INT. J. BIOL. BIOTECH., 14 (1): 141-145, 2017.

PHYTOTOXIC POTENTIAL OF *LAUNAEA PROCUMBENS* (ROXB) RAMAYYA AND RAJAGOPAL ON TWO TEST SPECIES

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ABSTRACT

Phytotoxic potential of *Launaea procumbens* (Roxb) Ramayya and Rajagopal were studied on two test crops *Brassica rapa* and *Cucurbita maxima*. In Petri plates experiment, it observed that germination percentage and speed of germination of both species were highly suppressed by aqueous extract of root, leaves and whole plant of *L. procumbens*. Similarly the radicle and plumule length of both species were also affected at varying degree while *Brassica rapa* was more affected as compared to *Cucurbita maxima*. These results showed that *Launaea procumbens* affected the growth of both test species.

Key words: Allelopathy, *Launaea procumbens*, *Brassica rapa*, *Cucurbita maxima*, Radicle plumule, concentrations.

INTRODUCTION

The concept of allelopathy was described by many scientists. It is defined as; allelopathy is the influence of one plant on another plant through releasing chemicals into environment. Allelopathy means inhibition of growth due to release of phytotoxins by one plant that influence another plant growth (Inderjit and Callaway, 2003). Allelopathy simply defined as, "the release of phytotoxins by plants" (Bais *et al*., 2003) or the ability of plants to inhibit germination and growth of other plants directly or indirectly (Machado, 2006; Kohli *et al*., 1997; Singh *et al*., 2001). Similarly, some workers stated that allelopathy is the interference mechanism in which chemicals substance released from the plant inhibit or stimulate the associated plant growth (Harper, 1977; May and Ash, 1990). The allelochemicals may belong to different chemical classes and may vary from plant to plant. They may include tannins, cyanogenic glycosides, several flavonoids and phenolic acids such as ferulic, p-coumaric, syringic, vanillic p-hydroxybenzoic acids, etc. (Einhellig, 1995). Several investigators also reported that allelopathy play a vital role in crop and weed interaction (Wilson and Rice, 1968; Rasmussen and Rice, 1971; Tajuddin *et al*., 2002; Colton and Einhelig, 1980).

The extract of *Perthenium hysterophorus* reduced the growth of *Brassica rapa* and its germination (Jawed *et al*., 2001). Early growth of *Brassica rapa was also* reduced by Parthenium residues due to water soluble phenols which released into soil (Singh *et al*., 2005). Different concentratiosn of *Croton bonplandianum* are known to inhibit germination and root length of seedlings of *Brassica rapa* (Sisodia and Sidddique 2010). Similarly, the germination and growth of *Cucurbita maxima* was also affected due to the application of different extracts of *Lantana camara* (Hossain and Alam 2010). *Cucurbita maxima* itself appears to be a plant of allelopathic potential. *Squash Cucurbita* extract inhibited the germination radical and hypocotyls elongation of *Zea mays* and lettuce also (Fujiyoshi *et al*., 2002). *Launaea procumbens* is reported to affect the germination and growth of mustard, bulrush millet, corn and spinach (Shaukat *et al*., 2003) and radish (Khan *et al*., 2011). The present study is undertaken to investigate the allelopathic potential of weedy *Launaea procumbens* on two important crop species of Pakistan *i.e. Brassica rapa* (Turnip) and *Cucurbita maxima* (Pumpkin).

MATERIALS AND METHODS

Twelve kg of *Launaea procumbens* (Roxb.) Ramayya and Rajagopal were collected from the different departments of FUUAST Gulshan-e-Iqbal campus Karachi. The plants were separated into roots and leaves from the half of collected weed sample while other remaining part of collected weed sample used as whole plant. The separated parts and whole material of weeds kept in green house for 2-3 weeks for drying. A fine powder of roots, leaves and whole plants were prepared by grinding the dried plant materials in Villiemill (electric grinding machine). The 2, 4 and 6% extract of roots, leaves and whole plant were prepared from the powder. The seeds of both test species viz., *Brassica rapa* and *Cucurbita maxima* were sterilized with 0.5% $HgCl_2$ for 2 minutes and then washed with distill water for several times. The Petri plates were washed with distill water and sterilized at 120ºC

for 3 hours in autoclave. Ten sterilized seeds were placed in each Petri plates containing double layers of Whatman No.1 filter paper at uniform distance. The experiment was designed to use 2, 4 and 6% aqueous extracts of root, leaves and the whole plant. However, in every treatment, control was also established. The extract was poured in alternate days. While, control was treated with only distill water. The germination and growth of both test species were observed up to 12 days and then its radicle and plumule lengths of the seedling were recorded.

Statistical analysis: The data was analyzed statistically following Khandakar and Bradbear (1983).

RESULTS

Effect of *Launaea procumbens* on final germination percentage and speed of germination of *Brassica rapa*.

The final germination percentage and speed of germination decrease with the increase of concentration of root, leaves and whole plant extract of weed. At 6% of leaves extract of weed, the percentage germination and speed of germination highly decreased as compared to control. While 4% and 6% extract of root, leaves and whole plant also decreased percentage germination and speed of germination in *Brassica rapa* (Table 1).

Effect of *Launaea procumbens* on radicle and plumule elongation of *Brassica rapa*.

The mean of radicle and plumule length were shown in Table 1. Elongation of radicle and plumule considerably decreased with the increase of concentration of root, leaves and whole plant extract of weed. However, at 6% of leaves extract showed lowest elongation of radicle and plumule in contrast of control and other concentration 4% and 6% of roots and whole plant extract also decrease the growth. While the inhibition percentage with the increase of concentration of root, leaves and whole plant extract of *Launaea procumbens*.

Effect of *Launaea procumbens* on final germination percentage and speed of germination of *C. maxima*

Germination percentage and speed of germination are summarized in Table 2. The final germination percentage and the speed of germination slightly decrease with the increase of different concentration of weed as compared to control. No effect was observed in germination percentage and speed of germination at 2% whole plant concentration.. However it is clear that the final germination percentage and speed of germination reduced in 4% and 6% concentration of root, leaves and whole plant of *Launaea procumbens*.

Table 1. Effect of different concentration of aqueous extract of *Launaea procumbens* on *Brassica rapa* (Turnip).

Treatment	Final Germination (%)	Speed of germination (%)	Radicle length (cm)	Inhibition (% of radicle length)	plumule length (cm)	Inhibition (% of plumule length)
Control	10±0	100	2.28±0.19	2.28	3.51±0.33	3.51
2% Root	9.67±0.33	62	1.42±0.29	37.71	2.93±0.48	16.5
2% Leaves	10±0.00	68	1.85±0.22	18.85	3.73±0.21	3.98
2% Whole plants	10±0.00	100	1.23±0.13	46.05	2.24±0.11	36.18
4% Root	8.67±0.67	86	1.82±0.12	20.17	2.1±0.39	40.17
4% Leaves	9.67±0.33	96	2.25±0.26	1.31	3.1±0.64	11.68
4% Whole plants	6±2.08	35.50	0.94±0.28	58.77	0.77±0.37	78.06
6% Root	8.67±0.67	30	0.56±0.06	75.43	0.73±0.16	79.2
6% Leaves	4±1.00	20	0.51±0.23	77.63	0.69±0.21	80.34
6% Whole plants	5.33±2.4	24.75	0.6±0.43	73.68	0.93±0.69	73.58

Table 2. Effect of different concentration of aqueous extract of *Launaea procumbens* on *Cucurbita maxima* (Pumpkin).

Treatment	Final Germination (%)	Speed of germination (%)	Radicle length cm	Inhibition (% of radicle length)	plumule length cm	Inhibition (% of plumule length)
Control	10±0	100	2.18±0.09	2.18	1.46±0.13	1.46
2% Root	7±1	26.35	2.11±0.06	3.21	1.65±0.09	13.01
2% Leaves	6.67±0.33	42.75	2.58±0.46	18.3	1.63±0.15	11.64
2% Whole plants	6.33±0.33	43.75	2.9±0.33	33	2.24±0.04	53.42
4% Root	6.33±.67	41.35	2±0.27	3.21	1.78±0.27	43.83
4% Leaves	4.67±0.33	46	0.97±0.05	16.51	0.63±0.05	12.83
4% Whole plants	5.67±0.88	69.50	1.36±0.25	3.21	0.89±0.15	47.2
6% Root	7.33±0.33	64	1.76±0.25	56.88	1.34±0.09	50
6% Leaves	8±0.58	71	1.87±0.37	74.31	1.48±0.36	52.73
6% Whole plants	6.33±0.67	61	2.32±0.3	72.47	1.61±0.17	36.3

Fig. 1. Effect of weed extract on the seedling growth of Turnip.

Fig. 2. Effect of weed extract on the seedling growth of Pumpkin.

Effect of *Launae procumbens* on radicle and plumule elongation of *C. maxima*.

The result of radicle and plumule length of *C. maxima* are presented in Table 2. The radicle and plumule enlongation comparatively decline in different concentration of weed as compared to control. The root are more retarteded with the increase of concentration and due to this reason the more inhibition of root were observed in 6% (root, leaves and whole plant) treatment of *Launaea procumbens*. The same trend were observed in the shoot length of seedling.

DISCUSSION

Our study clearly indicated that the *Launaea procumbens* different concentration (2, 4, 6%) of roots, leaves and whole plant affected the both crop species negatively at seedling stage *i.e.* they cause a decrease in final germination percentage, speed of germination and retarded root and shoot growth. Some workers described that allelopathic plants have phenolic compounds which cause toxicity due to which growth in length and seeds germination are inhibited (Stowe *et al*., 1987; Blum, 1996; Inderjit, 1998; Burhan and Shaukat, 2000). The negative effect was increasing with the increase of extract concentration of *Launaea procumbens* which indicated that the allelopathic potential of *Launaea procumbens* depend on concentration against *Brassica rapa* and *Cucurbita maxima*. Some other workers also presented that allelopathy is concentration dependent (Rai and Tripathi, 1984; Rizvi and Rizvi, 1987; Khan and Shaukat, 2006a, 2006b; Khan and Naqvi, 2008; Daniel, 1999). In both test species the growth of root as well as shoot was inhibited as compared to the controlled plant. Similar results have been reported by Khan *et al*. (2011) and Khan *et al*. (2012). Our results indicate that different crops have different response against treatment of weed extracts. The same results of allelopathic concentration response were presented by some workers on other plants also (Shaukat *et al*., 1985; Casado, 1995; Hofmann *et al*., 1996; Tajuddin *et al*., 2002; Shaukat *et al*., 2003). Our study has indicated that *Launaea procumbens* weed has *in vitro* phytotoxic potential against *Brassica rapa* and *Cucurbita maxima*.

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(*Accepted for publication December 2016*)