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ALLELOPATHIC EFFECTS OF AQUEOUS AND ORGANIC FRACTIONS OF *Euphorbia dracunculoides* LAM. ON GERMINATION AND SEEDLING GROWTH OF CHICKPEA AND WHEAT

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Identification of weed species with allelopathic potential and characterization of their adverse effects against associated crops is required for better understanding of weed-crop interactions. Phytotoxic activity of *Euphorbia dracunculoides* Lam. on germination and seedling growth of chickpea (*Cicer arietinum* L.) and wheat (*Triticum aestivum* L.) was investigated under controlled conditions. Two separate studies were done with each of four organic solvent fractions (n-hexane, chloroform, ethylacetate, 1-butanol) and crude aqueous (1:10 and 1:20) whole plant fractions of *E. dracunculoide*s using distilled water and 0.05% (v/v) dimethyl sulfoxide (DMSO) as control. Different aqueous and organic fractions of *E. dracunculoides* had a significant bearing on germination attributes and seedling growth that varied among tested species. The final germination percentage of wheat remained unaffected; nevertheless, root and shoot elongation and biomass accumulation in these parts were significantly retarded. Aqueous fractions appeared more phytotoxic than organic fractions and suppressed chickpea germination by 35-53%. These aqueous fractions also reduced root (64-75% and 33-34%) and shoot (18-62% and 21%) length and root (32-33% and 42-46%) and shoot (7-32% and 80-84%) dry weight of wheat and chickpea, respectively. Among organic fractions, n-hexane was more suppressive to test species. Chromatographic analysis revealed the presence of four phytotoxins, furoic, *p*-coumaric, syringic, and caffeic acids, in aqueous whole plant (1:10) fractions. This study determined the phytotoxic allelopathic activity of *E. dracunculoides* against wheat and chickpea.

Key words: Allelopathy, weeds, germination attributes, suppression, phenolics.

Weeds are the most prevalent or dominant class of pests and interfere with crop plants through competition and allelopathy, resulting in direct quantity and quality loss of produce. Allelopathy is a mechanism that weeds often utilize to affect germination dynamics and growth of field crops (Qasem and Foy, 2001; Kadioglu *et al*., 2005; Benyas *et al*., 2010) in order to establish weedy monoculture by influencing species patterning in agro-ecosystems (Weston and Duke, 2003). Living as well as dead weed tissues that are left in the soil after completing the life cycle can have deleterious effects on the same or subsequent crops by releasing allelochemicals (Batish *et al*., 2007). These allelochemicals are reported to be present in almost all plant parts, including stems, leaves, flowers, buds, pollen grains, seeds, fruits, roots, and rhizomes (Rice, 1984; Singh *et al*., 2003). However, differences are observed among species regarding their allelopathic potential and their ability to produce toxins in various parts (Qasem and Foy, 2001; Veenapani, 2004).

Among 7500 species of Euphorbiaceae, many are known as weeds that exert allelopathic activity on crops. The allelopathic potential of extracts, residues and root secretions of *Euphorbia corollata* L. (Rice, 1964), *E. esula* L. (Manners, 1987), *E. geniculata* Ortega (Sugha, 1979), *E. granulata* Forssk (Hussain, 1980), *E. hirta* L. (Tiwari *et al*., 1985), *E. prostrata* Aiton (Alsaadawi *et al*., 1990), *E. hierosolymitana* Boiss. (Abu-Romman *et al*., 2010) and *E. helioscopia* L. (Qasem, 1995; Tanveer *et al*., 2010) have been reported against crops like pea, tomato, wheat, chickpea, cotton, alfalfa, lettuce, groundnut, and soybean. Allelopathic activity has been attributed to several phytotoxins like phenolic acids (gallic, tannic), kaemferol 3-glucuronide and 1-hexacosanol (Rice, 1969; Manners, 1987) present in these species.

Beside these species, dragon spurge (*E. dracunculoides* Lam.) is also an important component of weed flora in winter crops like wheat and chickpea (Marwat *et al*., 2004; Tanveer, 2008), especially in rainfed areas. Identification of weed species with allelopathic potential and characterization of their adverse effects against associated crops is required for a better understanding

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of weed-crop interactions. Moreover, magnitude of allelopathic suppression is believed to vary with sample preparation and extraction techniques (Zieliński and Kozłowska, 2000; Javaid *et al*., 2011). Little is known about the allelopathic influence of *E. dracunculoides* against associated crops. The following studies therefore were conducted to evaluate the allelopathic potential of *E. dracunculoides* on germination and early seedling growth of wheat (*Triticum aestivum* L.) and chickpea (*Cicer arientinum* L.), main cereal and pulse crops in Pakistan.

MATERIALS AND METHODS

Seed source

Seeds of wheat ('Sehar-2006') and chickpea ('CM-2000') were obtained from Ayub Agriculture Research Institute, Faisalabad, Pakistan. The seeds were manually cleaned to ensure physical purity and the surfaces were sterilized with fungicide.

Extraction and portioning of *E. dracunculoides* plant material

Field grown plants of *E. dracunculoides* were uprooted at maturity (with seeds enclosed in fruit) and dried at room temperature. The well-dried plant material was chopped into 2-3 cm pieces and dried in an oven at 70 °C for 48 h. The oven-dried material was ground (Cyclotec 1093 Sample Mill, Sweden) and passed through a 40-mesh screen. The ground material (1 kg) was extracted in 3 L of 80% ethanol-water solution at room temperature for 24 h. The aqueous ethanolic extract of whole plant was obtained by filtering extracts through a filter paper using a vacuum pump (type N820.3FT18, KNF Neuberger GmbH, Freiburg-Munzingen, Germany). This filtrate was concentrated to crude brown gum, which was then dissolved in 1 L distilled water, acidified with 10% acetic acid (pH 4), washed with hexane to remove fats and neutral material. It was sequentially portioned against n-hexane, chloroform, ethyl acetate, 1-butanol, and water (Figure 1). Each of the four organic solvent fractions were dried over anhydrous Na_2SO_4 and evaporated to dryness below 40 °C. Different fractions were weighed and dissolved in 0.05% (v/v) dimethyl sulfoxide (DMSO). The extracts were collected in separate bottles (stock) and tagged.

Bioassay

Ten seeds each of wheat and chickpea were placed evenly on Whatman # 42 filter paper in sterilized Petri dishes of 9 cm diameter. Five mL of respective organic solvent fraction or crude extract was added to Petri dishes as treatment. The same volume of distilled water and 0.05% DMSO was applied to two separate control treatments. Half of the solution was used to moisten the filter paper receiving seeds while the remaining half was applied to the covering filter paper. The Petri dishes were maintained under laboratory conditions (room temperature 25 °C ± 2

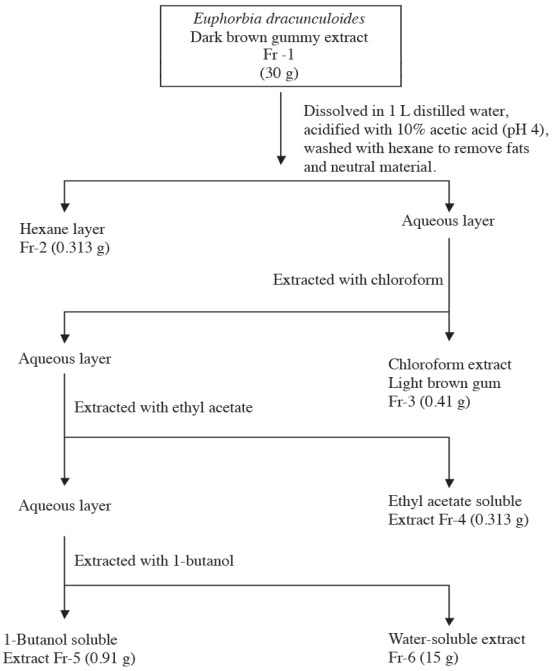

Figure 1. Scheme showing the procedure for extraction and portioning of dried ethanol extract of *Euphorbia dracunculoides* (adapted from Iqbal *et al*., 2002).

at midday with diffused light during day) for 2 wk. The same volume of distilled water was added to the dishes when the moisture content of the filter paper decreased. The outer filter paper was removed just before the initiation of germination.

Germination counts were recorded on a daily basis according to AOSA (1990) until a constant count was achieved. Seeds were considered to have germinated when the radicle and hypocotyl lengths were over 2 mm.

The time elapsed before 50% emergence (E_{50}) was calculated according to the modified formulae of Farooq *et al*. (2005):

$$E_{50} = t_i + \frac{\left(\frac{N}{2} - n_i\right)(t_j - t_i)}{n_j - n_i} \quad [1]$$

where N is the final number of emerged seeds, and n_i and n_j are the cumulative number of seeds emerged by adjacent counts at times t_i and t_j where $n_i < N/2 < n_j$.

Mean emergence time (MET) was calculated according to Ellis and Roberts (1981) as:

$$MET = \Sigma Dn/\Sigma n \quad [2]$$

where n is the number of seeds, which were emerged on day D, and D is the number of days counted from the beginning of emergence.

Emergence Index was computed as described by AOSA (1983):

$$EI = \frac{N^o \text{ of emerged seeds}}{\text{Days of first count}} + \text{------} + \frac{N^o \text{ of emerged seeds}}{\text{Days of final count}} \quad [3]$$

Root and shoot lengths were measured after 14 d with a measuring tape. All roots and shoots from each Petri dish were cut separately and oven dried at 70 °C for 48 h to get dry biomass of root and shoot. The seedling vigor index was calculated according to the following formula of Abdul-Baki and Anderson (1973) as:

$$SVI = Germination\ (\%) \times Radicle\ length\ (cm) \quad [4]$$

Detection of phytotoxins and bioassays with detected compounds

Due to their greater suppression potential, aqueous *E. dracunculoides* extracts were chemically analyzed with the High Performance Liquid Chromatography system (Model SCL-10A, Shimadzu HPLC, Tokyo, Japan) for identification and quantification of suspected phytotoxins. The separation conditions are listed in Table 1.

The peaks were detected by a UV detector. Standards of suspected phytotoxins (Aldrich, St. Louis, Missouri, USA) were run for identification and quantification. Standards of phenolics were prepared in different concentrations. Furoic, coumaric, syringic, and caffeic acids were identified by their retention time with authentic standards. The concentration of each isolated compound was determined by the following equation:

Table 1. HPLC conditions to determine phytotoxins in aqueous *Euphorbia dracunculoides* extracts (whole plant 1:10).

Parameter	Characteristic
Column dimensions	25 cm length × 4.6 mm diameter, particle size 5 μm
Diatomite	Supleco wax 10
Attenuation	0.01 mg L^{-1}
Rate of recorder	10 mm min^{-1}
Detector	SPD-10A vp-detector
Detection	UV, 280 nm
Flow rate	0.25 mL min^{-1}
Volume injection sample	50 μL
Type of column	Shim-pack CLC-octadecyl silicate (ODS) (C-18)
Mobile phase	Isocratic; 100% methanol
Temperature	25 °C

$$\text{Concentration (ppm)} = \frac{\text{Area of sample}}{\text{Area of standard}} \times \text{Concentration of standard} \times \text{Dilution factor} \quad [5]$$

The activities of the identified compounds were evaluated with the seed of both tested species. An equimolar solution of analytical grade furoic, *p*-coumaric, syringic, and caffeic acids (10^{-3} M) was prepared in distilled water. The solution was stored at 5 °C until subsequent use.

Twenty seeds each of chickpea and wheat were placed separately and uniformly on a Whatman # 42 filter papers in a 9-cm diameter Petri dishes. Some 5 mL of tested solution of each phytotoxin was applied in respective Petri dishes. A distilled water control was maintained for each tested species. Germination percentages of test species were recorded using standard procedures (AOSA, 1990). The percentage of germination was determined after a constant count was achieved.

Experimental design and statistical analysis

All the experiments were quadruplicated in a completely randomized design and repeated twice. A separate experiment was conducted for each tested species. Treatment means were separated by the Least Significant Differences test (LSD) at $P \leq 0.05$. Data were analyzed following an ANOVA with MSTAT-C software.

RESULTS AND DISCUSSION

Germination traits of wheat and chickpea were negatively influenced by aqueous and organic fractions of *E. dracunculoides* (Table 2). There were significant ($P \leq 0.05$) delays in E_{50} over control in all the treatments of both wheat and chickpea. However, these delays were more pronounced for chickpea, in which the n-hexane fraction accounted for the maximum delay and was at par ($P \leq 0.05$) with the chloroform fraction. On the other

Table 2. Influence of aqueous and organic fractions of *Euphorbia dracunculoides* extracts on germination attributes of wheat and chickpea.

Treatment	E_{50}		Final germination		Mean germination time		Emergence index	
	Wheat	Chickpea	Wheat	Chickpea	Wheat	Chickpea	Wheat	Chickpea
	d		%		d			
Water (control)	2.34ab	2.20d	100.00^{ns}	85.00a	2.35d	2.47e	4.62b	6.56a
Aqueous extract (1:10)	2.51a	4.16b	100.00	35.00f	4.13ab	3.59cd	1.42d	1.23e
	(7)[1]	(89)	(0)	(-53)	(76)	(53)	(-69)	(-81)
Aqueous extract (1:20)	2.41ab	2.60cd	100.00	55.00d	3.46c	3.60cd	1.58d	1.47e
	(3)	(18)	(0)	(-35)	(47)	(53)	(-66)	(-78)
0.5% DMSO	1.82c	2.67c	100.00	75.00b	4.35a	4.56a	3.65c	4.29c
	(-22)	(21)	(0)	(-12)	(85)	(94)	(-21)	(-35)
n-Hexane	2.56a	4.61a	100.00	45.00e	4.60a	4.11bc	3.34c	3.99c
	(9)	(109)	(0)	(-47)	(96)	(75)	(-28)	(39)
Chloroform	2.16b	4.38ab	100.00	55.00d	4.62a	4.95a	3.46c	3.37d
	(-7)	(99)	(0)	(-35)	(97)	(111)	(-25)	(-49)
Ethylacetate	1.68c	2.51cd	100.00	65.00c	4.38a	4.52ab	3.55a	5.50b
	(-28)	(14)	(0)	(-23)	(86)	(92)	(-23)	(-16)
1-Butanol	2.39ab	2.27cd	100.00	55.00d	3.63bc	3.44d	3.47c	3.45d
	(2)	(3)	(0)	(-35)	(54)	(46)	(-25)	(-47)
LSD ≤ 0.05	0.292	0.423	-	8.426	0.603	0.524	0.336	0.484

Means with different letters differ at 5% level of probability by LSD test.
[1]Numbers given in parenthesis show percent change over control. ^{ns}: non significant.

hand, final germination of wheat remained unaffected by the extract application. Final germination of chickpea was inhibited principally (53%) by the aqueous (1:10) fraction, followed by the n-hexane fraction at 47%. The aqueous (1:20) and chloroform fractions were responsible for statistically similar suppression of final chickpea germination. Mean emergence time of wheat and chickpea was also increased by all the aqueous and organic fractions over control. The chloroform fraction scored maximum (97 and 111%) delays in MGT for wheat and chickpea, respectively, and it was statistically similar ($P \leq 0.05$) with the n-hexane and aqueous fractions for wheat, and the ethyl acetate fraction for chickpea. Significantly ($P \leq 0.05$) lower EI values than those for control were also recorded. Drastic reductions in EI compared to those of the control were obtained by aqueous fractions (1:10 and 1:20) for both wheat and chickpea and were statistically similar ($P \leq 0.05$).

Root and shoot length of wheat and chickpea were also significantly ($P \leq 0.05$) suppressed by the aqueous and organic fractions of *E. dracunculoides* (Table 3). Aqueous fractions caused significant reduction in root (64-75% and 33-34%) and shoot (18-62% and 21%) length over control in wheat and chickpea, respectively. Among the organic fractions, n-hexane and chloroform were most significant in retarding root and shoot elongation of the tested species. Shoot and root dry weight was also reduced under all treatments over control. Aqueous fractions scored maximum reduction in root (32-33% and 42-46%) and shoot (7-32% and 80-84%) dry weight of wheat and chickpea, respectively. Among the organic fractions, n-hexane accounted for greater suppression in root (19 and 35%) and shoot (5 and 75%) dry weight of wheat and chickpea, respectively. Significantly ($P \leq 0.05$) lower SVI values than those of the control were obtained by the aqueous *E. dracunculoides* fractions, which were statistically similar ($P \leq 0.05$) to those obtained with organic fractions of n-hexane and chloroform. Wheat seedling growth was improved by 0.5% DMSO compared to the distilled water control. Chromatographic analysis (Table 4) revealed the presence of four phytotoxins namely furoic, *p*-coumaric, syringic and caffeic acids in aqueous whole plant (1:10) fraction of *E. dracunculoides*. Furoic acid was the predominant (904 mg μL^{-1}) compound detected in this fraction. A considerable amount of syringic acid was also found in aqueous whole plant fraction, while *p*-coumaric and caffeic acids were detected in lesser amounts. Bioassay with these detected compounds showed inhibition of chickpea and wheat germination over control. Maximum suppression of chickpea and wheat germination was obtained by syringic and caffeic acids, respectively, that was at par with syringic acid regarding wheat germination (Table 5).

Analysis and interpretation of the results reveal significant inhibition of germination dynamics (except wheat) and seedling growth of species tested under the influence of the different treatments. The suppression was allelopathic in nature, and detection of phytotoxic

Table 4. Chromatographic analysis of *Euphorbia dracunculoides* aqueous whole plant extracts (1:10).

Detected compound	Concentration	Retention time	Peak area	Peak area	Peak height	Peak height
	$\mu g\ mL^{-1}$	min	mV	%	mV	%
Furoic acid	904	10.53	1440.7	18.4	17.77	9.3
p-Coumaric acid	1.21	12.99	184.24	2.3	5.98	3.1
Syringic acid	8.98	18.32	561.78	7.2	2.30	1.2
Caffeic acid	0.52	22.36	75.47	8.9	0.41	2.6

Table 5. Influence of detected phytotoxins on germination of wheat and chickpea.

	Germination (%)	
Tested phytotoxin	Wheat	Chickpea
Control	95.00 ± 2.87a	91.67 ± 1.67a
Furoic acid	83.33 ± 1.67b	76.67 ± 1.67b
p-Coumaric acid	83.33 ± 1.67b	78.33 ± 1.67b
Syringic acid	75.00 ± 2.88c	66.67 ± 3.33c
Caffeic acid	72.67 ± 1.67c	75.0 ± 2.87b
LSD ≤ 0.05	7.046	7.427

Means with different letters differ at 5% level of probability by LSD test.

Table 3. Influence of aqueous and organic fractions of *Euphorbia dracunculoides* extracts on seedling growth of wheat and chickpea.

	Root length		Shoot length		Root dry weight		Shoot dry weight		Seedling vigor index	
Treatment	Wheat	Chickpea	Wheat	Chickpea	Wheat	Chickpea	Wheat	Chickpea	Wheat	Chickpea
	cm				mg seedling^{-1}					
Water (control)	9.25b	3.40a	9.28a	3.35a	67.75b	52.00a	86.50c	337.00a	925.50b	257.78a
Aqueous extract (1:10)	2.34f (-75)	2.29cd (-33)	3.52e (-62)	2.41b (-21)	46.25d (-32)	30.00de (-42)	59.00d (-32)	55.00g (-84)	234.50f (-75)	130.30cd (-49)
Aqueous extract (1:20)	3.28e (-64)	2.25d (-34)	7.61c (-18)	2.40b (-21)	45.50d (-33)	28.00e (-46)	80.75c (-7)	66.00fg (-80)	328.50e (-64)	122.80d (-52)
0.5% DMSO	13.01a (40)	3.45a (2)	9.13ab (-2)	3.53a (16)	90.75a (34)	44.75b (-14)	91.25ab (5)	236.00c (-30)	1301.3a (41)	249.95a (-3)
n-Hexane	2.57ef (-72)	2.65bc (-22)	2.74f (-70)	2.31b (-24)	54.75c (-19)	34.00d (-35)	82.00c (-5)	84.50ef (-75)	257.75ef (-72)	125.45d (-51)
Chloroform	2.89ef (-69)	2.72b (-20)	6.01d (-35)	2.41b (-21)	58.50c (-14)	40.50bc (-22)	88.00abc (2)	157.25d (-53)	289.75ef (-69)	149.18bc (-42)
Ethyl acetate	4.17d (-55)	2.76b (-19)	8.67b (-6)	2.46b (-19)	70.25b (4)	57.25a (10)	87.75bc (1)	269.25b (-20)	417.75d (-55)	168.65b (-35)
1-Butanol	5.21c (-44)	2.52bcd	7.08c (-24)	2.61b (-14)	67.00b (-1)	35.00cd (-33)	95.25a (10)	95.50e (-72)	521.50c (-44)	145.98bcd (-43)
LSD ≤ 0.05	0.732	0.397	0.597	0.382	8.392	5.810	7.417	20.634	73.252	23.544

Means with different letters differ at 5% level of probability by LSD test.
[1]Numbers given in parenthesis show percent change over control.

compounds (Table 4) and quantification of their adverse effects on germination of chickpea and wheat (Table 5) confirm this hypothesis. Chromatographic analysis provided additional insights into phytotoxin-mediated suppression of the tested species tested by determining the qualitative and quantitative presence of different compounds. A number of phenolic compounds responsible for inhibitory allelopathic activity of *E. dracunculoides* were identified in the present study; none of them previously reported in aqueous extracts of this weed. Chemical analyses revealed the presence of 2-furoic, caffeic, syringic, and *p*-coumaric acids in aqueous extracts of *E. dracunculoides*. Caffeic and *p*-coumaric acids are cinnamic acid derivatives while syringic acid is a benzoic acid derivative. Most of these compounds are water-soluble and when present in sufficient concentration can cause allelopathic activity in their immediate vicinity. These compounds are known to interfere with basic structures and functions in the tested species, causing various forms of stress resulting in impaired germination and diminished growth (Duke and Dayan, 2006). The suppression of chickpea germination in the aqueous whole plant fraction (1:10) was higher than that observed when the detected compounds were individually used in bioassays. Allelopathic activity is believed to arise from different chemicals acting additively or synergistically (Einhellig, 1996). Blum (1996) reported that mixtures of phenolic allelochemicals and other organic chemicals present in the substratum could cause inhibitory effects, although their individual concentrations are far below the threshold level to cause allelopathic activity.

Inhibition of plant growth by allelopathic compounds can be explained by induced changes in cell ultra structures, molecular biology, as well as biochemical and physiological attributes. Alteration in germination and seedling morphology under the influence of aqueous and organic fractions of *E. dracunculoides* can be a secondary expression of disturbances and alterations in these primary mechanisms (Weir *et al*., 2004; Gniazdowska and Bogatek, 2005). Aqueous extracts (1:10) exhibited more suppression of germination and seedling growth of species tested than aqueous extracts in 1:20. This could be attributed to increased concentration of individual phytotoxins or their compound effects in concentrated aqueous extract (1:10) of *E. dracunculoides* than the diluted one (1:20). Anjum and Bajwa (2010) reported pronounced increases in allelopathic inhibition due to the effect of doage. In addition to aqueous *E. dracunculoides* extracts, organic fractions also exhibited differential level of phytotoxicity against test species that might arise due to the variable chemical nature of the compounds used for extraction. Water is a polar compound while n-hexane is non-polar in nature. Variable phytotoxicity of different aqueous and organic fractions of *E. dracunculoides* might be due to different extraction efficiencies of the solvents used, accounting for qualitative and quantitative differences in extracted phytotoxins in different fractions. In our study, water appeared as the best solvent to be used for extraction of inhibitory compounds as shown by impaired germination and retarded seedling growth of aqueous extracts of *E. dracunculoides*, which was significantly higher than several other organic fractions. Whitehead *et al*. (1981) concluded that phenolics, a major category of compounds responsible for allopathic activity (Li *et al*., 2010), can best be extracted in water. Javaid *et al*. (2010; 2011), while screening aqueous, methanol, and n-hexane extracts of *Withania somnifera* (L.) Dunal against *Parthenium hysterophorus* L. and *Phalaris minor* Retz., also concluded that highest allelopathic potential was in the water-soluble fraction. This allelopathic interference on behalf of water-soluble compounds is of great ecological significance particularly in cultivated fields that are infested with this weed and are frequently irrigated or receive rainwater.

In addition to the differential allelopathic potential exhibited by aqueous and organic fractions of *E. dracunculoides*, the tested species also varied in susceptibility and their response due to different attributes. The differential inhibition by allelopathic products is in agreement with findings of Khaliq *et al*. (2011). Wheat germination was not affected by any extract. The results of present study corroborate the findings of Tanveer *et al*. (2010), who reported that aqueous extracts of *E. helioscopia* suppressed germination and seedling growth of lentil and chickpea to a much greater extent than that of wheat, which was hardly affected or unaffected. Mishra *et al*. (2004) reported similar results.

The data obtained (Table 3) indicate that the root growth of both species was more responsive than shoot growth to the inhibitory allelopathic activity induced by *E. dracunculoides*. This indicates the organ-based sensitivity of the species to phytotoxic compounds. Previous studies (Tawaha and Turk, 2003; Mushtaq *et al*., 2010) also documented this aspect of greater root than shoot inhibition. Possible reasons are that roots are the first to emerge and are in direct contact with extracts and thus are exposed to peak periods and concentrations of phytotoxins. Khanh *et al*. (2005) indicated that the highest level of allopathic suppression may occur when maximum levels of phytotoxins coincided with early stages of plant growth.

CONCLUSIONS

Based on the results of this study, it can be concluded that phenolic compounds in aqueous extracts of *E. dracunculoides* can have allelopathic effects on chickpea and wheat growth, including impaired seed germination and retarded seedling growth. Therefore, *E. dracunculoides* should be removed from fields at early stages to prevent harmful effects of this weed on chickpea and wheat crops.

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Efectos alelopáticos de fracciones acuosas y orgánicas de *Euphorbia dracunculoides* Lam. sobre la germinación y crecimiento de plántulas de garbanzo y trigo. Se requiere la identificación de especies de malezas con potencial alelopático y la caracterización de sus efectos adversos en contra de los cultivos asociados para una mejor comprensión de las interacciones cultivos-malezas. Se investigó la actividad fitotóxica de *Euphorbia dracunculoides* Lam. en la germinación y crecimiento de plántulas de garbanzo (*Cicer arietinum* L.) y trigo (*Triticum aestivum* L.) bajo condiciones controladas. Dos estudios separados se realizaron con cada una de las cuatro fracciones de disolventes orgánicos (n-hexano, cloroformo, acetato de etilo, 1-butanol) y extracto acuoso (1:10 y 1:20) de fracciones enteras de plantas de *E. dracunculoides* usando agua destilada y 0,05% (v/v) dimetil sulfóxido (DMSO) como control. Diferentes fracciones acuosas y orgánicas de *E. dracunculoides* tuvieron una incidencia significativa en los atributos de germinación y crecimiento de las plántulas de las especies evaluadas. El porcentaje de germinación final de trigo no se vio afectado, sin embargo, la elongación de raíces y brotes y la acumulación de biomasa en estas partes fueron significativamente retrasadas. La fracción acuosa fue más fitotóxica que las fracciones orgánicas y disminuyó la germinación de garbanzo en 53% y 35% para 1:10 y 1:20, respectivamente. Estas fracciones acuosas, 1:10 y 1:20, también redujeron la longitud de raíces (75-64% y 33-34%) y brotes (62-18% y 21-21%) y el peso seco de raíces (32-33% y 42-46%) y brotes (32-7% y 84-80%) para trigo y garbanzo, respectivamente. Entre las fracciones orgánicas, n-hexano fue la más supresora de las especies ensayadas. El análisis cromatográfico detectó la presencia de cuatro fitotoxinas en la fracción acuosa (1:10) de la planta: ácido furoico, ácido *p*-cumárico, ácido cafeico, y ácido siríngico. El estudio determinó que *E. dracunculoides* es alelopática sobre el trigo y el garbanzo.

Palabras clave: alelopatía, malezas, atributos de germinación, supresión, compuestos fenólicos.

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