International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 12, No. 2, p. 146-155, 2018

RESEARCH PAPER OPEN ACCESS

Phytotoxic potential of *Lycium edgeworthii* miers against three cultivated test crop species

Muhammad Imran*, Imtiaz Ahmad, Hina Gul, Sakina Anwar, Syed Adil Hayat, Muhammad Jamal Babar

Department of Botany, Bacha Khan University, Charsadda, Pakistan

Key words: Allelopathy, *L. edgeworthii, T. aestivum, T. alexandrinum, L. sativa.*

http://dx.doi.org/10.12692/ijb/12.2.146-155 Article published on February 26, 2018

Abstract

Allelopathy can play a crucial role in future weed management and crop productivity. The allelopathic compounds tend to be used as natural herbicides and alternative pesticides; they are less riotous of the global ecosystem than artificial agrochemicals. Therefore, the investigations were made to test the potential of *L. edgeworthii* by using aqueous extracts from various parts. The parts of plant were collected shade dried, grinded and different extracts were made. All the extracts significantly arrested the germination rate and overall growth of *Triticum aestivum* L., *Lactuca sativa* L. and *Trifolium alexandrinum* L. in laboratory trials. The aqueous extracts with higher concentration 10g/100ml were more noxious than lower concentration 5g/100ml. Likewise, the extracts obtained after 72 hours were more inhibitory than 24 and 48 hours. Bark extract was found to be more toxic than leaves extracts. The robust inhibition i.e. 40%, 44% and 36% showed by 10/100ml at 72 hours' duration of bark followed by leaves 28%, 24% and 20% in germination of *T. aestivum, L. sativa* and *T. alexandrinum* respectively, similarly same concentration and duration showed maximum inhibition in radicle and plumule length i.e bark showed 70.16% and 73.33% in *Triticum aestivum* respectively. Hot water extracts, litter and mulching experiments also ascertained to be inhibitory to all the test species. It was proposed that various evaluated parts of *L. edgeworthii* have robust allelopathic potential contrary to the nominated tested crop species. Further exploration is required to find the chemicals that triggered inhibition, which may provide basis for the development of novel herbicides of biological origin.

* **Corresponding Author:** Muhammad Imran ✉ imranbotany12345@gmail.com

Introduction

"Allelopathy is the influence of a plant (including microorganisms) on other plant (which live the vicinity) via the release of chemicals constituents into the environments" (Khan *et al.,* 2011). Different types of chemicals that are release to the environment by plants which can cause stimulatory or inhibitory effect in alternative plants in their vicinity in the time of initial growth of that target plant by absorbing the chemicals from the environment, when positive effect produced by the plant, termed facilitation, and if negative effects prevail, the interaction results in competition or interference (AN *et al.,* 1996; Vidal and Bauman, 1997; Javaid and Anjum, 2006; Padilla and Pugnaire, 2006; Fiorentino *et al.,* 2007; Kong *et al.,* 2008; Mutlu and Atici, 2009; Sisodia and Siddiqui, 2010; Gantayet *et al.,* 2014). Allelopathy usually is a form of destructive biochemical communication that donor release while acceptor absorb (Mancini *et al.,* 2009). The plants depend on each other for various life support requirements' that live in same niche (Ells and Mcsay, 1991; Ben-Hammouda *et al.,* 2002; Quan *et al.,* 2003; Khan *et al.,* 2011). Different process such as stomata opening and closing, cell wall permeability, photosynthesis, respiration is adversely affected by the chemical that released by the plants in their vicinity (Nektarios *et al.,* 2005; Javaid, 2010; Bouchikh-Boucif *et al.,* 2014). Allelochemicals are usually stored by the plant cell in bound form therefore it is not noxious but become toxic when exonerate to the environment (Inderjit *et al.,* 2008; Terzi, 2008; Kamal, 2011) deprived growth of the crops that can grow unceasingly in the same field year after year is due to the allelochemicals in the soil (Chen *et al.,* 2011; Duke, 2015). Phenolic are well recognized to effects numerous physiological processes of plants (Siddiqui and Arif-Uz-Zaman, 2005; Li *et al.,* 2010; Al-Watban and Salama, 2012). Flavonoids are polyaromatic compound having 15-carbon skeleton and having about 10,000 types (Shaw *et al.,* 2006) it can play a numeral role in plants (Taylor and Grotewold, 2005; Pourcel *et al.,* 2006; Buer *et al.,* 2010; Cesco *et al.,* 2012; Weston and Mathesius, 2013). Vanillic, cis-ferulic acid, trans-p-coumaric, cis-p-coumaric, syringic, p-hydroxybenzoic acid, trans-ferulic and 2, 4-dihydroxy-7-methoxy-1, 4-benzoxazin-3-one (DIMBOA) have been secluded from wheat shoot and roots (Qasim, 2001; Li *et al.,* 2010; Yadav and Singh, 2013).

Much agronomic importance can be accomplished by means of natural compound for weed managements such as, soil quality enhancement, to reduce environmental deterioration triggered by synthetic agrochemicals and crop diversity is increased through crop rotation which diminished the growth of pest and weeds (Sanchez *et al.,* 2004; Khanh *et al.,* 2005; MA *et al.,* 2006; Machado, 2007; Araniti *et al.,* 2012; Araniti *et al.,* 2012; Saad and Abdelgaleil, 2014). Thousands of natural compounds have been sequestered and their structures elucidated but relatively few of these have been adequately tested for phytotoxicity (Duke *et al.,* 2012; Pacanoski *et al.,* 2014). Therefore, the current investigation was made to evaluate the phytotoxic potential of *Lycium edgeworthii* Miers in contradiction of *Triticum aestivum* L., *Trifolium alexandrinum* L., and *Lactuca sativa* L.

Material and methods

Healthy plants of *L. edgeworthii* were collected from Charsadda. Leaves and bark were separated and diverse parts were distinctly kept for shade drying at room temperature (20°C-25°C). The crushed material of each part was distinctly packed in airtight plastic bag for further research activities.

Aqueous extract bioassay

Leaves and bark powder in amount of 5g and 10g of the collected plant were soaked in 100ml distilled water separately for shorter 24 hours, medium 48 hours and longer 72 hours' durations at room temperature (20°C-25°C). The extracts were then filtered and adjust the pH at 6.5. All the extracts and distilled water as control were utilized in contradiction of test species viz. *L. sativa, T. alexandrinum* and *T. aestivum* in Petri dishes. Ten seeds were positioned in each Petri dish having two folds moistened filter paper with the respective aqueous extract, while distilled water was used as negative control.

Five replicates each having 10 seeds were taken for each handling. After 72 hours' duration the percent germination, radicle and plumule length in millimeter, dry and fresh weight in milligrams and moisture content were noted. 10 seedlings were selected indiscriminately for dry and fresh weight determination in each treatment.

Hot water extract bioassay

Ten-gram powder of leaves and bark of *L. edgeworthii* were separately boiled and filtered. The extracts were then cooled and were practiced in contradiction of the above mentioned test species.

Mulching bioassay

To find the effects of mulching 5g of plant powder were mixed discretely in sterilized and humidified sand in pots. 5 replicates per handling and five as a control were made, each with 10 seeds of the test species, *L. sativa*, *T. alexandrinum* and *T. aestivum*. Pieces of filter paper were used in control handling to intensify water holding capability of sand taken and keep the seeds humid.

Litter bioassay

Five grams' powder litter of *L. edgeworthii* placed discretely in Petri dishes, with a superficial single filter paper dampened with 5ml water. A double layer of filter paper was used in control treatment. Five replicates for each treatment were made, each with 10 seeds of the test species.

The Petri dishes were incubated at 25°C for 7 days. After 7 days of germination the roots and shoots length, dry and fresh weight and percent germination were determined. All the collected data were statistically analyzed through one-way ANOVA. The analysis was done using SPPS/PC version 2017.

Results and discussion

Effect of aqueous extracts

Both the aqueous and hot water extracts significantly affected various growth parameters and germination of all the test species. Extreme inhibition caused by the bark extract at higher concentration 10g/100ml at longer soaking duration 72 hours as compared to leaves extract in all the test species. All the species *T. aestivum*, *L. sativa* and *T. alexandrinum* showed highest inhibition by bark extracts *viz.*, 40%, 44% and 36%, however hot water extracts of bark caused 30%, 52% and 40% inhibition in germination, while 28%, 24% and 20% by leaves extracts respectively (Table No. 1).

Table 1. Effect of aqueous extracts of *L. edgeworthii* on the germination of the test species.

Treatments/extracts	Test species		
	T. aestivum	*L. sativa*	*T. alexandrinum*
Control	100±0.00	100±00.00	100±0.00
5g/100ml leaf. 24 hrs.	82±3.74^{Ns}	86±4.00^{Ns}	90±3.16^{Ns}
5g/100ml leaf. 48 hrs.	80±4.47^{Ns}	84±6.78^{Ns}	88±4.90^{Ns}
5g/100ml leaf. 72 hrs.	78±2.00^{Ns}	82±4.90^{Ns}	86±2.45^{Ns}
10g/100ml leaf. 24 hrs.	76±6.00^{Ns}	80±3.16*	84±6.78^{Ns}
10g/100ml leaf. 48 hrs.	74±6.00*	78±7.35*	82±3.74*
10g/100ml leaf. 72 hrs.	72±7.35*	76±6.78*	80±3.16*
5g/100ml bark. 24 hrs.	70±4.49*	70±5.48*	74±2.45*
5g/100ml bark. 48 hrs.	68±8.60*	68±6.63*	72±3.74*
5g/100ml bark. 72 hrs.	66±6.78*	66±5.10*	70±3.16*
10g/100ml bark. 24 hrs.	64±5.10*	64±2.45*	68±2.00*
10g/100ml bark. 48 hrs.	62±6.20*	60±2.00*	66±4.00*
10g/100ml bark. 72 hrs.	60±7.75*	58±2.00*	64±2.45*
10g/100ml H.W.L.E.	82±3.74^{Ns}	66±5.10*	78±5.83*
10g/100ml H.W.B.E.	70±3.16*	48±3.74*	60±7.07*

Key; H.W.L.E = Hot water leaves extracts, H.W.B.E = Hot water bark extract. Ns = Non-significant, * = Significant at α > 0.01. Each value is the Grand mean and standard error of 5 replicates, each with 10 seeds.

This agrees with (Hussain and Ilahi, 2009; Hussain *et al.,* 2010) who's also proved that aqueous and hot water extract of *Cenchrus* and *Bothriochla* has the strong allelopathic behavior against test species. Our result also supported by (Lodhi and Nickell, 1973; Lodhi, 1976).

Likewise, in the length maximum inhibition was recorded as 61.9% for *T. alexandrinum,* 67.41% for *L. sativa* and 70.16% for *T. aestivum* while in case of plumule length *T. aestivum* showed highest reduction 73.33% by *aqueous* water extract of bark (Table No. 2).

Table 2. Effect of aqueous extracts of *L. edgeworthii* on the length of radicle and plumule of the test species.

Test species	*T. aestivum*		*L. sativa*		*T. alexandrinum*	
Treatments	Radicle	Plumule	Radicle	Plumule	Radicle	Plumule
Control	12.4±0.55	10.5±1.09	9.82±0.55	12.5±0.71	6.3±0.35	9.3±1.20
5g/100ml leaf. 24 hrs.	5.4±0.77*	4.1±0.68*	3.8±0.85*	5.0±0.11*	4.5±0.47*	6.7±1.50*
5g/100ml leaf. 48 hrs.	5.3±0.58*	4.0±0.53*	3.8±0.72*	5.0±0.23*	4.4±0.45*	6.6±0.93*
5g/100ml leaf. 72 hrs.	5.3±1.31*	4.0±0.84*	3.8±1.08*	4.9±0.32*	4.2±0.21*	6.4±0.64*
10g/100ml leaf. 24 hrs.	5.2±1.46*	3.8±0.79*	3.6±0.67*	4.8±0.56*	3.7±0.51*	6.3±0.49*
10g/100ml leaf. 48 hrs.	5.2±1.60*	3.6±1.12*	3.6±1.08*	4.8±0.89*	3.2±0.24*	6.2±0.22*
10g/100ml leaf. 72 hrs.	5.0±1.44*	3.6±1.25*	3.6±1.06*	4.8±0.49*	3.0±0.38*	6.2±0.73*
5g/100ml bark. 24 hrs.	4.3±1.25*	3.3±1.60*	3.7±1.07*	3.9±0.49*	2.9±0.38*	5.8±0.73*
5g/100ml bark. 48 hrs.	4.1±1.32*	3.2±1.34*	3.6±0.77*	3.9±1.08*	2.8±0.34*	5.6±0.71*
5g/100ml bark. 72 hrs.	4.0±1.29*	3.2±0.73*	3.6±0.72*	3.6±0.68*	2.8±1.03*	5.5±0.61*
10g/100ml bark. 24 hrs.	3.9±1.09*	3.2±0.84*	3.5±0.77*	3.5±0.46*	2.7±0.29*	5.5±1.11*
10g/100ml bark. 48 hrs.	3.8±1.58*	2.9±1.25*	3.4±0.96*	3.3±0.81*	2.7±0.60*	4.7±1.02*
10g/100ml bark. 72 hrs.	3.7±1.38*	2.8±1.10*	3.2±0.37*	3.0±0.44*	2.4±0.32*	4.7±0.63*
10g/100ml H.W.L.E.	3.9±0.56*	3.5±0.60*	3.8±0.49*	2.8±0.37*	4.7±0.54*	5.7±0.55*
10g/100ml H.W.B.E.	3.5±0.28*	2.6±0.40*	2.8±0.37*	2.0±0.63*	2.6±0.51*	2.8±0.37*

Key; H.W.L.E = Hot water leaves extracts, H.W.B.E = Hot water bark extract. Ns = Non-significant, * = Significant at α > 0.01. Each value is Grand mean and standard error of 5 replicates each having 10 seeds.

Likewise, all the test species less percent of control value i.e 59.2%, 30.9% and 43.9% in fresh weight and 53.7%, 18.7% and 13.0% in dry weight by *aqueous* bark extracts whereas 65.1%, 48.2% and 53.2% fresh weight and 59.5%, 43.7% and 21.0% dry weight by leaves extracts, while in case of hot water bark extracts 50.5%, 41.8% and 58.8% in fresh weight and 46.3%, 14.6% and 30.9% in dry weight was found for *T. aestivum, L. sativa, T. alexandrinum* respectively (Table No. 3).

Table 3. Effect of aqueous extracts of *L. edgeworthii* on the fresh and dry weight of the test species.

Treatments	fresh weight (% of Control)			Dry weight (% of Control)		
	T. aestivum	*L. sativa*	*T. alexandrinum*	*T. aestivum*	*L. sativa*	*T. alexandrinum*
5g/100ml leaf. 24 hrs.	66.2±0.91*	66.1 ±0.45*	59.8±0.63*	60.9±0.46*	63.5±1.73*	30.6±0.79*
5g/100ml leaf. 48 hrs.	66.1±1.47*	62.7±0.49*	57.1±1.39*	60.9±1.29*	63.2±1.86*	30.1±1.82*
5g/100ml leaf. 72 hrs.	65.4±1.67*	60.7±0.80*	56.3±2.73*	60.7±1.76*	59.8±1.88*	28.4±1.46*
10g/100ml leaf. 24 hrs.	65.3±1.65*	57.4±0.92*	55.3±2.79*	60.2±1.34*	57.2±1.11*	27.4±1.15*
10g/100ml leaf. 48 hrs.	65.3±1.91*	50.0±0.58*	55.0±1.56*	60.1±1.07*	44.6±0.87*	24.9±1.30*
10g/100ml leaf. 72 hrs.	65.1±0.09*	48.2±0.32*	53.2±2.38*	59.5±0.72*	43.7±0.40*	21.0±0.12*
5g/100ml bark. 24 hrs.	64.9±0.73*	46.4±3.37*	52.6±0.75*	57.3±2.75*	41.7±1.24*	20.0±0.67*
5g/100ml bark. 48 hrs.	64.4±2.20*	38.0±1.39*	51.4±0.33*	56.7±0.19*	27.6±0.92*	17.8±0.73*
5g/100ml bark. 72 hrs.	63.9±1.21*	34.6±1.16*	49.2±1.74*	56.5±1.92*	22.8±0.91*	16.4±0.94*
10g/100ml bark. 24 hrs.	61.4±1.27*	33.3±2.40*	47.2±0.11*	56.0±1.37*	21.3±2.43*	15.4±1.70*
10g/100ml bark. 48 hrs.	61.3±2.61*	31.2±1.74*	44.9±0.27*	55.9±0.63*	18.7±0.32*	14.7±2.29*
10g/100ml bark. 72 hrs.	59.2±2.43*	30.9±1.09*	43.9±1.69*	53.7±2.03*	18.7±1.10*	13.0±1.21*
10g/100ml H.W.L.E.	60.5±0.33*	53.1±0.60*	75.7±0.32*	56.5±2.21*	21.2±0.44*	41.4±0.40*
10g/100ml H.W.B.E.	50.5±2.43*	41.8±0.94*	58.8±0.32*	46.3±3.66*	14.6±0.31*	30.9±0.30*

Key; H.W.L.E = Hot water leaves extracts, H.W.B.E = Hot water bark extract. Ns = Non-significant, * = Significant at α > 0.01. Each value is the Grand mean and standard error of 5 replicates each having 10 seeds.

In case of moisture contents the less percent of control value was recorded for longer 72 hours' duration and higher 10g/100ml concentration of bark extract in *L. sativa, T. alexandrinum* and *T. aestivum* i.e. 04.0%, 49.2% and 56.2% respectively (Table No. 4).

Table 4. Effect of aqueous extracts of *L. edgeworthii* on the moisture contents and seminal roots of the test species.

Treatments	*T. aestivum*	*L. sativa*	*T. alexandrinum*	*T. aestivum*
	Moisture contents % of control	Moisture contents % of control	Moisture contents % of control	Mean number of seminal roots (% of control)
5g/100ml leaf. 24 hrs.	63.7±0.11*	38.7±0.31*	63.0±0.05*	46.4±0.24*
5g/100ml leaf. 48 hrs.	63.6±0.13*	28.0±0.19*	58.8±0.09*	42.9±0.24*
5g/100ml leaf. 72 hrs.	62.8±0.12*	26.2±0.23*	58.6±0.01*	39.3±0.20*
10g/100ml leaf. 24 hrs.	62.8±0.09*	18.9±0.74*	57.5±0.03*	35.7±0.00*
10g/100ml leaf. 48 hrs.	62.7±0.08*	14.5±0.78*	58.5±0.08*	32.1±0.20*
10g/100ml leaf. 72 hrs.	62.6±0.04*	09.5±0.64*	58.3±0.07*	28.6±0.24*
5g/100ml bark. 24 hrs.	62.6±0.14*	06.9±0.56*	58.1±0.04*	25.0±0.24*
5g/100ml bark. 48 hrs.	62.2±0.10*	06.3±0.45*	57.6±0.03*	21.4±0.20*
5g/100ml bark. 72 hrs.	61.6±0.11*	06.0±0.30*	55.1±0.06*	17.9±0.00*
10g/100ml bark. 24 hrs.	58.6±0.09*	05.6±0.88*	52.7±0.11*	14.3±0.20*
10g/100ml bark. 48 hrs.	58.4±0.05*	05.0±0.98*	49.5±0.09*	10.7±0.24*
10g/100ml bark. 72 hrs.	56.2±0.14*	04.0±0.46*	49.2±0.10*	07.1±0.24*
10g/100ml H.W.L.E.	57.4±0.11*	65.2±0.34*	83.6±0.04*	57.1±0.49*
10g/100ml H.W.B.E.	46.5±0.17*	48.2±0.44*	61.0±0.07*	46.4±0.51*
Leaves mulching	86.0±0.07*	61.0±0.41*	57.5±0.09*	25.8±0.24*
Bark mulching	71.0±0.08*	73.4±0.54*	41.5±0.03*	52.3±0.68*
Litter	83.6±0.10*	03.2±0.53*	08.3±0.05*	50.0±0.24*

Key; H.W.L.E = Hot water leaves extracts, H.W.B.E = Hot water bark extract. Ns = Non-significant,* = Significant at $\alpha > 0.01$. Each value is the Grand mean and standard error of 5 replicates each having 10 seeds.

Effect of mulching and litter

The mulching and litter of *L. edgeworthii* significantly inhibited the germination and overall growth of the selected test crop species. In case of mulching the bark caused maximum reduction in growth and germination of selected crop species followed by the leaves (Table No. 5). Our finding agrees with those of (Sher *et al.,* 2011) used *Populus euphratica,* (Sarah *et al.,* 2011) used *Polypogon monspeliensis* as mulching who's reported the same manners of allopathic potential of mulching and litter of the selected plant. The highest inhibition by mulch of the plant in germination was recorded for bark i.e 66%, 60% and 60%, similarly highest recorded value of inhibition in root (51.66%, 91.99% and 95.58%) and shoot (41.24%, 79.10% and 87.57%) in *T. aestivum, L. sativa* and *T. alexandrinum* respectively. The less percent of control value in fresh weight and moisture contents was recorded for *T. alexandrinum* caused by bark mulch i.e 51.10% and 41.5%, whereas in dry weight 26.20% percent of control value was showed by leaves mulch in *L. sativa*. It was also noticed that *L. sativa* and *T. alexandrinum* were the most suppressive species than *T. aestivum* (Table No. 4, 5). Our results are in agreement with those of (Khan *et al.,* 2005) who's also reported the allelopathic potential of *Accacia nilotica* (Maharian *et al.,* 2007) *Parthenium hysterophorus,* (Khan *et al.*, 2008) *Eucalyptus camaldulensis*, (Siddiqui *et al.,* 2009) *Prosopis juliflora*, (Barkatullah *et al.*, 2010) *Dodonaea viscosa*, and (Sher *et al.*, 2011) *Populus euphratica,* which reduced the germination as well as overall growth of test species.

Table 5. Effect of mulching of *L. edgeworthii* on the of germination and overall growth of the test species.

Treatments	Test species					
	T. aestivum	*L. sativa*	*T. alexandrinum*	*T. aestivum*	*L. sativa*	*T. alexandrinum*
	Germination					
Control	100.0±0.00	100.0±0.00	100.0±0.00	100±0.00	100±0.00	100±0.00
Leaves	64.0±2.45*	46.0±4.00*	50.0±3.16*	84.0±2.45*	26.6±0.68*	38.3±0.28*
bark	34.0±2.45*	40.0±3.16*	40.0±3.16*			
	Root length					
Control	72.4±1.12	14.8±0.37	12.8±0.37	13.3±0.58	20.6±0.40	12.5±0.22
Leaves	42.2±0.49*	7.2±0.48*	05.4±0.51*	03.6±0.41*	01.4±0.26*	02.7±0.31*
Bark	35.8±0.73*	05.8±0.37*	03.2±0.20*			
	Shoot length					
Control	106.2±0.60	47.4±0.51	31.2±0.58	07.6±0.24	14.7±0.38	23.4±0.24
Leaves	70.2±0.80*	24.2±0.80*	15.4±0.51*	01.9±0.30*	01.7±0.13*	03.1±0.32*
Bark	62.4±0.51*	22.2±0.58*	13.2±0.37*			
	Fresh weight % of control					
Leaves	86.4±0.51*	65.9±3.82*	66.1±2.32*	91.5±1.52*	27.4±0.45*	14.4±0.29*
Bark	72.2±0.37*	58.5±0.58*	51.1±1.00*			
	Dry weight % of control					
Leaves	83.9±0.40*	46.2±0.40*	59.8±0.37*	96.7±0.98*	31.9±0.29*	24.5±0.25*
Bark	72.6±0.86*	26.9±0.71*	39.9±0.37*			

Key; Ns = Non-significant, * = Significant at α > 0.01. Each value is the Grand mean and standard error of 5 replicates each having 10 seeds.

Effect of all parameters on seminal roots growth and number of T. aestivum

The number of seminal roots of *T. aestivum* were also significantly inhibited by all the parameter including aqueous extracts, mulching and litter (Table No. 4). The inhibition in the seminal root number and growth was found in the same manner that higher concentration at longer soaking duration of bark aqueous extract caused maximum inhibition followed by the leaves extract. This agree with (Sarah *et al.,* 2011) reported the mulching, litter and aqueous extracts of *Polypogon monspeliensis* and (Ahmad *et al.,* 2014) reported *Celtis australis* as a allelopatic plant, which showed strong effect in case of germination, overall growth and seminal roots numbers.

Overall finding agrees with (El-Khatib *et al.,* 2004) who's reported *Chenopodium murale*. Leaf litter leachates of *Derris scandens, Cymbopogon citratus, Tamarindus indicia* and *Gliricidia sepium* (Fritz *et al.,* 2007) used Ethanolic extracts from *Hypericum myrianthum* which retarded the germination and overall growth of the species. This results also supported by (Nasrine *et al.,* 2011) who's reported *Euphorbia guyoniana, Retama retam, Bromus tectorum, Melilotus indica* and *Triticum aestivum*. (Nekonam *et al.,* 2014) reported *Crocus sativum, Ricinus communis, Nicotine tabacum, Datura inoxia, Nerium oleander and Sorghum vulgare* which showed significant inhibitory effect on overall growth of the test species.

Conclusion

From the present results, it was concluded that *L. edgeworthii* has strong allelopathic potential against the selected crop species. Further exploration is required for isolation of the active phytochemicals

that cause inhibition, which may provide basis for the development of novel herbicides of biological origin. Biological herbicides are environment friendly and produce minimal adverse effects in comparison to synthetic herbicides.

Acknowledgements

I am thankful to Adnan Khan, Hazrat Ali, Musawer Khan, Fawad Ahmad, Zahid Ullah and Haider Abas for helping me in the plant collection. In last I am also thankful to Dr. Fazle Malik Sarim (Ex- Chairmain Department of Botany, BKUC) for providing me the laboratory facilities.

References

Ahmad I, Hussain F, Barakatullah, Ahmad B. 2014. Phytotoxic potential of *Celtis australis* L. (Family Ulmaceae) against four crop species. Pakistan Journal of Botany **46(6)**, 2063-2067.

Al-Watban A, Salama HMH. 2012. Physiological effects of allelopathic activity of *Artemisia monasperma* on common bean (*Phaseolus vulgaris* L.). International Research Journal of Plant Science **3(8)**, 158-163.

AN M, Pratley JE, Haig T. 1996. Differential phytotoxicity of Vulpia species and their plant parts. Allelopathy Journal **3(2)**, 185-194.

Araniti F, Sorgona A, Lupini A, Abenavoli MR. 2012. Screening of Mediterranean wild plant species for allelopathic activity and their use as bio-herbicides. Allelopathy Journal 29(1), 107-124.

Barkatullah, Hussain F, Ibrar M. 2010. Allelopathic potential of *Dodonaea viscosa* (L.) Jacq. Pakistan Journal of Botany **42(4)**, 2383-2390.

Ben-Hammouda M, Ghorbal H, Kremer RJ, Oueslatt O. 2002. Journal of Plant Nutrition **25(6),** 1155-1161.

Bouchikh-Boucif Y, Labani A, Benabdeli K, Bouhelouane S. 2014. Allelopathic Effects of Shoot and Root Extracts from Three Alien and Native Chenopodiaceae Species on Lettuce Seed Germination. Ecologia Balkanica **6(2),** 51-55.

Buer CS, Imin N, Djordjevic MA. 2010. Flavonoids: New Roles for Old Molecules. Journal of Integrative Plant Biology **52(1)**, 98-111. http://dx.doi.org/10.1111/j.1744-7909.2010.00905.x

Cesco S, Mimmo T, Tonon G, Tomasi N, Pinton R, Terzano R, Neumann G, Weisskopf L, Renella G, Landi L, Nannipieri P. 2012. Plant-borne flavonoids released into the rhizosphere: impact on soil bio-activities related to plant nutrition. A review. Biology and Fertility of Soil **48**, 123-149. http://dx.doi.org/10.1007/s00374-011-0653-2

Chen L, Yang X, Raza W, Li J, Liu Y, Qiu M, Zhang F, Shen Q. 2011. *Trichoderma harzianum* SQR-T037 rapidly degrades allelochemicals in rhizospheres of continuously cropped cucumbers. Applied Microbiology and Biotechnology **89**, 1653-1663. http://dx.doi.org/10.1007/s00253-010-2948-x

Duke SO. 2015. Proving Allelopathy in Crop-Weed Interactions. Weed Science **63(1)**, 121-132. http://dx.doi.org/10.1614/WS-D-13-001.30.1

Duke SO, Dayan FE, Rimando AM, Schrader KK, Aliotta G, Oliva A, Romagni JG. 2002. Invited Paper Chemicals from nature for weed management. Weed Science **50**, 138-151.

El-Khatib AA, Hegazy AK, Galal HK. 2004. Allelopathy in the rhizosphere and amended soil of *Chenopodium murale* L. Weed Biology and Management **4**, 35-42. http://dx.doi.org/10.1111/j.1445-6664.2003.00115.x

Ells JE, Mcsay AE. 1991. Allelopathic Effects of Alfalfa Plant Residues on Emergence and Growth of Cucumber Seedlings. Hort Science **26(4)**, 368-370.

Fiorentino A, Abrosca BD, Pacifico S, Izzo A, Letizia M, Esposito A, Monaco P. 2008. Potential allelopatic effects of stilbenoids and flavonoids from leaves of *Carex distachya* Desf. Biochemical Systematics and Ecology **36**, 691-698. http://dx.doi.org/10.1016/j.bse.2008.07.002

Fritz DA, Brnardi, Haasl JS, Ascoli BM, Bordignon SAL, Poser GV. 2007. Germination and growth inhibitory effects of *Hypericum myrianthum* and *H. polyanthemum* extracts on *Lactuca sativa* L. Revista Brasileira de Farmacognosia **17(1)**, 44-48. http://dx.doi.org/10.1590/S0102695X2007000100010

Gantayet PK, Adhikary SP, Lenka KC, Padhy B. 2014. Allelopathic impact of *Lanthara camara* on vegetative growth and yield components of Gram (*Phaseolus radiatus*). International Journal of Current Microbiology and Applied Sciences **3(7)**, 327-335.

Hussain F, Ilahi I. 2009. Allelopathic potential of *Cenchrus ciliaris* L. and *Bothriochloa pertusa* (L.). A Camus Journal of Science Technology **33(2),** 47-5.

Hussain F, Ahmad B, Ilahi I. 2010. Allelopathic effects of *Cenchrus ciliaris* L. and *Bothriochloa pertusa* (L.) A. Camus. Pakistan Journal of Botany **42(5)**, 3587-3604.

Inderjit, Seastedt TR, Callaway RM, Pollock JL, Kaur J. 2008. Allelopathy and plant invasions: traditional, congeneric, and bio-geographical approaches. Biological Invasions **10**, 875-890. http://dx.doi.org/10.1007/s10530-008-9239-9

Javaid A. 2010. Herbicidal potential of allelopathic plants and fungi against *Parthenium hysterophorus* - A review. Allelopathy Journal **25(1)**, 331-344.

Javaid A, Anjum T. 2006. Control of *Parthenium hysterophorus* L., by aqueous extracts of allelopathic grasses. Pakistan Journal of Botany **38(2)**, 139-145.

Kamal J. 2011. Quantification of alkaloids, phenols and flavonoids in sunflower (*Helianthus annuus* L.). African Journal of Biotechnology **10(16)**, 3149-3151. http://dx.doi.org/10.5897/AJB09.1270

Khan M, Hussain F, Mushararaf S. 2011. Allelopathic potential of *Rhazya stricta* decne on germination of *Pennistum typhoides*. International Journal of Biosciences **1(4)**, 80-85.

Khan MA, Hussain I, Khan EA. 2008. Allelopathic effects of Eucalyptus (*Eucalyptus camaldulensis* L.) on germination and seedling growth of wheat (*Triticum aestivum* L.). Pakistan Journal of Weed Science Research **14(1-2),** 9-18. ISSN : 1815-1094.

Khan MA, Marwat KB, Hassan G, Hussain Z. 2005. Bioherbicidal effects of tree extracts on seed germination and growth of crops and weeds. Pakistan Journal of Weed Science Research **11(3-4)**, 89-94.

Khanh TD, Chung MI, Xuan TD, Tawata S. 2005. The Exploitation of Crop Allelopathy in Sustainable Agricultural Production. Journal of Agronomy and Crop Science **191,** 172-184. http://dx.doi.org/10.1111/j.1439-037X.2005.00172.x

Kong CH, Wang P, Zhao H, Xu XH, Zhu YD. 2008. Impact of allelochemical exuded from allelopathic rice on soil microbial community. Soil Biology and Biochemistry **40**, 1862-1869. http://dx.doi.org/10.1016/j.soilbio.2008.03.009

Li ZH, Wang Q, Ruan X, Pan CD, Jiang DA. 2010. Phenolics and plant Allelopathy. Molecules **15,** 8933-8952. http://dx.doi.org/10.3390/molecules1512.89.33

Lodhi MAK. 1976. Role of allelopathy as expressed by dominating trees in a lowland forest in controlling the productivity and pattern of herbaceous growth. American Journal of Botany **63(1)**, 1-8. www.jstor.org/stable/2441664

Lodhi MAK, Nickell GN. 1973. Effects of leaf extracts of *Celtis laevigata* on growth, water content, and carbon dioxide exchange rates of three grass. Bulletin of the Torrey Botanical Club **100(3)**, 159-165. http://dx.doi.org/10.2307/2484627

MA HJ, Shin DH, Lee IJ, Koh JC, Park SK, Kim KU. 2006. Allelopathic potential of K21, selected as a promising allelopathic rice. Weed Biology and Management **6**, 189-196. http://dx.doi.org/10.1111/j.1445-6664.2006. 00219.x

Machado S. 2007. Allelopathic potential of various plant species on downy brome: implication for weed control in wheat production. Agronomy Journal **99,** 127-132.
http://dx.doi.org/10.2134/agronj2006.0122

Maharjan S, Shrestha BB, Jha PK. 2007. Allelopathic effects of aqueous extract of leaves of *Parthenium hysterophorus* L. on seed germination and seedling growth of some cultivated and wild herbaceous species. Scientific World **5(5)**, 33-39.

Mancini E, Arnold NA, Martino LD, Feo VD, Formisano C, Rigano D, Senatore F. 2009. Chemical Composition and Phytotoxic Effects of Essential Oils of Salvia hierosolymitana Boiss. and *Salvia multicaulis* Vahl. var. *simplicifolia* Boiss. Growing Wild in Lebanon. Molecules **14**, 4725-4736.
http://dx.doi.org/10.3390/molecules14114725

Mutlu S, Atici O. 2009. Allelopathic effect of Nepeta meyeri Benth. extracts on seed germination and seedling growth of some crop plants. Acta Physiologiae Plantarum **31**, 89-93.
http://dx.doi.org/10.1007/s11738-008-0204-0

Nasrine S, El-Darier MS, El-Taher MH. 2011. Allelopathic Effect from some Medicinal Plants and Their Potential Uses as control of weed. International Conference on Biology, Environment and Chemistry **24,** 15-22.

Nekonam MS, Razmjoo J, Kraimmojeni H, Sharifnabi B, Amini H, Bahrami F. 2014. Assessment of some medicinal plants for their allelopathic potential against redroot pigweed (*Amaranthus retroflexus*). Journal of Plant Protection Research **54(1)**, 90-95.
http://dx.doi.org/10.2478/jppr-2014-0014

Nektarios PA, Economou G, Avgoulas C. 2005. Allelopathic effects of Pinus halepensis needles on turfgrasses and biosensor plants. Hort Science **40(1)**, 246-250.

Pacanoski Z, Velkoska V, TYR S, Veres T. 2014. Allelopathic potential of jimson weed (*Datura stramonium* L.) on the early growth of maize (*Zea mays* L.) and sun flower (*Hellianthus annuus* L.). Journal of Central European Agriculture **15(3),** 198-208.
http://dx.doi.org/10.5513/JCEA01/15.3.1474

Padilla FM, Pugnaire FI. 2006. The role of nurse plants in the restoration of degraded environments. Frontiers in Ecology and Environment **4(4),** 196-202.

Pourcel L, Routaboul JM, Cheynier V, Lepiniec L, Debeaujon I. 2006. Flavonoid oxidation in plants: From Biochemical properties to physiological functions. Trends in Plant Science **12(1),** 1360-1385.
http://dx.doi.org/10.1016/j.tplants.2006.11.006

Qasim JR. 2001. Allelopathic Potential of White Top and Syrian Sage on Vegetable Crops. Agronomy Journal **9**, 64-71.

Quan YJ, Ye SF, Zhang MF, Hu WH. 2003. Effects of root exudates and aqueous root extracts of cucumber (*Cucumis sativus*) and allelochemicals, on photosynthesis and antioxidant enzymes in cucumber. Biochemical Systematics and Ecology **31,** 129-139.
http://dx.doi.org/10.1016/S0305-1978(02)00150-3

Saad MMG, Abdelgaleil SAM. 2014. Allelopathic potential of essential oils isolated from Aromatic plants on *Slybum marianum*. Global Advanced Research Journal of Agricultural Science **3(9)**, 289-297.
http://garj.org/garjas/index.htm

Sanchez MAM, Weiss OA, Reigosa-Roger MJ. 2004. Allelopathic Evidence in the Poaceae. The Botanical Review **69(3)**, 300-319.

Sarah S, Hussain F, Ehsan M, Burni T. 2011. Allelopathic potential of *Polypogon monspeliensis* L. against two cultivars of wheat. African Journal of Biotechnology **10(85),** 19723-19728.
http://dx.doi.org/10.5897/AJB11.1528

Shaw LJ, Morris P, Hooker JE. 2006. Perception and modification of plant flavonoid signals by rhizosphere microorganisms. Environmental Microbiology **8(11),** 1867-1880. http://dx.doi.org/10.1111/j.1462-2920.2006. 01141.x

Sher Z, Hussain F, Ahmad B, Wahab M. 2011. Allelopathic potential of *Populus euphratica* Oliver. Pakistan Journal of Botany **43(4),** 1899-1903.

Siddiqui S, Bhardwaj S, Khan SS, Meghvanshi MK. 2009. Allelopathic effect of different concentration of water extract of *Prosopsis juliflora* leaf on seed germination and radicle length of wheat (*Triticum aestivum* var-lok-1). American-Eurasian Journal of Scientific Research **4(2)**, 81-84.

Siddiqui ZS, Arif-Uz-Zaman. 2005. Effects of Capsicum Leachates on Germination, Seedling Growth and Chlorophyll Accumulation in *Vigna Radiata* (L.) Wilczek Seedlings. Pakistan Journal of Botany **37(4),** 941-947.

Sisodia S, Siddiqui MB. 2010. Allelopathic effect by aqueous extracts of different parts of Croton *Bonplandianum baill.* on some crop and weed plants. Journal of Agricultural Extension and Rural Development **2(1),** 022-028. www.academicjournals.org/jaerd

Taylor LP, Grotewold E. 2005. Flavoniods as developmental regulators. Current Opinion in Plant Biology **8**, 317-323. http://dx.doi.org/10.1016/j.pbi.2005.03.005

Terzi I. 2008. Allelopathic effects of Juglone and decomposed walnut leaf juice on muskmelon and cucumber seed germination and seedling growth. African Journal of Biotechnology **7(12),** 1870-1874. www.academicjournals.org/AJB

Vidal RA, Bauman TT. 1997. Fate of Allelochemicals in the soil. Ciencia Rural Santa Maria **27(2),** 351-357. http://dx.doi.org/10.1590/S01038478199700020003 2

Weston LA, Mathesius U. 2013. Flavonoids: Their Structure, Biosynthesis and Role in the Rhizosphere, Including Allelopathy. Journal of Chemical Ecology **39**, 283-297. http://dx.doi.org/10.1007/s10886-013-0248-5

Yadav K, Singh NB. 2013. Effects of benzoic acid and cadmium toxicity on wheat seedlings. Chilean Journal of Agricultural Research **73(2),** 168-174. http://dx.doi.org/10.4067/S07185839201300020001 3