Allelopathic effects of *Celosia argentea* L. on total polyphenol content of germinating seeds of Wheat (*Triticum aestivum* L.)

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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 total polyphenol content in germinating seeds of wheat (*Triticum aestivum* L.). The laboratory experiments were conducted to assess total polyphenol content of germinating seeds of wheat 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 total polyphenols were analysed after method of Folin and Denis (1915). The result showed that root leachates treatments responsible for slightly enhancement in total polyphenol content in wheat seedlings. However the inflorescence and leaf leachates were also act detrimentally on total polyphenol content in wheat. The present study indicated that the allelochemicals are present in the weed, *C. argentea*. Therefore it showed stimulatory as well as inhibitory results. This study needs further screening of allelochemicals and their characterization for detailed study.

KEY WORDS: Allelochemicals, *Celosia argentea* L., Total polyphenol, wheat 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 .

Wheat is staple food of mankind cultivating throughout the world but its field is generally affected by various weeds causing allelopathic effect on physiological aspects. In western part of Maharashtra (India), field of wheat is affecting by weed like *C. argentea* L. (Kengar and Patil, 2018).

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 wheat. This attempt signified for understanding weed crops interactions.

MATERIALS AND METHODS:

Preparation of aqueous leachates

The weed, *C. argentea* was collected from wheat 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 wheat (variety Trimbak) 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 of wheat was used to analyse of total polyphenols after 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 AND DISCUSSION:

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 wheat seedlings.

The effects of aqueous leachates of *C. argentea* on total polyphenol content in germinating seeds of wheat is studied and recorded in Table 1 and Fig. 1. The total polyphenol content was decreased after treatment of inflorescence and leaf leachates and it recorded as 1.514, 1.287, 1.133, 1.006 and 0.867g.100g^{-1}after 5 to 80 % inflorescence leachates; 1.789, 1.509, 1.267, 0.978 and 0.839g.100g^{-1} after 5 and 80% leaf leachate treatment; 2.005, 2.283, 2.383, 2.058 and 1.704g.100g^{-1} after 5 to 80 % root leachates Similarly, the

total polyphenol content was increased after root leachates treatments of *C. argentea* in wheat. It is noticed that root leachates treatments responsible for slightly enhancement in total polyphenol content in wheat seedlings. However the inflorescence and leaf leachates were also act detrimentally on total polyphenol content in wheat. Exact controversial results were recorded and details are explained as it is observed that inflorescence and leaf leachates were act detrimentally in wheat. Similarly, root leachates responsible to stimulate the total polyphenol wheat.

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.

Our experiment clearly advocated controversial results; aqueous leachates of inflorescence and leaf of *C. argentea* were act inhibitory on the total polyphenol content in wheat. Similarly, root leachates responsible to stimulated total polyphenol in wheat. 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 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* total polyphenols and activity of polyphenol oxidase in germinating seeds of wheat

Source of Leachates	Treatments	Total Polyphenols
	Control	1.913 ± 0.167^{b}
Inflorescence Leachates	5%	1.514 ± 0.178^{b}
	20%	1.287 ± 0.076^{b}
	40%	1.131 ± 0.046^{b}
	60%	1.064 ± 0.078^{b}
	80%	0.867 ± 0.013^{c}
Leaf leachates	5%	1.793 ± 0.138^{b}
	20%	1.592 ± 0.169^{b}
	40%	1.270 ± 0.143^{b}
	60%	0.983 ± 0.067^{c}
	80%	0.893 ± 0.034^{c}
Root leachates	5%	2.053 ± 0.165^{a}
	20%	2.235 ± 0.276^{b}
	40%	2.332 ± 0.137^{a}
	60%	2.086 ± 0.160^{a}
	80%	1.744 ± 0.134^{a}

Note:
The values of total polyphenols are expressed $g.100g^{-1}$ 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.

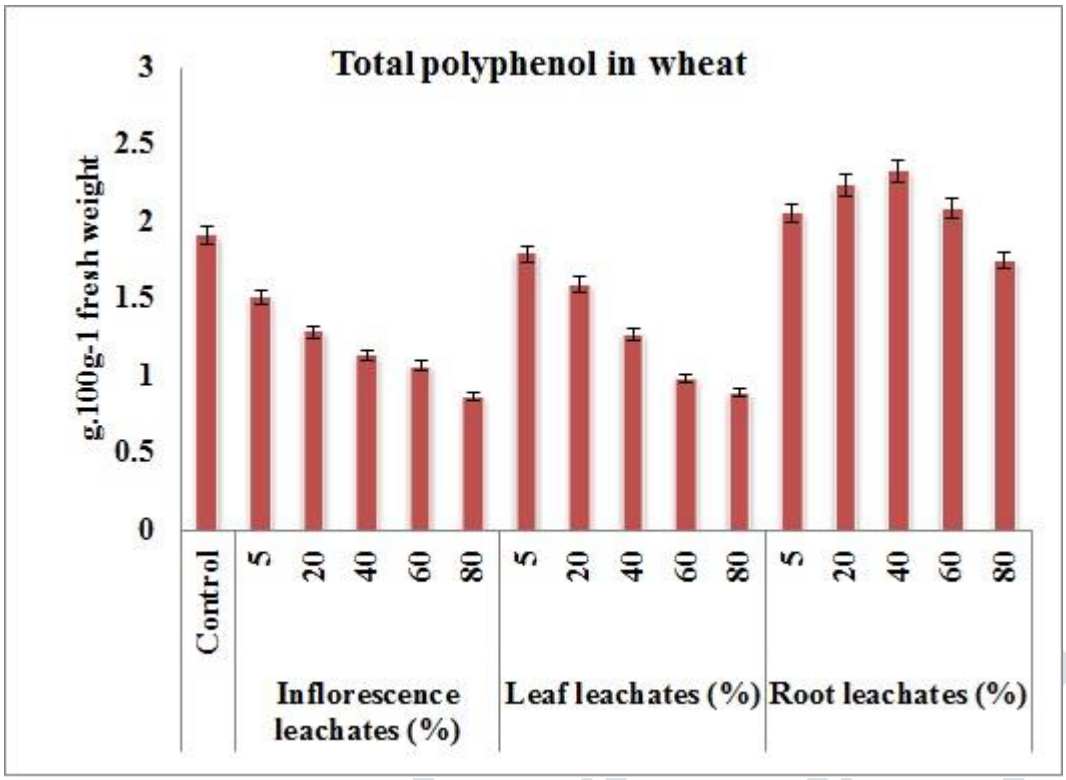

Fig.1. Effect of leachates of *C. argentea* L. on total polyphenol contents of germinating seeds of wheat

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