

# Allelopathic effects of *Celosia argentea* L. on total polyphenol content in germinating seeds of Guar (*Cyamopsis tetragonoloba* L. Taub)

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## ABSTRACT

*Celosia argentea* 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 germinating seeds of guar were examined for total polyphenol content after the method of Folin and Denis (1915). The result showed that, aqueous leachates of inflorescence and leaf of *C. argentea* were act stimulatory on the total polyphenol content in guar. Similarly, root leachates responsible to inhibit total polyphenol in guar. Both inhibitory and stimulatory effects were shown by leachates of *C. argentea* L. 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., Total Polyphenol, 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 cereals and legumes.

In this connection the attempt has made to study the influence of aqueous leachates plant parts of *Celosia argentea L.* on total polyphenol content in germinating seeds 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 (variety sadabahar) 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 germinating seeds of guar at 72 hours of seed germination were examined for total polyphenol content after the method of Folin and Denis (1915).

### 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

Plant phenolic compounds are very varied and diversified in their ecological and physiological processes, and greater levels of phenols and flavonoids in the plant may be a reaction to their strong antioxidative capabilities (Roitto *et al.*, 2005). Simple phenolic acids, polyphenolic compounds, isoflavones, flavonoid, tannis are all examples of plant phenolics. Phenols have an important role in protein biosynthesis and ammonia absorption. Despite the fact that phenols and polyphenolic

substances are flavonoids, they have antioxidant properties and can protect plant cells from the harmful effects of oxygen radicals (Lavid *et al.*, 2001). It's also important for plants' defensive mechanisms. Because of their high water solubility and plant growth inhibiting characteristics, polyphenols are probable allelochemicals (Inderjit, 1996). Considering all these aspects, the attempt had made to study allelopathic effect of aqueous leachates of *C. argentea* L. on polyphenol content of guar seedlings.

The total polyphenol content in germinating seeds of guar after treatment of aqueous leachates of *C. argentea* is depicted in Table 1 and Fig. 1. It was recorded that the total polyphenol content was enhanced after treatment of inflorescence, leaf leachates and declined after root leachates treatment in guar. The total polyphenol content were recorded as 0.749, 0.870, 0.891, 0.964 and 1.120g.100g<sup>-1</sup> after 5 to 80 % inflorescence leachates; 0.709, 0.752, 0.795, 0.854 and 0.911g.100g<sup>-1</sup> after 5 to 80 % leaf leachates and 0.634, 0.618, 0.609, 0.564 and 0.520g.100g<sup>-1</sup> after 5 to 80 % root leachates treatment in germinating seeds of guar. The pronounced increase in total polyphenol content was observed in treatment of inflorescence and leaf leachates but at higher concentrations. Moreover, total polyphenols were decreased after treatment of root leachates in guar. The results were recorded as inflorescence and leaf leachates were act stimulatory on the total polyphenol content in guar

### Discussion:

Phenolics are the compounds having allelochemical properties and most important in study of allelopathy to determine defence mechanism of host crop surrounded by allelo weeds. Phenolics are water soluble and leach into the soil from the leaves, stems, and roots. (Katase, 1993).

Many allelopathic experts noticed that increasing phenolic contents in sorghum, radish, black gram, corn, maize, mustard and rice after treatment of leaf extracts and leachates of *Parthenium*, *Tectona*, and *Adrographis* (Vaidya, 2009).

As reported by Ambika and Smitha (2005) showed the significant increase in phenolic contents after treatment of higher concentrations may be due to induction of biotic and abiotic stress for their survive. This statement supported by Buchanan *et al.* (2000) who stated that an increased synthesis of secondary metabolites such as polyphenol under such stressful conditions. Similar to this work Al-Watban and Salama (2012) completed the quantitative analysis phenolic compounds from aqueous extract of *Artemisia* containing.

Our experiment clearly advocated controversial results; aqueous leachates of inflorescence and leaf of *C. argentea* were act stimulatory on the total polyphenol content in guar. Similarly, root leachates responsible to inhibit total polyphenol in guar. Both inhibitory and stimulatory effects were shown by leachates of *C. argentea* L.

**CONCLUSION:**

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

Table 21: Effect of leachates of *C. argentea* L. on total polyphenols and activity of polyphenol oxidase in germinating seeds of guar

Source of Leachates	Treatments	Total Polyphenols
	Control	0.680 ± 0.067 <sup>b</sup>
Inflorescence Leachates	5%	0.749 ± 0.070 <sup>b</sup>
	20%	0.870 ± 0.074 <sup>b</sup>
	40%	0.891 ± 0.057 <sup>b</sup>
	60%	0.964 ± 0.087 <sup>b</sup>
	80%	1.120 ± 0.056 <sup>a</sup>
Leaf leachates	5%	0.709 ± 0.090 <sup>b</sup>
	20%	0.752 ± 0.045 <sup>b</sup>
	40%	0.795 ± 0.047 <sup>a</sup>
	60%	0.854 ± 0.064 <sup>b</sup>
	80%	0.911 ± 0.058 <sup>b</sup>
Root leachates	5%	0.634 ± 0.051 <sup>b</sup>
	20%	0.618 ± 0.060 <sup>b</sup>
	40%	0.609 ± 0.087 <sup>b</sup>
	60%	0.564 ± 0.038 <sup>b</sup>
	80%	0.520 ± 0.045 <sup>b</sup>

Note:

The values of total polyphenols are expressed g.100g<sup>-1</sup> fresh weight.

The 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).

Above values are obtained after 72h of germination.

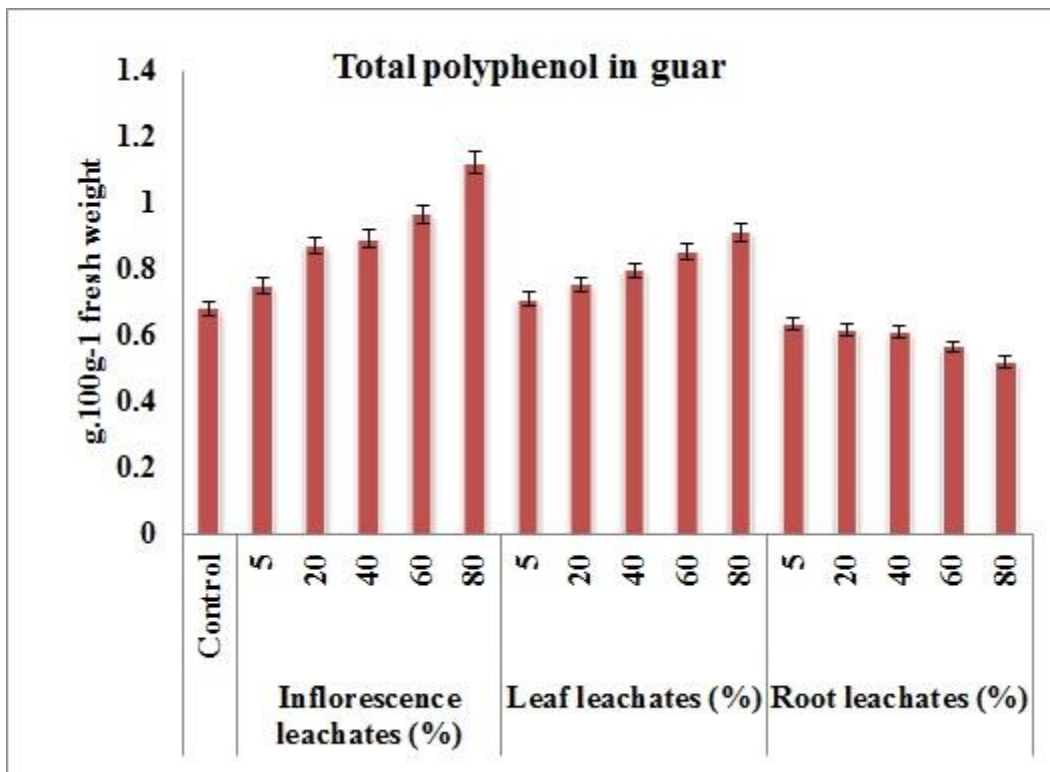


Fig.1. Effect of leachates of *C. argentea* L. on total polyphenol contents of germinating seeds of guar

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