Cassia senna* L. or *C. acutifolia* L.). In nature, *Cassia* competes well with *Parthenium* and inhibits its growth. Therefore, this study was performed to determine the cumulative effects of *C. occidentalis* on the biochemical activities of *Parthenium* and to evaluate the allelopathic potential of this plant in suppressing *Parthenium hysterophorus*.

The experiment was carried out from January, 2013 to December, 2013 at St. John' College, Agra, UP in the research laboratory of Botany Department which is geographically situated at 26° 44' N to 27° 25' N latitude and 77° 26' E to 78° 32' Elongitude at an altitude of 171m msl.

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Preparation of aqueous leachates for bioassay

The upper parts of shoot tips were collected from *C. occidentalis*. 100 g of shoot tips were soaked in 500 ml of double distilled water, each under aseptic conditions for 9 days and placed in conical flasks in a refrigerator at 8 ± 1°C. The aqueous leachates were filtered through three layers of muslin cloth/cheese cloth to remove debris. The filtrate was then re-filtered through one layer of Whatman no. 1 filter paper. Leachates of 100% concentration were prepared and used for bioassay.

Chlorophyll estimation

Chlorophyll content of *Parthenium hysterophorus* was estimated according to Arnon (1949) *Parthenium* leaves (0.40 mg) with 100% of shoot leachates of *Cassia* for 72 hours. After 72 hours, the treated *Parthenium* leaves were placed in black plastic bottles containing 10 ml of 80% acetone and then it was sealed with adhesive tape at its mouth so that acetone may not get evaporated and kept undisturbed in a refrigerator for 5– 6 days at 8 ± 1°C temperature. After 6 days, optical density was recorded by spectrophotometer at different wavelength, *i.e.* 480, 510, 630, 645, 652, and 665 nm.

Estimation of nitrogen

Nitrogen was estimated by following the method of Snell and Snell (1955). 100 mg of *Parthenium* leaves were treated with 100% of shoot leachates of *Cassia* for 72 hours. Then the treated *Parthenium* leaves were placed in 50 ml of conical flask and mixed with 2 ml of concentrated H_2SO_4 and then it was heated on hot plate at 40 °C. When volume reduced to half of the original volume, 1.5 ml of 30% H_2O_2 was added. Then the solution was heated gently at 10 - 20 °C till the clear extract was obtained. The content was then transferred in 100 ml volumetric flask and the volume was made up to the mark with distilled water. After preparation of acid extract of plant material, the nitrogen was estimated.

One ml of prepared acid extract from plant material was taken in 50 ml volumetric flask. To this 10 drops of 10% NaOH and 10 drops of 10% sodium silicate were added and the solution was diluted up to the mark. 1.0 ml of freshly prepared nesseler's reagent was added to the flask, the colour intensity was measured by colorimeter after 15 minutes at transmittance of 420 nm using a reagent blank as reference. With the help of standard curve prepared with 100 ppm NH_4Cl solution the amount of N_2 in the sample was found out.

Protein content

The protein content in plant sample was calculated by multiplying percentage nitrogen content of plant sample by the factor of 6.25. Control received distilled water. The experiment was laid out in correlation with six treatments each comprised of chlorophyll, nitrogen and protein percentage. Using standard procedures of statistical data analysis (including the inbuilt mathematical functions of Microsoft Excel 2007), the effects of *Cassia* on *Parthenium* (before and after treatment) were correlated with the chlorophyll, nitrogen and protein percentage.

It clearly depicted that shoot leachates of *Cassia* inhibited the chlorophyll content of *Parthenium* to the tune of 84.9%, followed by nitrogen and protein in which inhibition was recorded 96.4% and 96.4%, respectively, which was found to be significant.

Of the other flora studied, *C. occidentalis* showed the strongest competitive ability against *Parthenium* (Knox *et al.* 2014).

Maximum significant inhibition in fresh weight and biomass of *Parthenium* was observed in *C. occidentalis* having 6.0 and 3.9 g, respectively followed by *Calotropis procera* in which 7.4 g of fresh weight and 2.6 g of biomass was observed (Knox 2013). In the Indian context, the most efficient plant as biocontrol agent of this weed is undoubtedly *C. sericea* (syn. *C. uniflora*). It releases 'kolines' that interfere with germination and growth rate of only *Parthenium* (Mahadevappa 1999). Lower dose of atrazine supplemented with *C. uniflora* extract was found effective in controlling *P. hysterophorus* (Knox *et al.* 2006). Based on the results of present investigation it can be concluded that *C. occidentalis* was most effective for the management of *Parthenium* weed because *Cassia* could exert allelopathic impact and hinder the biochemistry of *Parthenium*.

SUMMARY

Inhibitory effect of *Cassia occidentalis* L. (CO) on *Parthenium hysterophorus* L. (PH) was assessed under various biochemical parameters like chlorophyll, nitrogen and protein percentage. Chlorophyll content, nitrogen and protein percentage of one month old *Parthenium* plants were observed after treatment with aqueous leachates of the shoots of *C. occidentalis* and compared with control sets treated with distilled water. The allelochemicals released from *Cassia* inhibited the chlorophyll, nitrogen and percentage of *Parthenium* to the tune of 84.9, 96.4 and 96.4%, respectively. The results indicated the possible suppressive effect of allelochemicals present in *C. occidentalis* L. (CO) on *P. hysterophorus*.

REFERENCES

Chou CH. 1995. Allelopathy and sustainable agriculture, pp. 211-233. In: *ACS symposium series 582*: *Allelopathy: Organisms, Process and Applications*. (Eds. Inderjeet DKMM and Einhellig FA, Washington, D.C).

Knox J, Bhalerao SA and Paul MS. 2014. Phytosociology of *Parthenium hysterophorus* and its possible management through some potential Bio-agents. *International Journal of Life Sciences* **2**(1): 49-52.

Knox J. 2013. Effect of allelopathic plants on Congress grass (*Parthenium hysterophorus* L.) in a tropical region. *Research in Environment and Life Sciences* **6**(4): 113-114.

Snell FD and Snell CT. 1955. Colorimetric method of analysis of nitrogen, pp. 813-816. In Vol. **II** AD Van Bostrand Company, Inc. Princeton NJ.

Sushilkumar.2014. Spread, impact and management of Parthenium. *Indian Journal of Weed Science* **46**(3): 205-219.

Sushilkumar and Varshney J.G. 2010. *Parthenium* infestation and its estimated cost management in India. *Indian Journal of Weed Science* **42**(1&2): 73-77.

Tanner MS and Mattocks AR. 1987. Hypothesis: plant and fungal biocides, copper and Indian childhood liver disease. *Annals of Tropical Paediatrics* **7**: 264-269.

Arnon DI. 1949. Copper enzymes in isolated chloroplasts: Polyphenol oxidase in *Beta Vulgaris*. *Plant Physiology* **24**:1-15.

Knox J and Paul MS. 2013. *Parthenium hysterophorus* and its management through botanicals. *Journal of Crop and Weed* **9**(2):207-209.

Mahadevappa M. 1999. Methods of *Parthenium* Control, pp 46. In: *Parthenium* and its management. Publication Centre, University of Agricultural Science, Dharwad, India

Knox J, Dass A, Thomas M and Paul MS. 2006. Management of *Parthenium hysterophorus* L. Through Atrazine with *Cassia uniflora* extract. *Annals of Plant Protection Sciences* **14**(2):459-461.