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Allelopathic Activities of Aqueous Extracts of Two Sinai's Flora against Weed Control and Seed Germination

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ABSTRACT

The present investigation was conducted to study the allelopathic effects of some Sinai's Flora (*Seriphidium herba-alba* Asso and *Achillea fragrantissima* Forssk) aqueous extracts on seed germination and weed control growing in olive orchards. Plant aqueous extracts at 5, 15 and 25% concentrations and tap water as a control were applied alone or in combination with commercial herbicide named SUN UP® 48% SL (the effective compound was Glyphosate ammonium) were used at 2.5 L. feddan^{-1} (1:1) under field and laboratory conditions. Data indicated that the total fresh and dry weight of weeds was decreased significantly by increasing the concentration level of the extracts. The herbicide was the superior treatment in eradicating annual, biennial and perennial weeds, followed by *A. inculata* 25%+ Sun Up which achieved reasonable suppression for most annual, biennial and perennial weeds compared to the control. The extracts of *S. herba-alba* 25% + Sun Up inhibited the germination of most weeds (biennial and perennial).
Keywords: Allelopathic, Asteraceae, weeds control and seed germination.

INTRODUCTION

Weeds are one of the most serious problems in agricultural production. They are volunteer plants from the wild or semi culture species that are found in food crops despite the will of the people and harm reducing yields both qualitatively and quantitatively (Gupta and Mittal, 2012). Today, some 30000 species of weeds, are second group after natural vegetation. Slaveya *et al.,* (2015) reported that weeds account for 35% of losses in wheat, 28% in vegetables, 29% in fruit species and vineyards, 37% in tobacco, etc. In modern "organic farming" the problem of weed control is increasing and refusal of chemical resources of protection from them is usually accompanied by a sharp decrease in yields. Gallet and Pellissier (2002) defined allelopathy, i.e. any direct or indirect, harmful or beneficial effect of one plant on another through the production of chemical compounds that are released into the environment. Allelopathic substances are most commonly found in some plant extracts and in plant residues of soil (Kayode and Ayeni, 2009).

Plant extracts which contained allelochemicals can be used to manage weed and can be considered as an alternative to synthetic herbicides. Several Asteraceae species have been reported for having allelopathic effects on other plant species, reducing seed germination and emergence of subsequent small grain crops when grown in rotation (Miky, 2008; Abu-Romman, 2011). The first genus of family Asteraceae *Artemisia* is known to include some allelopathic species that may arrest succession (Holechek *et al.,* 1998). The second genus; *Achillea* comprises more than 200 species, most indigenous to Europe and the Middle East (Ahmed *et al.,* 1988; Aburjai and Hudaib 2006). Scanty information is available concerning allopathic activities of extracts of two Sinai's Flora against weed control and seed germination. The purpose of this study was to assess the allelopathic effects of aqueous extracts from *Seriphidium herba-alba* and *Achillea fragrantissima* on seed germination and weed control of some range plant species on olive orchard.

MATERIALS AND METHODS

This investigation was conducted during 2014 and 2015 at the experiment Farm and Laboratory of the Faculty of Environmental Agricultural Sciences, Arish University, North Sinai Governorate, Egypt to study the effect of foliar application of two plant extracts and herbicide–on weeds growing in olive (*Olea europaea* L.) orchard.

Plant material preparation and extraction procedure

Aqueous extracts of two Sinai's Flora i.e. *Seriphidium herba-alba* (previously named *Artemisia herba-alba* Asso.) known in Arabic as shih and *Achillea fragrantissima* known in Arabic Qaysum or Lavender cotton were prepared using the following scheme according to the method described by Abdel-Salam *et al.* (2009): 50, 150 and 250 g of dry plant material were crushed in a mortar with quartz sand and quantitatively transferred into a flask with 1000 ml of distilled water. After standing in the dark for 24 hours, the solution was filtered and twice, first through cheese-cloth (50% cotton and 50% polyester) and then through filter paper (Whatman No. 2).

After standing in the dark for 24 hours, the solution was filtered and a 5% aqueous extract was prepared (Teneva *et al.,* 2007). By dilution with distilled water thereof were prepared test solutions with concentrations of the *A. fragrantissima* and *S. herba-alba* 5%; 15% and 25% aqueous extract. The amount of obtained aqueous extracts were preserved in sterile dark bottles (500 ml) in a cool environment (40 C) until used (Teneva *et al.,* 2007).

Treatments

- Control: Weeds sprayed with tap water.
- Herbicide Sun Up® 48% SL is non-selective herbicide to the most annual weeds in fruit gardens and contains the effective compound (Glyphosate ammonium) were imported from Sun Date company, Singapore. Herbicide Sun Up 48% SL was applied alone at 2.5 L feddan^{-1} in 100 L of water sprayed on the weeds.
- Aqueous extract of *S. herba-alba* alone at concentrations (5, 15 and 25%) in 100L of water sprayed on the weeds.
- Aqueous extract of *A. fragrantissima* alone at concentrations (5, 15 and 25%) in 100L of water sprayed on the weeds.

Field experiment

The final concentrations of the prepared *A. fragrantissima* and *S. herba-alba* 0, 5, 15 and 25% were used alone or combination with commercial herbicide named SUN UP® 48% SL at 2.5 L.feddan^{-1} (1:1) as spray on the soil surface, under olive trees. The first application was applied in early February, the second ones after 20

days of the first application. Weeds were sprayed with tap water as a control during both seasons.

Laboratory experiment

Germination bioassay was conducted in laboratory of environmental protection. Different selected weed seeds were sown in glass Petri dish (9.0 × 1.5 cm) on three layers of filter paper moistened with distilled water were used to study the allelopathic effect of aqueous extract and distilled water as a control on the germination, seedling growth in the form of seedling length and seedling dry weight of crops. Two plant extracts were added at a concentrations of 5, 15 and 25 % with or without SUN UP® 48% SL herbicide. These concentrations were selected to cover a wide range of plant extracts as described by Yin *et al.* (2012). All test variants were carried out in five replications. An individual Petri dish was considered as a replicate. All Petri dishes were covered with lids and incubated at 24-28°C and 12/12 hours light period for a required time when germination percentage were assessed. The exposure time was 21 days.

Measurements

- For the field experiment, the following information were recorded on weeds: classification of weeds before applications, total fresh weight, total dry weight of weeds as well as surviving weeds.
- Weeds population density are the simplest and most popular methods of measuring abundance and estimated according to Roger *et al.,* (2015). The most accurate way to estimate the weed population of the orchard is to count the number of plants in an area of square (1×1m) at a number of locations. Density (D) measures the number of individuals per unit area. Thus:

$$D_i = \Sigma Y_i / S_a$$

Where:

Di = density of species i.

ΣY_i = number of individual plants of species i contained in the sampling unit

S_a = Surface area of the sampling unit.

- For the laboratory experiment assessing the results of the experiments were used the following parameters: germination percentage (%) was done after an interval of 30 days.

Germination percentage was measured after sowing days by following formula: For each treatment, Germinability (PG) is the germination percentage of equation (1) according to Assaeed, (2003):

$$PG = 100(n/N)$$

Where:

***n* = Number of germinated seed.**

N = Total seeds number.

Statistical analysis

Statistical evaluation of the results obtained was performed by descriptive statistical analysis and t-test ($p<0.05$) using software Statistica 7.0 (STATSOFT INC., 2004). and means were differentiated using Duncan's multiple range test at (0.05) level of significance (Duncan, 1955).

RESULTS AND DISCUSSION

1- Identification of weeds species

Data represented in Table (1) revealed that ten different weed species belong to ten families were found on ground around olive trees. Weeds are classified according to their growth habit:

Annual and biennial weeds

Six annual and biennial weeds were identified and classified i.e. Ghasoul *Mesembryanthemum forsskaleii* (Family: Aizoaceae), Merar or Morerah *Senecio vulgaris* L. (Family: Asteraceae), Khobbeiza *Malva parviflora* L. (Family: Malvaceae), Wild mustard *Sinapis arvensis* L. (Family: Brasicaceae), Nitna or Mintina *Chenopodium ambrosioides* L. (Family: Chenopodiaceae) and Devil's grass *Cynodon dactylon* L. (Family: Poaceae).

Perennial weeds

From the same table, four perennial weeds were identified and classified Bramble *Convolvulus arvensis* (Family: Convolvulaceae), camelthorn *Alhagi graecorum* (Family: *Fabaceae*), Bearberry *Solanum nigrum* (Family: Solanaceae) and Rutreyt or Kammun *Zygophyllum coccineum* (Family: Zygophyllaceae).

Table 1. Identified and classified weeds distributed in Olive Research Farm at El-Arish, North Sinai Governorate, Egypt during 2014 and 2015.

Identification of weeds population			
Scientific Name	**Family**	**Common Name**	
		English Name	**Arabic Name**
1.Annual and biennial weeds			
Mesembryanthemum forsskoleii	Aizoaceae	Hamad – Ghasoul	حمد – الغسول
Senecio vulgaris	Asteraceae	Merar – Morerah	المرار – مريره
Malva parviflora	Malvaceae	Khobbeiza	الخبيزة
Sinapis arvensis	Brasicaceae	Wild mustard	الخردل
Chenopodium ambrosioides	Chenopodiaceae	Nitna – Mintina	زربيح - نتنه - منتنه
Cynodon dactylon	Poaceae	Devil's grass	نجيل ديل الفار
2. Perennial weeds			
Convolvulus arvensis	Convolvulaceae	Bramble	العليق
Alhagi graecorum	Fabaceae	Camelthorn	العاقول - عاجول
Solanum nigrum	Solanaceae	Bearberry	عنب الديب
Zygophyllum coccineum	Zygophyllaceae	Rutreyt – Kammun	الرطريط

The identification of weeds was according to Boulos (2009).

2-Weeds population density

The presented results in Figure (1) illustrated that perennial weed *Cyndon dactylon* was recorded the highest value of population density (32.45 %), followed by annual weed *Mesembryanthemum forsskaoleii* (19.35 %), perennial weed *Convolvulus arvensis* (10.67%), *Senecio vulgaris* L. (8.50 %), *Solanum nigrum* (6.3%), *Chenopodium ambrosioides* (6.20%), *Alhagi graecorum* (5.78 %), *Zygophyllum coccineum* (4.6%), and *Malva parviflora* (3.70 %). Meanwhile, annual weed *Sinapis arvensis* was obtained least value of population density (2.45 %) in olive orchard.

3-Total fresh weight of weeds

Data in Table (2) indicated that total fresh weight of weeds were decreased significantly by increasing

concentration of plant extracts. The least values of total fresh weight of weeds were noticed with herbicide Sun Up 48%, followed by *S. herba-alba* extract at 25% + Sun Up (51.31 and 52.71 g.m^{-2}), (41.85 and 32.07 g.m^{-2}) and (22.59 and 18.26 g.m^{-2}) during mid-April, mid-June and mid-August in both years, respectively. Meanwhile, the control treatment caused a remarkable increase in the total fresh weight of weeds (227.01 and 294.24 g.m^{-2}), (201.82 and 206.78 g.m^{-2}) and (173.44 and 189.90 g.m^{-2}) in both years, respectively.

4-Total dry weight of weeds

Data in Table (3) illustrated that total dry weight of weeds were decreased by increasing concentration of plant extracts. The least values of total dry weight of weeds were noticed with herbicide Sun Up 48%, followed by *S. herba-alba* extract at 25% + Sun Up (15.80 and 14.01 g.m^{-2}), (11.33 and 2.97 g.m^{-2}) and (8.68 and 6.90 g.m^{-2}) during mid-April, mid-June and mid-August in both years, respectively. Meanwhile, the control treatment caused a remarkable increase in the total dry weight of weeds (69.68 and 65.70 g.m^{-2}), (51.46 and 52.55 g.m^{-2}) and (49.39 and 49.27 g.m^{-2}) in both years, respectively.

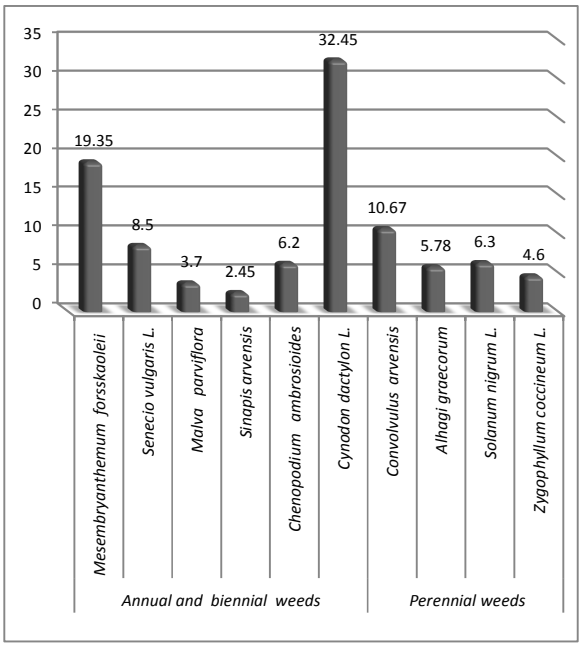

Fig. 1. Weeds density of identified weeds on ground around olive trees before applied the treatments.

Table 2. Allelopathic effect of leaf extract of *S. herba-alba* and *A. fragrantissima* at different concentrations alone or combination with herbicide Sun Up 48% SL on total fresh weight of weeds.

Treatments	Total fresh weight of weeds (g.m^{-2})					
	Mid-April		Mid-June		Mid-August	
	2014	2015	2014	2015	2014	2015
Control	227.01 a	294.24 a	201.82 a	206.78 a	173.44 a	189.90 a
Herbicide Sun Up 48%	0.00 h	0.00 h	0.00 g	0.00 g	0.00 g	0.00 h
S. herba-alba 5%	127.42 de	128.28 ef	115.64 bcd	115.51 bc	80.64 c	50.54 de
S. herba-alba 15%	177.55 c	188.79 c	133.95 bc	141.18 b	74.68 cd	55.19 d
S. herba-alba 25%	130.35 d	130.22 e	99.01 cd	78.66 cd	49.14 def	49.04 de
S. herba-alba 5% + Sun Up	64.62 f	54.29 g	63.15 de	63.69 d	30.93 ef	33.85 ef
S. herba-alba 15% + Sun Up	52.80 g	53.95 g	54.62 e	42.99 e	31.11 ef	25.80 fg
S. herba-alba 25% + Sun Up	51.31 g	52.71 g	41.85 f	32.07 f	22.59 f	18.26 g
A. fragrantissima 5%	222.76 ab	254.11 ab	143.63 b	156.23 ab	105.44 b	86.99 b
A. fragrantissima 15%	219.62 abc	221.21 b	128.98 bc	135.45 b	67.52 cde	64.43 c
A. fragrantissima 25%	188.85 bc	156.21 d	111.69 bcd	102.77 c	50.03 def	45.86 e
A. fragrantissima 5%+ Sun Up	109.33 e	89.23 f	116.56 bcd	74.62 cd	91.03 bc	61.11 c
A. fragrantissima 15%+ Sun Up	72.87 ef	83.65 f	70.88 d	59.38 de	57.46 de	39.85 ef
A. fragrantissima 25%+ Sun Up	60.44 f	58.71 g	50.35 ef	42.83 e	36.52 ef	31.22 f

Means followed by the same letter(s) within each column are not significantly different at the 0.05 level of probability, according to Duncan's multiple range test.

Table 3. Allelopathic effect of plant extract of *Seriphidium herba-alba* and *Achillea fragrantissima* at different concentrations alone or combination with herbicide Sun Up 48% SL on total dry weight of weeds.

Treatments	Total dry weight of weeds (g.m^{-2})					
	Mid-April		Mid-June		Mid-August	
	2014	2015	2014	2015	2014	2015
Control	69.68 a	65.70 a	51.46 a	52.55 a	49.39 a	49.27 a
Herbicide Sun Up 48%	0.00 h	0.00 h	0.00 g	0.00 i	0.00 i	0.00 i
S. herba-alba 5%	37.88 d	37.15 d	29.91 cd	29.81 de	20.32 cd	20.92 cd
S. herba-alba 15%	29.17 def	21.02 f	17.68 e	19.64 de	9.01 g	11.15 f
S. herba-alba 25%	25.90 ef	21.12 f	20.14 de	20.49 e	18.81 de	13.38 e
S. herba-alba 5% + Sun Up	24.02 f	15.61 fgh	15.44 ef	13.38 f	13.21 efg	8.92 g
S. herba-alba 15% + Sun Up	23.00 fg	16.88 fg	14.82 f	12.00 g	10.30 fg	8.99 g
S. herba-alba 25% + Sun Up	15.80 g	14.01 gh	11.33 h	2.97 h	8.68 h	6.90 h
A. fragrantissima 5%	57.76 b	57.43 b	38.70 b	39.17 c	39.95 b	41.55 b
A. fragrantissima 15%	53.09 bc	51.50 bc	34.24 bc	35.25 cd	42.01 ab	42.90 b
A. fragrantissima 25%	52.68 bc	61.88 ab	50.51 ab	47.04 b	22.89 c	23.25 c
A. fragrantissima 5%+ Sun Up	49.27 bcd	49.14 bcd	28.11 d	25.16 de	15.92 ef	17.83 de
A. fragrantissima 15%+ Sun Up	42.62 cd	44.05 cd	32.92 bcd	30.90 d	19.21 cde	18.15 d
A. fragrantissima 25%+ Sun Up	31.60 de	29.06 e	19.45 de	18.45 ef	17.79 e	17.41 de

Means followed by the same letter(s) within each column are not significantly different at the 0.05 level of probability, according to Duncan's multiple range test.

5-Survival weeds

The visual observation of surviving weeds on ground around olive trees as affected by different plant extracts during 2015. Table (4) showed that the herbicide Sun Up 48% treatment proved to be the superior treatment in eradicating annual, biennial and perennial weeds, followed

by *S. herba-alba* 25%+ Sun Up plant extract which achieved satisfactory eliminate of most annual, biennial and perennial weeds. *S. herba-alba* 15% + Sun Up and *A. fragrantissima* 25%+ Sun Up treatments recorded the third rank for eradicating annual, biennial and perennial weeds except Devil's grass (*Cynodon dactylon*), wild mustard (*Sinapis arvensis*) and Rutreyt (*Zygophyllum coccineum*) which were resistance as compared with control treatment. These results agreed coincide with those reported by El-Mahdy (2017) who reported that *Artemisia* sp. extract displayed marked inhibition of the growth of *F. solani.*

This may be due the presence of allelochemicals growth inhibiting in the extraction of *Artemisia* sp. In addition, this results were in agreement with Yang *et al.* (2012) who showed that the inhibitory effect of *Artemisia* extract was related to the allelechemical concentration. Analysis of one % extract of *Artemisia* showed that the presence of three galloylglucose, free ammonia, reducing sugars, free amino N and five types of flavanol glycosides in different concentrations that inhibited radical elongation (Lixf *et al.,* 2010).

Table 4. Allelopathic effect of plant extract of *Seriphidium herba-alba* and *Achillea fragrantissima* at different concentrations alone or combination with herbicide Sun Up 48% SL on survival weeds from ground around olive trees.

Treatment	Annual and biennial weeds						Perennial weeds			
	Ghasoul	Morerah	Khobbeiza	Mustard	Nitna	Devil's grass	Bramble	Camelthorn	Bearberry	Rutreyt
Control	+++	++	+++	++	++	+++	+	+++	+++	+++
Herbicide Sun Up 48%	--	--	--	--	--	--	--	--	--	--
S. herba-alba 5%	+	++	+	++	+	+++	+	++	++	+++
S. herba-alba 15%	+	+	+	+	+	++	-	+	+	++
S. herba-alba 25%	+	-	+	+	-	++	-	+	+	++
S. herba-alba 5% + Sun Up	-	+	+	+	-	++	-	+	+	++
S. herba-alba 15% + Sun Up	--	-	-	+	-	+	--	--	-	+
S. herba-alba 25% + Sun Up	--	--	--	-	--	-	--	-	--	-
A. fragrantissima 5%	+	++	++	++	+	++	+	++	++	+++
A. fragrantissima 15%	+	++	+	++	+	++	+	++	+	+++
A. fragrantissima 25%	-	+	+	++	+	++	-	+	+	++
A. fragrantissima 5%+ Sun Up	+	++	+	++	+	++	-	+	+	++
A. fragrantissima 15%+ Sun Up	-	+	+	+	+	++	-	+	+	++
A. fragrantissima 25%+ Sun Up	-	-	-	+	-	+	-	-	-	+

Where: -- = Weeds were completely eradicated - = Few weeds showed tolerance
+ = Moderate percentage of weeds were staying alive ++ = Considerable percentage of weeds were staying alive
+++ = Large percentage of weeds were staying alive

6-Seed germinability

Concerning the effects of different concentrations of *S. herba-alba* and *A. fragrantissima* extracts on seed germination, data in Table (5) indicated that different aqueous extracts significantly affected the germination percentage of different weed seeds in laboratory. The extracts of herbicide Sun Up alone, *S. herba-alba* 25% + Sun Up, *S. herba-alba* 15% + Sun Up and *A. fragrantissima* 25%+ Sun Up achieved the lowest percentage of germination (strong inhibition) of annual and biennial seeds (Ghasoul *Mesembryanthemum forsskaoleii*, Morerah *Senecio vulgaris*, *Khobbeiza Malva parviflora* and Nitna *Chenopodium ambrosioides*) and perennial seeds (Bramble *Convolvulus arvensis*, Camelthorn *Alhagi graecorum* and Bearberry *Solanum nigrum*), respectively compared to control treatment. It was observed that the degree of inhibition increased with the concentration of the extracts. These results were in agreement with findings of other authors on germination response to some allelopathic species (Kalburtji and Mosjidis, 1993; Assaeed and AL-Doss, 1997). They also suggested similar phytotoxic influence of different *A. monosperma* aerial parts on germination. Marco and Barbera (1990) also reported that the aqueous extract of *Artemisia* vegetative organs exhibited negative effects on seed germination of weeds.

Table 5. Effect of plant extract of *Seriphidium herba-alba* and *Achillea fragrantissima* at different concentrations alone or combination with herbicide Sun Up 48% SL on seed germinability (%) on the experimental weeds after 30 days incubation period.

Treatment	Annual and biennial weeds						Perennial weeds			
	Ghasoul	Morerah	Khobbeiza	Mustard	Nitna	Devil's grass	Bramble	Camelthorn	Bearberry	Rutreyt
Control	100 a	77.5 a	100 a	73.5 a	83.5 a	100 a	47.5 a	100 a	100 a	100 a
Herbicide Sun Up 48%	0.0 j	0.0 f	0.0 h	0.0 k	0.0 g	0.0 h	0.0 g	0.0 i	0.0 i	0.0 i
S. herba-alba 5%	50.5 d	63.5 b	50.5 c	59.5 bc	47.5 b	86.0 b	35.5 b	84.0 b	79.5 bc	92.0 ab
S. herba-alba 15%	41.0 e	33.0 cd	39.0 d	50.0 d	29.5 d	65.5 de	19.5 cd	74.5 c	62.0 d	73.5 cd
S. herba-alba 25%	23.5 g	15.5 d	33.5 e	42.5 e	17.5 e	61.0 e	11.0 de	48.5 de	52.0 e	50.0 e
S. herba-alba 5% + Sun Up	19.5 h	7.5 e	17.5 fg	31.5 f	15.0 e	71.5 cd	5.5 f	38.5 e	53.5 e	66.5 de
S. herba-alba 15% + Sun Up	0.0 j	4.5 e	9.5 g	19.0 h	6.5 f	40.0 f	0.0 g	13.0 g	14.5 h	30.0 g
S. herba-alba 25% + Sun Up	0.0 j	0.0 f	0.0 h	6.5 j	0.0 g	24.5 g	0.0 g	0.0 i	0.0 i	12.5 h
A. fragrantissima 5%	64.5 b	70.5 ab	67.5 b	62.0 b	44.5 b	93.5 ab	37.0 b	87.5 b	84.5 b	100 a
A. fragrantissima 15%	53.0 c	54.5 b	50.0 c	57.5 bcd	31.0 c	76.5 c	22.5 c	75.0 c	71.0 c	89.5 b
A. fragrantissima 25%	16.5 hi	39.0 c	40.5 d	46.0 de	26.5 d	67.0 de	18.0 cd	50.5 d	55.5 e	69.0 d
A. fragrantissima 5%+ Sun Up	33.5 f	56.5 b	34.0 e	54.5 cd	21.0 de	82.5 bc	12.5 d	39.5 e	60.0 d	76.5 c
A. fragrantissima 15%+ Sun Up	12.0 i	31.0 cd	22.0 f	28.5 g	14.5 e	70.0 cde	9.0 e	21.0 f	37.0 f	43.5 f
A. fragrantissima 25%+ Sun Up	0.0 j	17.0 d	10.5 g	15.0 i	5.5 f	40.0 f	0.0 g	7.5 h	18.5 g	29.0 g

Finally, it can be concluded that the aqueous extract of *A. inculata* 25%+ herbicide Sun Up 48% (1:1) achieved satisfactory eliminate of most annual, biennial and perennial weeds compared to control treatment. The extract of *S. herba-alba* 25% + herbicide Sun Up 48% inhibited the germination of most weeds (biennial and perennial) under olive orchard during experimental seasons.

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تأثير التضاد البيوكيميائي للمستخلصات المائية لنوعين من نباتات سيناء البرية على مكافحة الحشائش وإنبات بذورها

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أجري هذا البحث لدراسة تأثيرات التضاد البيوكيميائي لبعض مستخلصات الفلورا المصرية النامية في سيناء (العادر *Seriphidium herba-alba* والقيسوم *Achillea fragrantissima*) على القضاء على بعض الحشائش النامية بمزرعة الزيتون بكلية العلوم الزراعية البيئية بالعريش وقابلية إنبات بذورها معمليا بمعمل حماية البيئة ، جامعة العريش ، مصر. تم استخدام مستخلصات النباتية بتركيزات 5 و 15 و 25٪ منفردة أو بالخلط بنسبة (1:1) مع مبيد الحشائش التجاري صن أب 48% ® (المادة الفعالة جليفوسات أيزوبروبيل أمونيوم) عند تركيز 2.5 لتر للفدان بتركيز 2% تحت ظروف الحقل والمعمل. وأوضحت النتائج إلى أن إجمالي وزن الحشائش الغضة والجافة انخفض بشكل ملحوظ بزيادة تركيز المستخلصات النباتية. وأثبتت المعاملة بمبيد الأعشاب صن أب 48% أنها المعاملة الفعالة في القضاء على الحشائش الحولية ، وثنائية الحول والمعمرة ، يليها مستخلص نبات العادر *S. herba-alba* بتركيز 25% + مبيد الأعشاب صن أب 48% (بنسبة 1:1) قد حققت إبادة مرضية لمعظم الحشائش الحولية وثنائية الحول والمعمرة مقارنة بمعاملة المقارنة. كما أظهرت النتائج تفوق مستخلص نبات العادر عند تركيز 25% + مبيد الأعشاب صن أب 48% في تثبط إنبات معظم بذور الأعشاب الضارة معملياً.