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CHEMICAL CONSTITUENTS OF *Euphorbia prostrata* AIT. EXTRACT WITH REFERENCE TO ITS BIOLOGICAL EFFECT ON SOME CROPS

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ABSTRACT

The present investigation was carried out to study the effect of *Euphorbia prostrata* ethanol extract on seed germination and growth characters of some crops as well as the isolation and identification of the chemical constituents of *E. prostrata* by using GC/MS. Seed germination of lettuce was the most sensitive to *E. prostrata* ethanol extract with I_{50} and I_{90} 0.16 and 2.76 ppm, respectively. While radish was the most tolerant with I_{50} and I_{90} 6.37 and 135 ppm, respectively. *E. prostrata* had no significant effect on the rate of germination of all the tested crops at 0.4 and 2 ppm. Nevertheless, at higher concentration (4 ppm) it showed significant effect on seed germination rate of carrot, tomato, wheat, lettuce and onion. Root growth was much more affected by the treatment with *E. prostrata* than shoot growth of all the treated crops. Lettuce was the most sensitive crop to treatment with *E. prostrata* ethanol extract for shoot and root length (I_{50} 1.15 and 0.79 for shoot and root length, respectively.

The crude ethanol extract of *E. prostrata* yielded seven bands on TLC plate having the following R_f values: 0.0, 0.09 – 0.15, 0.19 - 0.52, 0.55 - 0.69, 0.71- 0.84, 0.87- 0.93 and 0.94 - 0.97. Band No. IV with R_f value 0.55-0.69 completely inhibited lettuce seed germination. GC/MS analysis of the band No. IV of *E. prostrata*, which showed

allelopathic effect, resulted in 22 constituents. Monoterpene beta-terpineol was the dominant compound amounting to 47.56%, followed by n-valeramide; N,N-dimethyl-4-benzloxybutylamine; carvone and2,3,5-trimethylhexane amounting to 11.39, 8.20, 6.39 and 6.07%, respectively. The total area of the eight monoterpene compounds, that were detected in this band was 62.43%.

Key words: *ethanol extract, chemical constituents, germination, growth.*

1. INTRODUCTION

Allelopathy, the direct or indirect effect of one plant on other plants through the production of chemical compounds that escape into environment, occurs widely in natural plant communities and postulated to be one mechanism by which crops interfere with weed growth. The most obvious and probably the most significant consequence of allelopathy is the control and modification of population densities explaining vegetation patterns in plant communities. Allelopathic chemicals released to the environment through decomposition, leaching by water extraction or exudation from living plants and their residues inhibit or stimulate the germination, growth and biomass production of both crops and weed species. Allelopathy is inferred to be of greater importance when vegetation residues are left on the soil surface as compared with annual incorporation of residue into the soil (Rice, 1984).

Certain weed species produce chemicals, which increase their competitive ability. Weeds do not only compete with crop plants for water, light and space causing crop losses, but also may form allelopathic chemicals that inhibit the growth of competing plants. Allelopathic compounds occur in crop and weed plants in such ways that protect the producing plant against their effect. Weed control measures should take allelopathy into consideration because such compounds may remain in the soil for sometime.

The mode of action of allelochemicals can broadly be divided into indirect and direct action. Indirect action may include effects through alteration of soil property. On the other hand, the direct mode of action, which includes effects of allelochemicals on various aspects

of plant growth and metabolism (Winter 1961). Previous work showed that many weed species: *Panicum repens* L., *Desmostachia bibinnata* L. Stapf. and *Euphorbia prostrata* Ait. produced allelopathic effect which inhibited the competing crop or weed plants (Zaki *et al.*, 1994).

The objective of the present work was to investigate the effect of *E. prostrata* ethanol extract on the germination and growth of nine crops. In addition, identification of the chemical components of the more active fraction by using GC/MS was carried out.

2. MATERIALS AND METHODS

2.1. Plant used

Euphorbia prostrata Ait. (Family Euphorbiaceae) weed plant was obtained from the Faculty of Agriculture s farm, Cairo University, Giza, to study its biological effect on germination and growth character of nine crops (Table1).

Table (1): English, Scientific and Family names of the tested crops.

English name	Scientific name	Family
Cabbage	*Brassica oleracea var. capitata*	Cruciferae
Turnip	*Brassica rapa* L.	Cruciferae
Carrot	*Daucus carota ver. sativa*	Umbelliferae
Rocket	*Eruca sativa* L.	Cruciferae
Tomato	*Lycopersicon esculentum* L.	Solanaceae
Radish	*Raphanus sativus* L.	Cruciferae
Wheat	*Triticum aestivum* L.	Gramineae
Lettuce	*Lactuca sativa*	Composteae
Onion	*Allium cepa*	Alliaceae

2.2. Preparation of Crude Extract

Whole plant of *E. prostrata* was washed with distilled water and dried under room temperature. When dried, 50 g of the dried plant material were homogenized by about 200 ml of 95% ethyl alcohol for 15 min. using Ultra Thorax 25 homogenizer, and then the supernatant liquid was decanted through anhydrous sodium sulfate. This step was repeated 3 times and all the supernatant liquids were collected and then evaporated to dryness. The crude extract was kept in the refrigerator till it was assayed.

2.3. Biological activity of the Crude Extract

Convenient stock concentrations of the crude extract in ethanol were prepared. Ten seeds of each tested species were placed on Whatman No.1 filter paper in a 9.0 cm diameter glass Petri dish. Different crude extract concentrations namely 0.4, 2, 4, 20 and 40 ppm of the crude extract were added to each Petri dish. After ethanol evaporation under room conditions 5.0 ml distilled water were added to each Petri dish. In the control check only distilled water was added. Five replicates were made for each treatment. Seeds were incubated at the optimum temperature of each tested species. Seed germination was recorded as the emerged radical was 2 mm beyond the seed coat and the germination percentage was calculated. The root and shoot elongation was measured at the end of the incubation period to evaluate the effect of treatments on growth (Theresa and Horowitz 1970). Germination rate (mean days to germination) was estimated to account for any delay in germination of the treated seeds as described by Watkins and Contliffe (1983).

$$\text{Mean days to germination (M.D.G)} = \frac{\sum(\text{days to germination})(\text{number of germinated seeds})}{\text{Total number of germinated seeds}}$$

2.4. Isolation and identification of *E. prostrata* components

TLC was used for fractionation of the individual components constituting the *E. prostrata* crude extract. Glass plates (20 X 20 cm.) were coated with silica gel (GF 254), 0.75-mm. thicknesses, and left for dryness at room temperature. Ethanol extract was applied as a band, and developed in solvent system consisting of (chloroform–ethanol-acetic acid 92:4:4 v/v/v) and detected by natural colour or by exposing to UV lamp at 254 nm. The respective bands were separately scraped from plates and eluted with acetone. The eluate of each band was evaporated and subjected to biological studies. According to this procedure the crude extract of *E. prostrata* was fractionated to seven bands. Only one band No. IV which had R_f value 0.55 - 0.69 and gave 100% inhibition in lettuce seed germination was selected and subjected to analysis by GC / MS to identify its constituents.

2.5. GC/MS analysis

The GC/MS system consisted of a HP 6890 GC/HP 5973 mass-

selective detector (MSD) Hewlett Packard. HP-Carbowax column (80 m length X 0.30μm thickness). Injector temp. was 270 °C, Oven temperature was programmed from 40 to 240 °C at a rate of 4 °C/ min. with an initial hold time of 8 min, detector tem. Was 300 °C. MSD condition was as follows: capillary direct interface temperature, 250 °C; ion source temp. 250 °C; ionization voltage 70 eV; mass range 33-300 mu; electron multiplier voltage 2200 V.

3. RESULTS AND DISCUSSION

3.1. Seed Germination

The effect of *E. prostrata* ethanol extract at different concentrations on seed germination of tested crops is shown in Table (2). The results indicated the following:

1- The inhibitory effect of *E. prostrata* on seed germination of the nine tested crops is in direct correlation with concentration used.

2- *E. prostrata* at the highest used rate (40 ppm) caused 0.0% germination of all the tested crops except in radish, which showed 24% Germination. Also *E. prostrata* extract at 20 ppm showed no seed germination for tomato and lettuce, while seed germination of other tested crops ranged between 2 to 35%.

3- The nine tested crops could generally be, arranged according to median germination inhibition (GI_{50}) in the following descending order as regarding the effect of *E. prostrata* ethanol extract on seed germination: lettuce (GI_{50} 0.16), carrot (GI_{50} 0.26), tomato (GI_{50} 0.32), rocket (GI_{50} 0.42), onion (GI_{50} 0.61), cabbage (GI_{50} 0.88), wheat (GI_{50} 1.2), turnip (GI_{50} 1.33) and radish (GI_{50} 6.37).

4- Nevertheless, the following remarks should be stated:

a- Lettuce was the most sensitive crop to *E. prostrata* ethanol extract with GI_{50} and GI_{90} 0.16 and 2.76 ppm, respectively.

b- Radish was the most tolerant crop to treatment with *E. prostrata* ethanol extract with GI_{50} and GI_{90} 6.3 and 135 ppm, respectively.

5-The slope values of onion and wheat were 1.21 and 1.15, respectively followed by carrot (1.05), lettuce (1.03). While the other five crops of turnip, rocket, tomato, radish and cabbage had the lowest slope values 0.96, 0.96, 0.96, 96 and 0.93, respectively.

3.2. Germination Rate

The results presented in Table (3) indicate the following:

1- Ethanol extract of *E. prostrata* had no significant effect on the rate of germination of all the tested crops at 0.4 and 2 ppm. Nevertheless, *E. prostrata* at higher concentration (4 ppm) showed significant effect on seed germination rate of carrot, tomato, wheat, lettuce and onion and delayed germination 2.6, 2.8, 2.5, 2.3 and 2.9 days, respectively compared with control.

2- *E. prostrata* at a higher concentration had no effect on germination rate of the other tested crops (cabbage, turnip, rocket and radish).

Table (2): Effect of *E. prostrata* ethanol-extracts on seed germination of the tested crops.

Tested plants	Germination (% of control) Concentration of *E. prostrata* extract (ppm)					GI_{50} ppm	GI_{90} ppm	Slope
	0.4	2	4	20	40			
Cabbage *(B. oleracea)*	60	44	23	10	0	0.88	21.11	0.93
Turnip *(B. rapa)*	68	47	30	13	0	1.33	29.32	0.96
Carrot *(D. carota)*	40	22	8	2	0	0.26	4.21	1.05
Rocket *(E. sativa)*	48	30	18	2	0	0.42	9.29	0.96
Tomato*(L. esculentum)*	45	26	12	0	0	0.32	6.87	0.96
Radish *(R. sativus)*	92	67	48	35	24	6.37	135.0	0.96
Wheat *(T. aestivum)*	71	45	20	7	0	1.20	15.64	1.15
Lettuce *(L. sativa)*	32	18	4	0	0	0.16	2.76	1.03
Onion *(A. cepa)*	54	37	12	2	0	0.61	6.94	1.21

Table (3): Effect of *E. prostrata* extract on the germination rate of some crops (days).

Tested crops	Concentration of *E. prostrata* extract (ppm)			
	0.4	2	4	Control
Cabbage *(B. oleracea)*	4.2	4.3	5.4	4.2
Turnip *(B. rapa)*	3.2	3.6	5.1	3.1
Carrot *(D. carota)*	6.2	6.5	8.6*	6.0
Rocket *(E. sativa)*	3.6	4.0	4.3	3.5
Tomato *(L. esculentum)*	5.2	5.6	7.8*	5.0
Radish *(R. sativus)*	2.7	2.9	2.9	2.7
Wheat *(T. aestivum)*	3.5	4.1	5.7*	3.2
Lettuce *(L. sativa)*	3.6	4.0	5.6*	3.3
Onion *(A. cepa)*	3.5	4.1	5.9*	3.0

L.S.D. 5%= 2.04

3.3. Shoot and root length

The results given in Tables (4 and 5) generally indicate the following:

1- Root growth was much more affected by the treatment with *E. prostrata* ethanol extract treatment than shoot growth.

2- The nine tested plants can be arranged in a descending order with regard to the reducing effect of *E. prostrata* treatment as follows:
   - **a-** for shoot growth: lettuce (I_{50} 1.15), tomato (I_{50} 1.44), carrot (I_{50} 1.82), onion (I_{50} 2.04), rocket (I_{50} 2.29), wheat (I_{50} 2.83), turnip (I_{50} 3.04), cabbage (I_{50} 4.04) and radish (I_{50} 6.92).
   - **b-** for root growth: lettuce (I_{50} 0.79), tomato (I_{50} 1.16), onion (I_{50} 1.51), wheat (I_{50} 1.53), carrot (I_{50} 1.60), rocket (I_{50} 1.72), cabbage (I_{50} 2.42), turnip (I_{50} 2.76) and radish (I_{50} 5.46).

3- The following remarks could be stated: **a-** lettuce was the most sensitive crop to the treatment with *E. prostrata* ethanol extract for shoots and root length (I_{50} and I_{90} = 1.15 and 7.49 ppm for shoot, 0.79 and 4.15 ppm for root length, respectively). **b-** radish was the most tolerant to the treatment with *E. prostrata* extract with I_{50} and I_{90} 6.92 and 65.14 for shoot length, 5.46 and 41.74 for root length, respectively.

4- The slope value for shoot length of rocket was 3.02 followed by wheat (1.76), turnip (1.67), lettuce (1.57), onion (1.54), cabbage (1.53), radish (1.32), carrot (1.29) and tomato (1.12). For root length the slope values ranged from 1.3 to 1.83.

These results agree with those obtained by Alsaadawi *et al.*, (1990) who indicated that *Euphorbia prostrata* strongly interferes with *Cynodon dactylon* (L.). Soil collected from under *E. prostrata* stands was very inhibitory to seed germination and seedling growth of *C. dactylon*. It was also found that allelopathy is an important component of the interference by *E. prostrata* against *Amaranthus retro-flexus*, *Medicago sativa* and *Gossypium hirsutum*.

Tijani and Fawusi (1989) reported that petroleum spirit, diethylether and ethyl acetate fractions of acidic and basic methanolic extracts of the aerial parts of siam weed (*Chromolaena odorata*) and wild poinsettia (*Euphorbia heterophylla*) were more inhibitory to tomato seed germination and seedling growth than were aqueous extract. *C. odorata* was generally more inhibitory than *E. heterophylla*, the ethyl acetate fractions of both resulting in the most detrimental

effects (2.5-5 or 5.5-13.25/15 seeds germinated after 336 h., root length was reduced from 5.7 - 5.97 to 0.35 - 0.49 or 2.34 - 3.60 cm and shoot length from 6.10 - 6.57 to 0.65 - 0.95 or 2.70 - 6.13 cm by incubation in 0.1mg/ml of the respective extracts. Also Madhu *et al.*, (1995) studied the effect of *Erogrostis*, *Parthenium*, *Acanthospermum*, *Euphorbia* and *Cyperus* extracts at 5 and 10% on sunflower, maize, soybeans, French beans and cotton in laboratory trials. Parthenium and *Cyperus* extracts had the greatest inhibitory effect on germination, root and shoot elongation, and vigour index with the 10% concentration being most inhibitory.

Zaki *et al.*, (1994) studied the allelopathic effects of the extracts of rhizomes or roots and foliage of 3 weed species (*Panicum repens* L., *Demostachia bipinnata* L. Stapf. and *Euphorbia prostrate* Ait.). They showed that definite inhibitory effects on seed germination, root and shoot lengths, fresh and dry weights of 7 flower plant species (*Viola tricolor* L., *Tagetes erecta* L., *Petunia hybrida hort. Vit.* Ander, *Mathiola incana* L., *Cosmos bipinnatus* Cav. Ann, *Celosia argentea* L. and *Dimorphotheca aurantiaca* Dc.). They showed that rhizome extracts were more inhibitory than foliage extract and the hot water extracts being most effective than other extracts.

3.4. Biological Effect of Different Bands

Thin layer chromatography of *E. prostrata* ethanol extract revealed the presence of seven bands having the following R_f values: 0.0, 0.09 – 0.15, 0.19 -0.52, 0.55 - 0.69, 0.71 - 0.84, 0.87 - 0.93 and 0.94 - 0.97. The seven bands were checked biologically and those proved to be active were subjected to GC/MS analysis. Table (6) shows the R_f values of *E. prostrata* ethanol crude extract bands and their effect on lettuce seed germination. Band IV, which had R_f value 0.55 – 0.69, was highly suppressive against lettuce seed germination (0.0% germination) followed by band V, which gave 39% germination, while bands No. VI, VII and III gave 56, 64 and 67% germination. The other two bands No. I and II appeared to have no effect.

3.5. Phytochemical Effect of Band No. IV

The band which had complete effect on seed germination and R_f value 0.55–0.69 (band No. IV) from the ethanol extract of *E. prostrata*

Table (4): Effect of *E. prostrata* ethanol-extracts on shoot length of some crops.

Tested plants	Concentration of *E. prostrata* extract (ppm) % Inhibition in shoot length					I_{50} ppm	I_{90} ppm	Slope
	0.4	2	4	20	40			
Cabbage *(B. oleracea)*	0	25	60	83	100	4.04	27.71	1.53
Turnip *(B. rapa)*	0	31	68	89	100	3.04	17.78	1.67
Carrot *(D. carota)*	20	48	72	90	100	1.82	17.93	1.29
Rocket *(E. sativa)*	2	38	80	100	100	2.29	6.09	3.02
Tomato *(L. esculentum)*	4	43	78	100	100	1.44	20.17	1.12
Radish *(R. sativus)*	0	18	47	69	85	6.92	65.14	1.32
Wheat *(T. aestivum)*	8	30	70	92	100	2.83	15.06	1.76
Lettuce *(L. sativa)*	26	56	86	100	100	1.15	7.49	1.57
Onion *(A. cepa)*	16	43	70	95	100	2.04	13.88	1.54

Table (5): Effect of *E. prostrata* ethanol-extracts on root length of some tested crops.

Tested plants	Concentration of *E. prostrata* extract (ppm) % Inhibition in root length					I_{50} ppm	I_{90} ppm	Slope
	0.4	2	4	20	40			
Cabbage *(B. oleracea)*	16	34	74	87	100	2.42	21.65	1.35
Turnip *(B. rapa)*	8	40	78	92	100	2.76	26.90	1.30
Carrot *(D. carota)*	22	45	80	94	100	1.60	13.14	1.40
Rocket *(E. sativa)*	12	47	86	95	100	1.72	8.61	1.83
Tomato *(L. esculentum)*	24	55	90	100	100	1.16	6.19	1.76
Radish *(R. sativus)*	0	20	52	76	90	5.46	41.74	1.45
Wheat *(T. aestivum)*	18	50	83	95	100	1.53	9.55	1.61
Lettuce *(L. sativa)*	32	69	94	100	100	0.79	4.15	1.78
Onion *(A. cepa)*	20	49	80	98	100	1.51	8.73	1.68

prostrata was analyzed by GC/MS. Twenty two compounds were identified in this band by their scan after comparing with library data of the instrument. Data in Table (7) show that beta-terpineol (11) was the dominant compound amounting to 47.56%, followed by n-valeramide (1), N, N-dimethyl-4-benzloxybutylamine (3), carvone (13) and 2,3,5-trimethylhexane (2) amounting to 11.39, 8.20, 6.39 and 6.07%, respectively. The results also show that eight of the detected compounds are monoterpens: dl-limonene (5), alpha-pinene (6), pentanedioic acid, dimethy ester (9), camphor (10), beta-terpineol (11), linalool (12), carvone (13) and neryl propionate (14). The total area of the previously mentioned monoterpen compounds represent 62.43% of all the components of this band.

Table (6): Effect of different components isolated from *E. prostrata* ethanol extract on seed germination of lettuce (% of control).

Band No.	R_f value	% Germination
I	0.0	100.0
II	0.09 – 0.15	94.0
III	0.19 – 0.52	67.0
IV	0.55 – 0.69	0.0
V	0.71 – 0.84	39.0
VI	0.87 – 0.93	56.0
VII	0.94 – 0.97	64.0

Furthermore, n-valeramide (1) and propionic acid, 3,3-thiobis (TDPA) (18) were also detected and identified as monocarboxylic acid. The heterocyclic compounds detected in band No. IV are: 1H-imidazole-1-ethanol, alpha-methyl (4) and indoline (8). Among, the fatty acids, which have been detected in band No. IV was 9,12-octadecadienoic acid, methyl ester (16). Also nine compounds have been detected in band No. IV, are: 2,3,5-trimethylhexane (2), N,N-dimethyl-4-benzloxybutylamine (3), ethyl 2-pyridyl acetate (7), 4-methyl-1- (2 – methylbut – 3 – en – 2 –yl) -1,2- diazetidin-3-one (15), pentaethoxylated pentadecyl alcohol (17), 1,4,7,10,13,16-hexaoxacyclooctadecane (19), butanedioic acid, 2,3-dimethoxy, diethyl ester (20), 1-3- (2,5,8,11,14,17-hexaoxactodecano) benzene (21) and 3,6,9,12,15-pentaoxabicyclo [15.3.1] heneicosa (21), 17,19-triene-22-d (23).

Table (7): Constituents of the *E. prostrata* L. band no. IV (R_f value 0.58 - 0.69).

No.	Compounds	R_f	% Area	M.W.	Chemical formula
1	n-Valeramide	1.76	11.39	149.08	$C_5H_{11}NO$
2	Hexane, 2,3,5-trimethylhexane	1.88	6.07	128.16	C_9H_{20}
3	N,N-Dimethyl-4-benzloxybutylamine	1.96	8.20	207.16	$C_{13}H_{12}NO$
4	1H-Imidazole-1-ethanol, alpha-methyl	2.19	1.52	126.08	$C_6H_{10}N_2O$
5	dl-Limonene	3.60	1.42	136.13	$C_{10}H_{16}$
6	Alpha-Pinene	4.28	1.37	136.13	$C_{10}H_{16}$
7	Ethyl 2-pyridyl acetate	4.33	0.45	165.08	$C_9H_{11}NO_2$
8	Indoline	4.56	2.69	119.07	C_8H_9N
9	Pentanedioic acid, dimethyl ester	6.45	1.63	160.07	$C_7H_{12}O_4$
10	Camphor	9.73	1.77	152.12	$C_{10}H_{16}O$
11	**Beta. Terpineol**	**10.69**	**47.56**	**154.14**	**$C_{10}H_{18}O$**
12	Linalool	11.0	1.40	154.14	$C_{10}H_{18}O$
13	Carvone	15.26	6.39	150.10	$C_{10}H_{14}O$
14	Neryl propionate	16.22	0.89	210.16	$C_{13}H_{22}O_2$
15	4-Methyl-1-(2-methylbut-3-en-2-yl)-1,2-diazetidin-3-one	18.18	1.80	154.11	$C_8H_{14}N_2O$
16	9,12-Octadecadienoic acid, methyl ester	34.96	0.48	294.26	$C_{19}H_{34}O_2$
17	Pentaethoxylated pentadecyl alcohol	35.09	0.31	432.38	$C_{25}H_{52}O_5$
18	Propionic acid, 3,3-thiobis (TDPA)	35.45	1.36	178.03	$C_6H_{10}O_4S$
19	Butanedioic acid, 2,3-dimethoxy, diethyl ester	38.10	0.30	234.11	$C_{10}H_{18}O_6$
20	1,3-(2,5,8,11,14,17-Hexaoxactodecano) Benzene	38.53	1.36	340.19	$C_{18}H_{28}O_6$
21	1,4,7,10,13,16-Hexaoxacyclooctadecane	38.58	1.31	264.16	$C_{12}H_{24}O_6$
22	3,6,9,12,15-Pentaoxabicyclo [15.3.1] henicosa-1 (21), 17,19-triene-22-d	41.03	0.33	297.17	$C_{16}H_{24}O_6$

Maier *et al.*, (1999) confirmed that the two fatty acids (2E, 4Z) – decadienoic acid and (2E, 4Z, 7Z)- decatrienoic acid, show strong herbicidal activity against *Lemna minor* and *Lepidium*. Gaspar and Neves (1995) identified sixty two compounds in the two allelopathic fractions isolated from wheat straw using methanol: water extraction. The compounds were carboxylic acid methyl ester, phenolic acids and triterpenoids. Four of them were new natural products (14-alpha-methyl - 5- alpha -cholestan -3 – one ;(24R)- 14 – alpha – methyl –5 –

alpha ergostan-3-one; cycloart-5-ene-3-beta; 25-diol and 4-alpha-methylergost-5-ene-3-beta-ol) and with the exception of some phenolic acids. Aliotta *et al.*, (1996) isolated allelochemicals (5-methoxysporalen; 8-methoxysporalen and quercetin) from *Ruta graveolens*. These compounds delayed the onset and decreased germination, and also damaged the radicals of purslane seedlings.

Friebe *et al.*, (1995) reported that the allelopathic constituents of ethyl acetate extract from shoot and root exudates of 10-day old *Agropyron repens* seedlings were identified by GC/MS and the retention time and mass spectra compared with the data obtained from reference compounds. In shoot extracts the cyclic hydroxamic acids; 2,4-dihydroxy-7-methoxy-2H-1,4-benzoxazin-3-one (DIMBOA) and 2,4-dihydroxy-2H-1,4-benzoxazin-3-one (DIBOA), as well as the corresponding lactam derivative, 2-hydroxy-1,4-benzoxazin-3-one (HBOA), were identified. In root extract the cyclic hydroxamic acids were identified DIMBOA, DIBOA and additionally 2,4-dihydroxy-7, 8- dimethoxy-2H-1,4-benzoxazin-3-one (DIM2BOA) was detected. The phytotoxins, vanillic, ferulic and beta-hydroxybutyric acid were also found.

Abdalla (1997) demonstrated that the crude extract of *E. prostrata* yielded six fractions having R_f values as follows: 0.0, 0.18, 0.42, 0.64, 0.82 and 1.0. The two fractions with R_f values 0.64 and 0.82 were the most inhibitory, exhibiting 26.7 and 3.0% seed germination. *E. prostrata* ethanol extract may contain the following function groups as recorded by IR spectrum: Ph.OH, C=O, H-C=O, CH_2 or CH_3 and OH free.

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التركيب الكيماتي لمستخلص حشيشة اللبينة وعلاقة ذلك بفاعليته على بعض المحاصيل

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ملخص

صمم هذا البحث لدراسة تأثير المستخلص الإيثانولى لحشيشة اللبينة *Euphorbia prostrata* Ait. على إنبات ونمو بذور تسعة أنواع من المحاصيل وكذلك فصل وتعريف المركبات ذات التأثير المضاد والتي يحتويها مستخلص اللبينة وذلك باستخدام جهاز الـ GC/MS. أجرى هذا البحث في كلية الزراعة – جامعة القاهرة. وكانت أهم النتائج المتحصل عليها كما يلي:

أولا: دراسة فعالية مستخلص حشيشة اللبينة

١- لم يحدث إنبات لبذور لأي من المحاصيل المختبرة عند معاملتها بالتركيز المرتفع (٤٠ جزء في المليون) فيما عدا بذور الفجل حيث كانت نسبة الإنبات ٢٤%.

٢- أظهرت النتائج أن بذور الخس هي أكثر البذور حساسية لمستخلص اللبينة وكانت قيمة الـ I_{50} و I_{90} هي ١٦,٠ و ٢,٧٦ جزء في المليون علي الترتيب. بينما وجد أن بذور الفجل هي من أكثر البذور تحملا وكانت قيمة الـ I_{50} , I_{90} هي ٦,٣ و ١٣٥,٠ جزء في المليون على الترتيب.

٣- لم يكن لمستخلص اللبينة أي تأثير معنوي على معدل إنبات جميع بذور النباتات المختبرة وذلك عند المعاملة بتركيز ٠,٤ ، ٢ جزء في المليون. بينما أظهر مستخلص اللبينة بالتركيز المرتفع (٤ جزء في المليون) تأثيرا معنويا على معدل إنبات بذور كل من الجزر ، الطماطم ، القمح ، الخس والبصل ، بينما لم تظهر باقي النباتات أي فروق معنوية في التأثير على معدل الإنبات.

٤- فيما يتعلق بالتأثير على أطوال الريشة و الجذير للنباتات المختبرة وجد أن مستخلص اللبينة كان أكثر تأثيرا على طول الجذير لجميع النباتات المختبرة عن طول الريشة. وقد وجد أيضا أن بذور نبات الخس كان أكثر أنواع النباتات المختبرة تأثرا من حيث طول الريشة والجذير على جميع التركيزات المختبرة حيث كانت قيمة الـ I_{50} هي ١٥, ١ و ٧٩, جزء في المليون على الترتيب.

ثانيا: فصل وتعريف المركبات الفعالة لمستخلص اللبينة

١- أعطى مستخلص حشيشة اللبينة سبعة شرائط bands مفصولة وكانت قيم الـ R_f لها كالتالي: صفر ، ٠,٠٩ - ١٥ , ، ١٩, - ٥٢, ، ٥٥, - ٦٩, ، ٧١, - ٨٤, ، ٨٧, - ٩٣, ، ٩٤, - ٩٧, وكذلك وجد أن الشريط الرابع band IV والتي قيمة الـ R_f له ٥٥, - ٦٩, ثبطت إنبات بذور الخس تثبيطا كاملا وكان أكثرها تأثيرا وفعالية.

٢- أظهرت نتائج التحليل باستخدام جهاز الـ GC/ MS أن الشريط الرابع band IV المفصول من حشيشة اللبينة يحتوى ٢٢ مركبا أمكن التعرف عليها وقد وجد أن مركب التربين الأحادي beta-terpineol يوجد بنسبة أكبر في المستخلص ٥٦, ٤٧% ثم تبعه n-valeramide, N, N-dimethyl- benzloxybutylamine, 4- carvone and 2,3,5-trimethylhexane بنسبة ١١,٣٩، ٨,٢٠ ، ٦,٣٩، ٦,٠٧% على الترتيب. وكانت نسبة مركبات التربينات الأحادية الثمانية التي يحتويها الشريط band هي ٦٢,٤٣%.