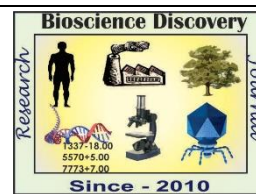


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Research Article



Allelopathic Effect of *Celosia argentea* L. extract on Photosynthetic Pigments of *Vigna aconitifolia* L. and *Trigonella foenum graecum* L.

Patil Bhimarao J and Hemlata N Khade*

Department of Botany and Plant Protection,
Sadguru Gadge Maharaj College, Karad-415124 Maharashtra, India.
*Email: hemlata_dhane@rediffmail.com

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Abstract

Celosia argentea L. is famous allelopathic plant. In present study *Celosia argentea* L. leaf extract was tested against photosynthetic pigments of *Vigna aconitifolia* L. and *Trigonella foenum graecum* L. The seeds were soaked in different concentration of aqueous leaf extracts viz., 5%, 10%, 15% and 20% for 4 hrs. and 9 hrs. The seven days old seedlings were used for analysis of photosynthetic pigments. This study indicated that the higher concentration of leaf extract of *Celosia argentea* L. i.e. 20% was more inhibitory than control. An increased concentration of extract decreased the photosynthetic pigments in *Vigna aconitifolia* L. and *Trigonella foenum graecum* L. *Celosia argentea* L. shows allelopathic effect on photosynthetic pigment.

INTRODUCTION

Allelopathy is a phenomenon where plants chemically obstruct with the growth and development of other plants and has been known for over 2000 years. A variety of weeds have been reported to acquire allelopathic activity on the growth of other plant (Rice, 1974). Allelopathy may also play an eminent role in the intraspecific and interspecific competition and may determine the type of interspecific relationship (Setia *et al.*, 2007). The plant may exhibit inhibitory or rarely stimulatory effect on germination and growth of other plants in the immediate locality. Due to the action of allelochemicals a large number of physiological functions and biochemical reactions are affected such as seed germination, cell division and cell elongation. The leaf extract has much allelochemicals property studied by (Kumbhar and Patel, 2012). Many allelochemical have been acknowledged since experiments began to separate

and determine allelopathic potential of plant compounds that have been identified, thus for include a variety of chemicals such as phenolic acids, coumarins, benzoquinones, terpenoids, glucosinolates and tannins (Putnam and Duke, 1978). Allelopathy shows interaction between the plants either negatively or positively, resulting either inhibitory or stimulatory potential on nearby plants (Rency *et al.*, 2015). *Vigna aconitifolia* L. is a drought resistant legume commonly known as moth bean, belongs to family Fabaceae. Moth bean sprouts and protein rich seed crop grown in India for both human consumption and as a forage crop. *Trigonella foenum graecum* L. is a herb plant belongs to family Fabaceae. The weed *Celosia argentea* L. (Cocks Comb) is one of the most allelopathic plant. In the present study the allelopathic effect of *Celosia argentea* L. was checked on the two crop plants i.e. *Vigna aconitifolia* L. and *Trigonella foenum graecum* L.

MATERIALS AND METHODS

Collection of seed samples of *Vigna aconitifolia* L. and *Trigonella foenum graecum* L. was obtained from local areas of Satara. *Celosia argentea* L. was collected from Bhujinj agricultural field in Satara District. Leaves were instantly separated and washed with tap water to remove soil particles and shade dried for a week. The dried leaves were ground into a fine powder separately using a mixer grinder. Leaf Powder was weighed in 5, 10, 15 and 20gm soaked in 100 ml. of distilled water separately and mixed thoroughly by keeping in rotatory shaker. Keep it over night at the room temperature. After 24 hrs. of soaking, extracts were filtered through double layered muslin cloths. The filtrate was a stock solution and then prepared 5, 10, 15 and 20% concentration with distilled water. Healthy uniform seeds of *Vigna aconitifolia* L. and *Trigonella foenum graecum* L. were surface sterilized with 1% Sodium Hypo-Chloride for 10 minutes. Then rinsed with distilled water for several times to remove excess of chemical. Then 100 seeds were soaked separately in different concentrations of plant extract for 4 hrs. and 9 hrs. in 100ml beaker. Seeds soaked in distilled water were treated as control. These 30 treated seeds were placed in petri plates containing wet blotting papers. At each concentration triplicate sets were arranged at room temperature ($30 \pm 2^{\circ}\text{C}$) for germination. After the completion of 7 days of seed soaking, seedlings were used for testing the biochemical parameters.

Photosynthetic pigment Estimation:

The photosynthetic pigments i.e. chlorophyll a, b, total chlorophyll and carotenoids content after 7 days seed germination was estimated followed by Arnon method (1949). 0.5 gm of germinated seeds of *Vigna aconitifolia* L. material was ground in a mortar and pestal with 10ml of 80 percent acetone. The homogenate was centrifuged at 800 rpm for 15 min. The supernatant was read at 645nm and 663nm using visible UV - Spectrophotometer. The chlorophyll a, b, total chlorophyll and carotenoid content were estimated by Kirk and Allen method (1965). Absorbance 480nm and expressed in mg g⁻¹ fresh weight basis. Calculated values were presented in Table 1 and 2.

Statistical Analysis:

The analysis was carried out in three replicates for all determinations. The mean and standard deviation were calculated. The data were analyzed by one-way analysis of variance (ANOVA). A multiple

comparison procedure of the treatment means was performed by Duncan's new multiple range test.

RESULTS AND DISCUSSION

In *Vigna aconitifolia* L. chlorophyll a, b, total chlorophyll and carotenoid content was gradually decreases with increasing concentration of leaf extract at 4 hrs. and 9 hrs. seed soaking period (Table 1). The *Celosia argentea* L. showed allelopathic effect on photosynthetic pigments in *Vigna aconitifolia* L. When the seeds of *Vigna aconitifolia* L. treated with *Celosia argentea* L. leaf extract as per seed soaking hours, the photosynthetic pigments were increased in 9 hours seed treatment than the 4 hours. The photosynthetic pigments were reduced as compare to control in all treatments. In *Trigonella foenum graecum* L. photosynthetic pigments were gradually decreases with increasing concentration treatment of *Celosia argentea* L. leaf extract (Table 2). Nine hours seed soaking treatment was more effective than 4 hours seed treatment in reduction of photosynthetic pigments.

Chlorophylls are important molecules which act as core component of pigment complexes surrounded the photosynthetic membrane and play a foremost role in photosynthesis (Siddiqui and Zaman, 2005). Chlorophyll a and b and carotenoids concentration correlate to the photosynthetic potential of a plant and give indication of the physiological status of the plant (Young and Britton, 1990). Many researchers have reported that chlorophyll content and ion uptake was reduced significantly by allelochemicals (Alsaadawi *et al.*, 1986). (Peng *et al.*, 2004) reported that allelochemicals affect the photosynthetic activity in plant by destroying chlorophyll molecules. The reduction in chlorophyll content may be due to the fact that allelochemicals either inhibit the synthesis of chlorophyll or perhaps they breakdown the chlorophyll molecule by acting on the pyrrolic ring and the phytol chain (Blum *et al.*, 1993).

The present study showed that there was high chlorophyll accumulation in control for 4 hrs. and 9 hrs. soaking period seen in *Vigna aconitifolia* L. and *Trigonella foenum graecum* L. Present results were supported by (Oyerinde *et al.*, 2009) who revealed the decrease in chlorophyll a, b, total chlorophyll accumulation in young plants of Maize after being treated with fresh shoot aqueous plant known to possess allelopathic characteristics.

The data obtained suggest that the decrease in leaf chlorophyll content was influenced by increase in concentrations of aqueous leaf extract of *Celosia argentea* L. (Siddiqui and Zaman, 2005) reported that the accumulation of chlorophyll and porphyrin content of *Vigna radiata* L. Wilezek seedlings was inhibited as the capsicum leachates concentration increased. (Yang *et al.*, 2002) also found that the accumulation of chlorophyll content of rice (*Oryza sativa*) seedling were inhibited as allelopathic phenolics concentration increased.

Based on the result obtained in present study postulate that seed germination and seedling growth fresh and dry weight of *Vigna aconitifolia* L. and *Trigonella foenum-graecum* L. were also affected due to reduction in plants capacity to accumulate chlorophyll which is an essential component of food manufacturing process; the photosynthesis. This study revealed that reduction in chlorophyll content might be attributed by various allelochemicals present in *Celosia argentea* L.

Table 1: Effect of aqueous leaf extract of *Celosia argentea* L. on Photosynthetic pigment in *Vigna aconitifolia* L. seeds germination with various soaking period.

Sr. No.	Conc. of extract (%)	Seed Soaking Period in hours							
		4				9			
		Chl. 'a'	Chl. 'b'	Total Chl.	Carotenoids	Chl. 'a'	Chl. 'b'	Total Chl.	Carotenoids
1	Control	3.25 ± 0.021	19.16 ± 0.115	22.51 ± 0.012	18.06 ± 0.024	3.86 ± 0.255	12.26 ± 0.353	16.12 ± 0.103	14.48 ± 0.096
2	5	2.653 ± 0.124	18.2 ± 0.081	20.73 ± 0.057	15.50 ± 0.044	2.61 ± 0.081	11.34 ± 0.106	13.95 ± 0.016	8.60 ± 0.057
3	10	2.46 ± 0.124	12.15 ± 0.0235	14.16 ± 0.111	11.26 ± 0.062	1.99 ± 0.0081	6.29 ± 0.0817	8.28 ± 0.040	7.88 ± 0.004
4	15	1.416 ± 0.004	11.15 ± 0.205	13.67 ± 0.038	5.82 ± 0.020	1.19 ± 0.024	4.03 ± 0.046	5.22 ± 0.351	6.60 ± 0.506
5	20	1.333 ± 0.169	4.07 ± 0.008	5.26 ± 0.590	3.5 ± 0.047	0.80 ± 0.073	2.44 ± 0.044	3.24 ± 0.208	6.60 ± 0.506

* Values are expressed in mg.100g⁻¹ fresh weight.

* Bottom values are Mean ± SD.

Table 2: Effect of aqueous leaf extract of *Celosia argentea* L. on Photosynthetic pigments in *Trigonella foenum - graecum* L. seeds germination with various soaking period.

Sr. No.	Conc. of extract (%)	Seed Soaking Period in hours							
		4				9			
		Chl. 'a'	Chl. 'b'	Total Chl.	Carotenoids	Chl. 'a'	Chl. 'b'	Total Chl.	Carotenoids
1	Control	9.76 ± 0.408	14.40 ± 0.066	24.16 ± 0.062	25.33 ± 0.024	7.5 ± 0.043	11.53 ± 0.033	19.03 ± 0.028	22.70 ± 0.390
2	5	6.76 ± 0.363	10.52 ± 0.364	17.28 ± 0.240	24.16 ± 0.113	5.77 ± 0.098	7.84 ± 0.036	13.61 ± 0.446	20.50 ± 0.404
3	10	4.80 ± 0.253	5.45 ± 0.032	10.25 ± 0.592	22.68 ± 0.116	3.51 ± 0.026	3.44 ± 0.211	6.95 ± 0.044	17.74 ± 0.325
4	15	5.79 ± 0.148	3.25 ± 0.155	8.44 ± 0.038	20.16 ± 0.046	1.68 ± 0.128	1.89 ± 0.004	3.57 ± 0.081	15.71 ± 0.364
5	20	3.56 ± 0.012	3.57 ± 0.054	7.13 ± 0.182	8.74 ± 0.143	0.72 ± 0.020	0.436 ± 0.134	1.16 ± 0.102	6.89 ± 0.717

* Values are expressed in mg.100g⁻¹ fresh weight.

* Bottom values are Mean ± SD.

Conclusion

It can be concluded that aqueous leaf extract of *Celosia argentea* L. showed allelopathic effects on photosynthetic pigments of *Vigna aconitifolia* L. and *Trigonella foenum graecum* L.

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