JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Allelopathic effects of *Celosia argentea* L. on seedling growth of Guar (*Cyamopsis tetragonoloba* L. Taub)

Dilipkumar T. Patil

Department of Botany,
Smt. Kusumtai Rajarambapu Patil Kanya Mahavidyalaya, Islampur, Dist. Sangli, Maharashtra, India, 415409.
Email:-dilipkumarpatil75@gmail.com

ABSTRACT

Celosia argentia L. is dominant alien weed reported from crop field of Islampur in Walwa taluka of Sangli district of Maharashtra, India. It has been scrutinized for its allelopathic potentiality of *C. argentea* against enzyme activity seed germination percentage of Guar (*Cyamopsis tetragonoloba* L. Taub). The laboratory experiments were conducted to assess seedling growth of guar after treating seeds with different concentrations (5, 20, 40, 60 and 80%) of aqueous leachates of inflorescence (flower), leaves and root of *C. argentea* separately. The result showed that, the seedling growth was increased only after treatment of leaf leachates but only at 5 % concentrations. However other treatments such as 20 to 80% leaf leachates acts as inhibitor on seedling growth. Over all, inflorescence and root leachates treatment were acts as detrimental on seedling growth of guar. The tremendous reduction in length of seedling was recorded after treatment of root leachates followed by inflorescence leachates followed by leaf leachates. Therefore, allelo toxicity of C. argentea was observed in the trends of the root > inflorescence > leaf leachates on seedling growth of guar. It indicated that the allelochemicals from leaf act stimulatory on the germination and seedling growth but at lower concentrations.

The present study indicated that the allelochemicals are present in the weed, *C. argentea*. This study needs further screening of allelochemicals and their characterization for detailed study.

KEY WORDS: Allelochemicals, *Celosia argentea* L., Seedling growth, Guar etc.

INTRODUCTION:

Weeds are mostly redundant plants that affect the growth of standing crop through releasing chemical substances nearby area, called as allelochemicals (Batish *et al.*, 2007). They often affect growth and development of crop plants (Kadioglue *et al.*, 2005) and affect metabolic functions like photosynthesis, respiration, mineral uptake nutrition and such others (Saxena *et al.*, 2004) through allelopathic mechanism (Benyas *et al.*, 2010). Allelopathy signifies either negatively or positively between the plants and weeds, results in to inhibitory or stimulatory effect on adjacent plants (Kengar and Patil, 2018).

Guar is legume used as vegetable as well as fodder for animals, cultivating all over world but its field is generally affected by various weeds. In western part of Maharashtra (India), field of guar is affecting by weed like *C. argentea* L. The weed, *Celosia argentea* L. is an exotic flowering herb belonging to Amaranthaceae predominately interfere in crop field of cerals and legumes (Inamdar and Kamble, 2009).

In this connection the attempt has made to study the influence of aqueous leachates plant parts of *Celosia argentea L.* on seedling growth of guar. This attempt signified for understanding weed crops interactions.

MATERIALS AND METHODS:

Preparation of aqueous leachates

The weed, *C. argentea* was collected from guar fields of Islampur, Sangli district of Maharashtra, India [17° 15' - 18° 01' N latitude and 74° 12' - 74° 74' E longitude] and washed with tap water to remove soil particles. The plant parts such as leaves, roots and inflorescence were separated and shade dried for 10 days. Dried parts were powered with the help of grinder and stored in polythene bag. The extract were prepared by taking 10gm of fine powder of each part and poured in 100ml distilled water as pure extract, stock solution. From this extract, the different (5, 20, 40, 60 and 80%) concentrations were prepared for treatments while distilled water used as control (0%). The extract was filtered after 24h through a double layered muslin cloth; the filtrates were used as leachates, for further analysis.

Seed treatment with aqueous leachates:

Healthy uniform seeds of guar were selected and procured from authorized shop of Shetkari Sahakari Sangh Pvt. Ltd, Kolhapur. The seeds were surface sterilized with 1% sodium hypo-chloride for 10 min, then rinsed with distilled water for several times to remove excess of chemical. Then surface sterilized seeds were soaked for treatments in 20 to 80% concentrations of plant leachates for 6h. The seeds were soaked in distilled water were used as a control. These treated seeds were placed in petriplate ((9.0 cm diameter) containing wet blotting paper and covered with a lid. At each concentration and incubation period, triplicate sets were arranged and placed in the laboratory under normal temperature for germination. The seedling growth of guar was recorded at 72 hours of seed germination.

Statistical analysis

The analysis was carried out in three replicates for all determinations and the mean were calculated. The statistical analysis performed according to Duncan's multiple range test. The letter on values are not significantly different ($P<0.05$).

RESULTS

Guar (*Cyamopsis tetragonoloba* L Taub):

The aqueous leachates of inflorescence, leaf and roots of *C. argentea* at different concentration (5, 20, 40, 60 and 80%) were treated against seedling growth of guar was showed to increase after leaf leachates treatment but only at 5 % concentrations (Table 1). However other treatments such as 20 to 80% leaf leachates acts as inhibitor on seedling growth. Over all, inflorescence and root leachates treatment were acts as detrimental on seedling growth of guar. The detailed result is given here with length of seedling after each treatment in petriplate bio assay.

The length of seedling of guar recorded in inflorescence leachate treatment as 2.9, 2.1, 1.9, 1.5 and 1.2cm; leaf leachates treatment as 4.8, 3.2, 2.6, 1.4, and 1.1cm; while root leachates treatment 2.4, 2.1,1.4, 1.1 and 0.6cm after 5 to 80% treatments in guar. The maximum length of seedling growth was recorded in guar seedling after 5% leachates of leaf (4.8cm) as compared to control (3.9cm). It was observed that the 5 to 20% leaf leachates treatment showed enhancement in seedling growth in guar.

Here in this treatment, 80% inflorescence, leaf, and root leachates treatment responsible for three fold reduction in length of guar seedling as compared to control.

The tremendous reduction in length of seedling was recorded after treatment of root leachates followed by inflorescence leachates followed by leaf leachates. Therefore, allelo toxicity observed in the trends of the root > inflorescence > leaf leachates on seedling growth.

DISCUSSION:

Production of good quality plant seedlings is essential in the establishment of crops as it strongly affects crop yield. Therefore, seedling quality has become of great concern. Growth analysis studies of seedlings have shown to be effective measures in explaining adaptation mechanisms particular species in a given habitat (Cai *et al.*, 2005). The variables like shoot and root height and diameter, root to shoot ratio, fresh and dry matter have been widely used for it. Several factors influence the growth of every plant including light, water, temperature, nutrients, other environmental factors, genetic factors and competition among the plants species. The neighboring plants and microbes from rhizosphere released chemicals that affect the growth of plants. Therefore, the influence of leachates of *C. argentea* on seedling growth of guar was studied and performance of seedling growth is discussed here with.

Our results depicted that the inflorescence and root leachates treatments were acts as detrimental on seedling growth of guar. It was observed that the 5% leaf leachates treatment showed enhancement in seedling growth of guar (4.8cm) as compared to control (3.9cm).

The interpretation of our findings revealed a considerable fear of guar germination and plant growth pattern under the influence of different concentrations of leachates treatment of *C. argentea* weed parts. The allelopathic chemicals produced by the seedlings suppress seedling growth; most of them are water soluble and intrude on the fundamental skeleton and functions of the tested species (Duke and Dayan, 2006). The degree of inhibition reduces as the percentage of leachates rises, displaying a significant reciprocal relationship with the treatment. The results of present work are in tune with the findings of many workers and documented an earlier report that supports our findings.

El-Khawas and Shehata (2005) observed retardation of seed germination and seedling growth of maize (*Zea mays* L) after treatment of the leaf leachates of *Acacia auriculiformis* and *Gliricidia sepium.* Batlang and Shushu (2007) reported inhibition in germination, growth and dry weight of bambara groundnut seedlings under laboratory conditions after treatment of leaf and root extracts of sunflower (*Helianthus annus*). Ghodake *et al.* (2012) recorded that *Euphorbia genuculata* and *E. microphylla* inhibited seed germination of wheat and significant retardation of root, shoot elongation and biomass accumulation in wheat after treatment of the aqueous extract of *E. dracunculaoides* Lam.

Golzardi *et al.* (2014) found decreasing germination percentage, shoot length and radicle of *Triticum aestivum* L. in on increasing the concentration rate of aqueous extract of *Cynanchum acutum* L. **T**he allelopathic impact of weeds such as Cirsium , Papaver , Tripleurospermum , Amaranthus, Solanum and Sorghum extracts on wheat crop was investigated by Ravlic et al. (2016). Rita Szabo *et al*. (2018) tested three weed extracts on maize seed and discovered that extracts of pigweed responsible for reduction on germination and shoot length of maize, but it had a beneficial effect on maize weight and root length. Our results in present investigation are in the line of well documented above researchers findings.

Findings from our results showed that the seedling growth almost inhibited in all treatments of leachates of *C. argentea* except 5% leaf leachates. The above all reviewed workers reported the retardation in length of seedlings in allelopathic experiment (Saritha and Sreeramulu, 2013). We have also recorded similar results but stimulation of seedling growth at the lower concentrations was quite confusing. It indicated that the allelochemicals from leaf act stimulatory on the germination and seedling growth but at lower concentrations.

CONCLUSION:

The present results of study showed that the stimulation and suppression of seedling growth is due to allelochemicals present in plant parts that affects on seedling growth dynamics. It needs further screening of allelochemicals and their characterization for detailed study.

Table 1: Effect of leachates of *C. argentea* L. on seedling growth of guar after 72h of germination

Note:

Source of Leachates	Treatments	Seedling growth of guar
	Control	3.9 ± 0.11^{d}
Inflorescence Leachates	5%	2.9 ± 0.13^{cd}
	20%	2.1 ± 0.10^{c}
	40%	1.9 ± 0.06^{bc}
	60%	1.5 ± 0.10^{ab}
	80%	1.2 ± 0.09^{a}
Leaf leachates	5%	4.8 ± 0.16^{d}
	20%	3.2 ± 0.12^{c}
	40%	2.6 ± 0.09^{ab}
	60%	1.4 ± 0.07^{a}
	80%	1.1 ± 0.08^{a}
Root leachates	5%	2.4 ± 0.11^{c}
	20%	2.1 ± 0.10^{bc}
	40%	1.4 ± 0.08^{a}
	60%	1.1 ± 0.03^{a}
	80%	0.6 ± 0.01^{e}

The Seedling growth is expressed in cm.
Values are mean of three replications and according to Duncan's multiple range test. The letter on values are not significantly different ($P<0.05$).

REFERENCES

1. Batish, D. R, Lavanya K, Singh H. P and Kohli R. K (2007): Phenolic allelochemicals released by *Chenopodium murale* affect the growth, nodulation and macromolecule content in chickpea and pea. *Plant Growth Regulation* 51(2):119-128.
2. Batlang, U and Shushu D. D. (2007): Allelopathic Activity of Sunflower (*Helianthus annuus* L.) on Growth and Nodulation of Bambara Groundnut (*Vigna subterranea* (L.) Verdc.), *Journal of Agronomy*, 6(4), 10.3923/ja.2007.541.547.
3. Benyas, E., Hassanpouraghdam, M. B., Salmasi, S.Z., Oskooei, O.S.K (2010): Allelopathic effects of *Xanthium strumarium* L. shoot aqueous extract on germination, seedling growth and chlorophyll content of lentil (Lens culinaris Medic.). Rom Bio tech Lett 15(3): 5223-5228.
4. Cai, Xia, W., S. Yi Xin, and L. Zhihua. (2005): Differences of allelopathic effects of different forage legumes. *Grass.China* 27(6):39-43.
5. Duke, S.O. and Dyan, F.E. (2006): Mode of action of phy- totoxins from plants. In: Reigosa, M.J., Pedrol, N. and Gonzalez, L., Eds., *Allelopathy*: *A Physiological Process with Ecological Implications*, Springer, Netherlands, 511- 536.

6. El- Khawas, A.S and Shehata, M.M (2005): The allelopathic Potentiality of *Acacia nilotica* and *Eukalyptus rostrata* on Monocot (*Zea mays* L.) and Dicot (*Phaseolus vulgaris* L.) Plant, *Biotechnology*, 4, 23-34.
7. Ghodake, S. D., Jagtap, M. D and Kanade, M. B (2012): Allelopathic effect of three *Euphorbia* species on seed germination and seedlings growth of wheat. *Annals of Biology Research* 3(10): 4801-4803.
8. Golzardi, Farid., Yavar Vaziritabar, Yazdan Vaziritabar, Kamal Sadat Asilan , Mohamad Hasan Jafari Sayadi and Shabnam Sarvaramini (2014): Allelopathic effect of two *Cynanchum acutum* L. populations on emergence and shoot development of corn, *Int. J. of Adv. Life Sci*., (IJALS), 7 (4), 615-627.
9. Kadioglue, L, Yamhar Y, Asav U (2005): Allelopathic effects of weeds extracts against seed germination of some plants., *J of Env Biol* 26(2): 169-173.
10. Kengar, Y.D and Patil, B. J (2018): Allelopathic Influence of *Celosia argentea* L. Against α-Amylase Activity in *Lens culanaris* Medic. During Seed Germination, *IJSART*, 4 (1): 420-423.
11. Ravlic, Marija., Renata Baličević, Marina Nikolić, Ankica Sarajlić (2016): Assessment Of Allelopathic Potential Of Fennel, Rue And Sage On Weed Species Hoary Cress (*Lepidium draba*), Not Bot Horti Agrobo, 2015, 44(1):48-52. Doi:10.15835/Nbha44110097.
12. Rita, Szabo., Erzsebet Nadasy, Gyorgy Pasztor (2018): Study on the allelopathic effect of *Amaranthus retroflexus* L., *Datura stramonium* L. and *Panicum miliaceum* L. on the germination of maize. Julius-Kuhn-Archiv, 458: 458- 467. DOI 10.5073/jka.2018.458.068.
13. Saritha, P., and Sreeramulu A (2013): Allelopathic effects of *Celosia argentea L*. leaf extracts on crop plant seed germination. *Int. J. Life Sc. Bt. & Pharm Res.* 2(1): 56-64.
14. Saxena, S., Sharma K., Kumar S., Sand N.K., and Rao, P. B (2004): Interference of three weed extracts on uptake of nutrient in three different varieties of paddy through radio tracer techniques. *J. Environ. Biol*. 25(4): 387-393.