Effect of some medicinal oil with adjuvant (BIO-FILM) on maize, sunflower and sorghum productivity and associated weeds

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Abstract

The aim of this study to evaluate the applied basil and camphor oils for weed control and phytotoxic effect on some field crops, compared to chemical and mechanical weed control as well as un-weeded check. Wire house and field experiments were conducted during the period from the year 2020 to 2023 in the experimental farm and wire house of Weed Research Central Laboratory at Giza Research Station, Agricultural Research Center (ARC) Egypt, in Randomized Complete Block Design (RCBD) in four replicates.

The statically analyze of the data obtained, the significantly reduced of number and fresh weight of some weed species under all experiments by weed control treatments. Improvement of maize, sunflower and sorghum without any phytotoxic effect of essential oils or herbicides under study, except sorghum crop was sensitive to the herbicides used in the study.

Camphor and basil oils were more effective on *Ipomea eriocarpa*, *Setaria virids*, *Trianthema portulacastrum*, *Cyperus rotundus* and *Cynodon dactylon*. The reduction in fresh weight of weed species about between 80 to 100% under low weed seed bank of the soil and sensitive weed species and less effect under the high soil weed seed bank specially by *I. eriocarpa* and *S. virids*due to the emergence of this weed species after applied this oils.

Finley Camphor and Sweet basil oil can be using for weed control under low infestation by weeds and complement by one hand hoeing in case the high infestation by *I. eriocarpa*.

Introduction

Weeds cause higher reductions in crop yield than any other pest or disease accounting about 30% of potential losses. The continuous use of synthetic herbicides for their management is increasing the development of herbicide-resistant weeds, environment risks and human health. Natural products such as essential oils, plant extracts, allelochemicals, are environmentally friendly and have low toxicity. So the using medicinal and aromatic plants as source of bioherbicides as multi target site activity for sustainable agricultural production (11). The weeds making the main problem faced organic farmers in the field. Many plant species have allelopathic compounds with high phytotoxicity and can be using in weed control, such as essential oils (EOs), (10).

Essential oils are extracted from various aromatic plants generally localized in temperate to warm countries like Mediterranean and tropical countries where they represented an important part of the traditional pharmacopoeia. The certain essential oils like terpineol, eugenol, thymol, carvacrol, carvone, geraniol, (2). Essential oils (EOs) and their components, mainly terpenoids, as pure natural compounds or in mixtures have strong phytotoxic activity, could be developing as new bio-herbicides of new natural-like low impact than synthetic herbicides, (16). Essential oils extraction, by distillation from aromatic plants, they contain a variety of volatile molecules such as terpenes and terpenoids, phenol-derived aromatic components and aliphatic components, as antioxidants. Essential oils has prooxidants affecting inner cell membranes and organelles such as mitochondria, depending on type and concentration, they changes in intracellular redox potential and mitochondrial dysfunction induced by essential oils can be associated with their capacity to exert antigen-toxic effects. (2).

The present invention is depending on evaluated the phytotoxic potential of natural products of aromatic plant for weed control. Tomatoes crop as well as *Portulaca oleraceus* L, *Amaranthus* spp, *Euphorbia helioscopia* L, *Ammi majus*, L., *Anagallis arvensis* were sensitive to aqeous *O. basilicum* extracts when applied at the concentration 3, 4 and 5% post emergence at 2–4 leaf stage of weeds, but, aqueous O. basilicum extracts did not any effect on maize, kidney bean, as summer crops and wheat, Chickpea, clover and onion winter crops. However, *Chenopodium album*, *Amaranthus hybridus* and *Portulaca oleraceus* were susceptible to low concentrations of Ocimum extract 1, 2, 3, 4 and 5% when applied post- emergence at stage 2–4 leaves of weeds. O. basilicum extracts at the concentration 3, 4 & 5% caused reduced percentage of *P. oleraceus*; *T. portulacastrum* and *C. rotundus* by 60, 80 & 86%; 75, 80 & 90% and 75, 90 & 91%, respectively, in average in all experiments under study. This method for weed control is characterized by preserving the environment from contamination by the herbicide that are used for reducing weed density incidence, obtaining a healthy, clean and safe agricultural product for public health, with ease of manufacturing and saving hard currency for importing herbicides, (12). Crude extract of *O. basilicum* plus camphor oil were more effective against broadleaved and grassy weeds than using its formulation with adjuvant where about 40.48 kg fresh weight of *Ocimum* equivalent extracts ml – 1/ha when applied post emergence gave 97 to 99% control of weed biomass, which equal the recommended herbicide (glufosinate ammonium) effect. The chemical compositions of extracts were analyzed by GC–MS to determine chemical compositions shows the major compounds were 2-cyclopenten-1-one, 2,5,5-trimethyl, 3-cyano-5,5-dimethyltetrafuran-2-one area % 7.79, linoleic acid, methyl ester 6.6%, 9,12-Octadecadienoic acid (Z,Z)-6.3%, Phthalic acid, di(2-propylpentyl) ester, 1,2-benzenedicarboxylic acid 4.38%, 6-Octadecenoic acid, methyl ester, (Z)-3.75%, 2,3-bis(acetyloxy) propyl laurate 3.38%, Squalene 3.02%, thymol 2.95%, 2-cyclohexen- 1-one, 4-(3-hydroxy-1-butenyl)-3,5,5-trim ethyl-2.78%, hexadecanoic acid, methyl ester 2.28, cis-linalool oxide 1.75%, Eugenol, phenol, 2methoxy-3-(2-propenyl), 1,3,6,10-Cyclotetra decate traene, 14-Isopropyl-3,7,11-trimethyl(+), genranyl-a-terpinene, Retinol, acetate, 3-ethyl-3-hydroxy and drostan, 2-(7-hepta decynyloxy) tetrahydro 2h-pyran and M&P-Camphorne, these compounds have allelopathic effect the developing new bio-herbicide for controlling annual weeds and increasing the growth characteristics and yield of peanut and cowpea plants, (6) and (13). Some allelochemicals compounds have allelopathic effect such as phenolic compounds inhibit root and shoot length, (5) or thought to interact with the mitochondrial membrane and to impair mitochondrial respiration directly. The monoterpenes camphor, apinene, and limonene all strongly affected the respiratory activity of soybean radicular hypocotyl mitochondria, but apparently have different modes of action, (17). The tested chemicals of cinnamic acid was inhibited root hairs and changes the structure of the vascular system, the phloem elements were the most affected, Jităreanu *et al* (2013). squalene content of some vegetable oils, (14). Cinnamic acid chemical treatments were effected on the growth of bean plants, biosynthesis of polyphenols and growth of roots, in the seedling stage, at the concentration 114.6 μg cm^{-2}, (7). Essential oil compounds of Juniper camphor (24.7%), _-sinensal (7.7%), 6-epi-shyobunol (6.6%), _-zingiberene (5.8%), _-bisabolol (5.3%), and T-muurolol (4.7%) were a significant allelopathic activity on the weeds *Bidens pilosa* L. (hairy beggarticks) and *Dactyloctenium aegyptium* (L.) Willd and could be integrated into the methods of the management of these weeds is recommended for the characterization of the pure major compounds, particularly juniper camphor, (1).

Chemical weed control in sorghum crop is limited by the low quantity of herbicides registered for the crop, Machado et al. (2016) pointed that the herbicides were applied pre emergence (trifluralin at the rate 1200 g ha^{-1}, S-metolachlor at 768 g ha^{-1}) and clomazone at 1000 g ha^{-1} have high toxicity in the sorghum plants. No injuries were observed in sorghum plants by the use of herbicides in post emergence as bentazon at 720 g ha^{-1}, bentazon + atrazine at 480 + 880 g ha^{-1}, atrazine at 2200 g ha^{-1} and bentazon + pendimethalin at 720 + 1000 g ha^{-1}. (3) mentioned that S-metolachlor + mesotrione and S-metolachlor fb prosulfuron reduced sorghum yields by 1009 to 1121 kg ha^{-1} compared to other herbicide treatments. The five best herbicide treatments in terms of weed control and grain sorghum yield were quinclorac, atrazine + dimethenamid-p, S-metolachlor fb atrazine + dicamba, dimethenamid-p fb atrazine, and the standard treatment of S-metolachlor + atrazine fb atrazine.

The objectives of this study was the investigating the effect of some essential oils on weed control in maize, sunflower and sorghum crops and the possibility to be used as a natural herbicide, as well as the applicable method for utilizations from essential oils and its possible use to control weeds under field conditions.

Materials and methods

Wire house and field experiments were carried out during 2020 and 2023 years to study the effect of sweet basil and camphor oil Commercial source materials were selected, with BIO-FILM spray Adjuvant on maize , sun flower , sorghum and associated weeds in complete randomized blocks design (CRBD) with four replication in wire house and Giza farm station.

Treatments in maize were: -

1- Natural oils, Basil oil at 600 cm^3 ha^{-1} Production by El-captain (CAP PHARM for extraction) + BIO-FILM (adjuvant) 480 cm^3 ha^{-1} Post emergence at stage 2-4 leaves of maize

2- Natural oils, camphor oil at 600 cm^3 ha^{-1} Production by El-Masrayia production for natural oils extraction +BIO-FILM (adjuvant)at 480 cm^3 ha^{-1} Post emergence at stage 2-4 leaves of maize.

3- Adengo extra 46.5 % SC at the rate 360 cm^3 ha^{-1} Post emergence at stage 2-4 leaves of maize

4- Hand hoeing twice.

5- Control without any treatment.

Treatments in sunflower were: -

1- Natural oils, Basil oil at 600 cm^3 ha^{-1} Production by El-captain (CAP PHARM for extraction) + BIO-FILM (adjuvant) 480 cm^3 ha^{-1} Post emergence at stage 2-4 leaves of sun flower.

2- Natural oils, camphor oil at 600cm^3 ha^{-1} Production by El-Masrayia production for natural oils extraction +BIO-FILM (adjuvant)at 480 cm^3 ha^{-1} Post emergence at stage 2-4 leaves of sun flower.

3- Hand hoeing twice.

5- Control without any treatment.

Treatments in sorghum were: -

1- Natural oils, Basil oil at 600cm^3 ha^{-1}. Production by El-captain (CAP PHARM for extraction + BIO-FILM (adjuvant) 480 cm^3 ha^{-1}, Post emergence at stage 2-4 leaves of sorghum.

2- Natural oils, camphor oil at 600 cm^3 ha^{-1}. Production by El-Masrayia production for natural oils extraction +BIO-FILM (adjuvant)at 480 cm^3 ha^{-1} post emergence at stage 2-4 leaves of sorghum.

3- Pendimethaline, known commercially as stomp extra 45.5% CS pre sowing at the rate 3.6 l/ha-1.

4- Isoxaflutol 22.5% + theincarbazone-methyl 9%+ cyprosulfamide (safener) 10% SC, known commercially as adengo extra 46.5% SC pre -sowing at the rate 360 cm^3/ ha^{-1}.

5- Fluroxypyr-meptyl known commercially as cleaner 20% EC at the rate 480 cm^3 ha^{-1} as post emergence at 2- 4 leaves of weeds.

6- Foramsulfuron-3.35% +Iodosulfuron methyl – sodium 0.11% +Thiencarbazone- methyl 1.07%, known commercially as maister Power 4.25% OD at the rate 1.2 l ha^{-1}.

7- Foramsulfuron known commercially as equip 2.25% OD post emergence at the rate 1.8 l/ ha^{-1}.

8- Hand hoeing twice. 8- Control without any treatment.

All boiherbicide and herbicide treatments were applied using CP_3 Knapsack sprayer with one nozzle boom and the water volume was 480 l ha^{-1}.

BIO-FILM-spray adjuvant production by Kafer El-zeate (KZ), straction from 80 % plant extraction natural oils + 20 % waitable and adjuvant materials as adjovent.

Mode of action of weed control treatments: -

1- Basil oil: - volatile organic compounds, VOCs belong to two groups (i) terpenes and terpenoids (a terpene containing oxygen) and (ii) aromatic and aliphatic constituents. Regardless, terpenoids are the most representative and abundant compounds released by plants. monoterpenoids released by this species were characterized by an inhibitory activity on cell proliferation and DNA synthesis in the root meristem

2- Camphor oil: - volatile organic compounds, VOCs belong to two groups (i) terpenes and terpenoids (a terpene containing oxygen) and (ii) aromatic and aliphatic constituents. Regardless, terpenoids are the most representative and abundant compounds released by plants. monoterpenoids released by this species were characterized by an inhibitory activity on cell proliferation and DNA synthesis in the root meristem

3- Stomp extra: - Selective herbicide, absorbed by the roots and leaves. Affected plants die shortly after germination or following emergence from the soil.

4- Adengo extra: - Inhibition of carotenoid biosynthesis giving rise to chlorosis of new growth

5- Cleaner: - Selective contact herbicide, absorbed more readily by foliage (and especially the shoots) than by roots, with very little translocation.

6- Equip: - effect on meristemtic regions become chlorotic and necrotic, followed by general foliar chlorosis and necrosis.

7- Hand hoeing: - killed weeds by cutting the growing weeds above or under soil surface**.**

The sowing dates 1st June 2020 and 31st July 2021and 1st Jun 2022 of maize experiments and 5th June 2021 of sun flower, and sorghum crop in 1st July 2023 season calcium super phosphate 15.5 % fertilizer was added at land preparation at the rate 360 kg P_2O_2 /ha^{-1} Potassium at 120 kg/ha^{-1} In the from potassium sulfate 48 % K_2O/ha^{-1} Nitrogen applied in from of urea 46.5 %N at the rate 192 kg N ha^{-1} In two equal portions the 1st after thinning and before the first irrigation and the second production before the second irrigation, the other agricultural practices of maize , sun flower, sorghum were applied as recommended Maize cv. Three way cross 310 at seeding rate g/kg/ha-1 The plot area about 3 m^2 (2.1m L ×1.43m w), each plot include three row, maize sowing on one ridge 2 grain/hill and 25 cm part between the hills , then maize thinning to one plant/hill.

Sun flower cv, Giza 120 at seeding rate 12 kg ha^{-1} Plot area 10.5 m^2 (3 m w × 3.5 m L) include five row, sun flower sowing on one ridge 2seeds /hill and 20 cm part , then sun flower thinning on one plant/hill before the first irrigation sorghum cv at seeding rate 16.8 kg/ha^{-1} Plot area was 10.5 m^2 (5mL×2.1mw) include 3 row , sorghum sowing on one ridge 2 grain / hill and 15 cm apart between hill, then sorghum plant thinning on one plant /hill before the first irrigation .

Date was recorded:-

a- Weed traits:- At 60 Days After Sowing (DAS)

1- Weeds hand pulled from on square meter chosen at random in each plots after 60 DAS, identified and recorded the number and weighted (g/m^2) for each weed species and estimated the percent of reduction for each weed species and classified in to annual and perianal narrow, broad leaved weed and their total weeds.

2- Transverse sections were obtained by sharp razor and were examined immediately with video microscope fitted with a digital camera (Optika Italy) attached with computer. The obtained sections of seedling root and stem of *Chanabodium murale* and *Phalaris paradxa* under basil and camphor oils effect were compared to untreated check.

b- Maize traits:- At 90 DAS

Number of maize plant /m^2, plant height cm, number of green leaves/plant and plant weight g/plant.

At harvest: -

Five plants were chosen randomized from the central row for determine the following traits:-

Ear length cm, ear diameter cm, ear weight g/ear, number of rows/ear, number of kernels/row and grain yield (ton ha^{-1}) was estimated from grain yield of all plant/plots (kg/10.5m^2) then estimated for ton per hectare.

c- Sun flower traits: - at harvest

Plant height cm, plant weight g/plant, head diameters cm, number of plant/m^2, number of green leaves/plan, number of seeds/head, seeds weight (g/head) and seed yield ton ha^{-1} were estimated from all plant/plot (g/10.5m^2) then estimated by ton ha^{-1}.

d- Sorghum traits::- at harvest

Plant height cm, plant weight g/plant, number of green leaves/plant, number of plant/m^2, head diameter cm, head length cm, weight of seeds g/head and seed yield ton ha^{-1}) were estimated from all plants/plot.

d- Gas chromatography–mass spectrometry (GC-MS) analysis, by Regional Center for Food & Feed, Agricultural Research Center, Giza, Egypt

Table (1 a & b) The chemical composition of your samples performed using GC-TSQ mass spectrometer (Thermo Scientific, Austin, TX, USA) with a direct capillary column TG–5MS (30 m x 0.25 mm x 0.25 µm film thickness). The column oven temperature was initially held at 60°C and then increased by 5°C /min to 250°C withhold 2 min then increased to 300 with 30 C/min. The injector temperature was kept at 270°C. Helium was used as a carrier gas at a constant flow rate of 1 ml/min. The solvent delay was 4 min and diluted samples of 1 µl were injected automatically using Auto Sampler AS3000 coupled with GC in the split mode. EI mass spectra were collected at 70 eve ionization voltages over the range of m/z 50–650 in full scan mode. The ion source and transfer line were set at 200 °C and 280 °C respectively. The components were identified by comparison of their mass spectra with those of WILEY 09 and

NIST14 mass spectral database, **International Journal of Analytical Mass Spectrometry and Chromatography, 2016, 4, 14-25.**

Table (1a) Compound, retention time (RT) and peak area% in Basil oil

No.	Compound	RT (min.)	Area Sum%
1	1-Decanol	5.6	6.67
2	Heneicosane	7	1.45
3	Nonanal	7.7	1.41
4	Camphor	10.1	4.04
5	3-Undecyne	10.4	9.14
6	α-Guaiene	11.7	0.36
7	Bulnesene	12.2	18.5
8	Cinnamic acid, trimethylsilyl ester	12.6	0.41
9	11-Dodecenol	14	0.3
10	Oleic Acid	14.1	0.36
11	Citronellylvalerate	15.5	0.36
12	Isophytol	15.8	0.33
13	Phytol	15.9	0.35
14	Betulin	16.3	0.29
15	Eicosanoic acid	16.6	4.52
16	Digitoxin	16.8	0.27
17	Lupeol	17.7	1.48
18	Isolongifolo	18	26.57
19	Trans-Farnesol	18.2	1.85
20	Squalene	18.6	1.4
21	Stigmasterol	19.1	2.42
22	Erucic acid	19.5	0.45
23	1-Octadecyne	19.7	0.3
24	Betulin	20.4	5.62
25	Ledol	21.4	8.1
26	Thunbergol	22.1	0.42
27	β-Amyrone	22.4	1.24
28	Palmitoleic acid	22.5	0.29
29	Octadecanoic acid, octadecyl ester	23	0.51
30	β Carotene	23.5	0.58

Table (1b) Compound, retention time (RT) and peak area% in Camphor oil

No.	Compound	RT (min.)	Area Sum%
1	Ecogonin	5.87	35.96
2	Heptacosanol	6.96	1.55
3	D-(+)-Camphor	8.46	2.51
4	Linoleic	8.64	1.76
5	Squalane	9.75	26.43
6	Bergenin	10.99	5.84
7	Palmitelaidic acid	11.37	0.63
8	Elaidic acid	11.57	0.69
9	Cis-Vaccenic acid	11.64	0.81
10	Phytanic acid	11.77	2.23
11	1-Stearoyl-rac-glycerol	11.82	0.72
12	Tetradec-11-en-1-ol	16.67	1.89
13	Octadecanoic acid, 4-hydroxy-, methyl ester	18.21	13.93
14	Nonacosane	21.30	2.24
15	1-Oleoyl-2-palmitoyl-rac-glycerol	22.61	2.81

Statistical analysis:

All data were statistically analyzed according to technique of analysis of variance (ANOVA2) for the randomized complete block design with four replicates as mentioned by **(4)** by means of "MSTATC" computer software package and Least Significant Differences (LSD) at 5% and level of probability was calculated for comparison between the means of treatments.

Results and Discussion

Analysis of compounds present in the basil oil sample by GC-MS Chromatogram-GC-MS analysis shows the high peak area % was Isolongifolo 26.57, Bulnesene 18.5, 3-Undecyne 9.14, Decanol 6.7, Betulin 5.62, Eicosanoic acid 4.52. In camphor oil sample was Ecogonin 35.97, Squalane 26,83, Octadecanoic acid, 4-hydroxy-, methyl ester 13.93, Bergenin 5.84, 1-Oleoyl-2-palmitoyl-rac-glycerol, Nonacosane, D-(+)-Camphor 2.5% Table (1 a and b). These compounds have allelopathic effect on weeds, (2), (13) and (6).

Table (2) data results pointed that the number of weed species seedling after applied the weed control treatments have coefficient of variation (C. V) less than the number of seedling before applied the weed control treatments. Un-weeded control the number of weed species seedling increased at the period of the time survey than the time before applied the weed control treatments. Applied the essential oils reduced significantly the number of all weed species, compared to un-weeded control, except the effect of basil oil on *S. virides*. These results due to up normality weed distribution in field experiments before application the weed control treatments, but after applied the weed control treatments reduced the number of weed/ m^2 by essential oil was strong phytotoxic activity, Verdeguer *et al*, 2020; essential oils contain a variety of volatile molecules, as antioxidants can act as prooxidants affecting inner cell membranes and mitochondrial dysfunction with their capacity to exert antigen toxic effect, **(2)**, (13) and (6).

Table (2) Effect of medicinal oil with adjuvant number of weed species (plant/m^2) before and after application essential oil treatments in 2020 wire house

Treatments	*Setaria virides* plant/m^2		*Echinochloa colonum* plant/m^2		Total grassy weeds plant/m^2 plant/m^2		*Portulaca oleracea* (Broad leaved) plant/m^2 plant/m^2		Total weeds plant/m^2	
	Before	After	Before	After	Before	After	Before	After	Before	After
Camphor oil	10.5	0.0	5.5	0.0	16.0	0.0	10.75	1.25	26.75	1.25
Basil oil	11.25	11.0	5.25	1.25	16.5	12.25	14.75	3.5	31.25	12.75
Un-weeded	4.0	6.25	4.25	10.5	8.25	16.75	5.0	7.25	13.25	24.0
L.sd 0.05	12.75	4.11	13.36	5.95	22.93	7.66	14.71	3.51	29.27	5.4
C.V.	92.5	27.1	154.5	27.7	97.6	34.3	83.6	24.4	71.5	11.8

The dominant weed species are recorded in Table (3 and 4) and Fig. (1) shows the relative importance value of weed species *Ipomea eriocarpa* 50.6 and 9.9 and 40.3%, *Setaria virids* 28.0 and 58.3 and 9.6%, *Trianthema portulacastrum* 7.3 and 17.7 and 40.7% and *Cynodon dactylon* 0.0 and 11.3 and 22.4% in wire house and field experiments during 2020, 2021, 2022 and 2023 season respectively.

Table (3) Effect of medicinal oil with adjuvant on weed species weight (g/m^2) wire house experiment

Treatments	*Setaria virides* g/m^2	*Echinochloa colonum* g/m^2	*Portulaca*	*Trienatum*	*Convolvulus*	*Ipomea*	*Corchorus*
Camphor oil	67.2	7.5	11.0	90.0	15.8	98.7	0.0
Basil oil	220.2	11.8	6.7	85.5	9.5	49.0	0.0
Adengo extra	11.2	0.0	0.0	42.0	0.0	0.0	0.0
Hand hoeing	5.0	3.8	30.0	0.0	3.5	42.0	0.0
Un-weeded	378.0	42.0	39.3	98.6	26.5	684.0	83.3
L.sd 0.05	144.3	13.4	2.5	13.6	8.2	18.3	4.3
C.V.	68.7	66.9	9.2	9.3	50.1	6.8	16.7

Tables (3 and 4) and Fig. (2) the data pointed that all weed control treatments caused significantly reduction in fresh weight of all species weed in wire house and field experiments. Hand hoeing and adengo herbicide were superior effect than essential oils on the total weeds. Camphor oil was effective on *Cyperus rotundus, S. virids, Echinochloa colonum* and *I. eriocarpa* reduced the fresh weight between 70 to 100%, compared to un-weeded check. Sweet basil oil was effective on *C. rotundus* and *Cynodon dactylon* reduced the fresh weight between 65–80%. Essential oils were less effective on *T. portulacastrum*. These results due to died weeds by the effect of essential oils monoterpenes, camphor, apinene and limonene all strongly affected the respiratory activity, (17).

Table (4) Effect of medicinal oil with adjuvant on weed species weight (g/m^2) field experiment in 2021 and 2022 seasons

2021 season							
Treatments	*Setaria virides* g/m^2	*Echinochloa colonum* g/m^2	*Trienatum*	*Ipomea*	*Convolvulus*	*Cyperace*	*Cynodon*
Camphor oil	259.7	12.7	516.8	148.5	0.0	16.0	199.7
Basil oil	0.0	20.0	354.3	215.0	2.7	8.7	145.3
Adengo extra	404.7	0.0	30.8	106.0	0.0	7.6	27.0
Hand hoeing	285.7	0.0	16.5	0.0	0.0	17.0	0.0
Un-weeded	2056.3	44.0	626/0	348.3	10.3	44.6	400.3
LSD 0.05	84.3	7.9	76.7	44.9	1.1	3.1	6.5
C.V.	6.6	23.3	16.1	17.2	27.6	11.6	12.7
2022 season							
Camphor oil	63.3	258.0	641.8	918.7	-	0.0	92.0
Basil oil	145.3	122.3	404.2	663.0	-	21.7	41.0
Adengo extra	11.3	0.0	30.8	746.7	-	9.0	78.5
Hand hoeing	5.0	0.0	16.5	100.0	-	11.5	163.0
Un-weeded	378.0	385.0	551.0	1579.8	-	147.5	877.8
LSD 0.05	21.3	18.3	204.3	65.6	-	28.0	51.8
C.V.	11.5	7.2	40.3	5.5	-	54.2	10.9

Figure (1) Relative of weed species from total weed composition fresh weight of weed species

Figure (2) Reduction % in fresh weight of weed species and their totals weeds

Table (5) and Fig. (2) the data reflected that the efficiency of weed control treatments under high infestation by weeds (high weed seed bank of the soil). The number of weed species seed bank of the soil seeds/m^2 at 0–5 and 6–15 cm depth in field experiment was (18263.3 and 2658) of *I. eriocarpa*, *T. portulacastrum* (17100.3 and 3217.6), *Euphorbia geniculata* (11615 and 5742.6), *E. colonum* (5921.8 and 3483.1) and *S. virids* (1227.4 and 938.1 seeds/m^2). The greatest fresh weight reduction of total annual weed was resulted from hand hoeing twice followed by adengo herbicide, sweet basil and camphor oils. Sweet basil and camphor oils were effective on *E. geniculata* and *E. colonum*, reduced fresh weight 100%, but less effective on *I. eriocarpa*. Basil oil and adengo herbicide was effective on *S. virids* more than hand hoeing twice and camphor oil in this study. These results due to *I. eriocarpa* was have high seed bank of the soil, which represented and germinated after applied the oils treatments as well as after killed the sensitive weed species and became as the dominant weed species in the oils treated plots. These results were agreement with obtained by (14), (13), (6), and (12)

Table (5) Effect of medicinal oil with adjuvant on annual weed species complex weight (g/m^2) field experiment under high soil weed seed banks in 2021 and 2022 seasons

Treatments		*S. virides* g/m^2	*E. colonum* g/m^2	Total grassy	*T. portulacasterum*	*E. geneculata*	*Ipomea*	Total broad leaved	Total annual weeds
2021 season									
Camphor oil		359.7	0.0	359.7	916.7	0.0	1848.7	2765.0	3125.0
Basil oil		0.0	0.0	0.0	643.0	0.0	2015.9	2658.0	2658.0
Adengo extra		0.0	504.7	504.7	748.7	176.3	204.0	1127.0	1632.0
Hand hoeing		385.7	0.0	385.7	0.0	143.67	0.0	144.0	529.0
un-weeded		390.7	2165.3	2856.0	1584.3	54.0	237.3	1876.0	4432.4
LSD 0.05		34.66	78.2	84.3	98.9	19.93	48.56	125.6	149.7
C.V.		12.4	7.8	6.6	6.7	14.1	3.0	9.3	3.3
Seed banks in soil (seed m^{-2}	0–5 cm	1227.4	5921.8	7149.2	17100.3	11615.0	18263.3	46975.6	54124.8
	6–15 cm	938.1	3483.1	4421.2	3217.6	5742.6	2658.0	11618.2	16039.4

Figure (3) Reduction % in fresh weight of weed species and their totals weeds

Wire house experiments

All tested treatments significantly reduced the fresh weight of broad leaved, grassy and total weeds in the three seasons (2020, 2021 and 2022), table (6).

Results in Table (6), showed that the camphor oil gave the highest decreasing in the fresh weight of broad leaved, grassy and total weeds which were (83.8%, 62.6% and 69.1%) and (71.4%, 72.3% and 72.0%) for 2020 and 2021 seasons respectively, compared to un-weeded treatment. Whereas, Basil oil treatment decreased the fresh weight of broad leaved, grassy and total weeds by (73.9%, 57.3% and 62.4%) and (50.8%, 68.8% and 61.7%) for 2020 and 2021 seasons respectively, compared to un-weeded treatment.

In 2022 season, the highest reduction in the fresh weight of broad leaved, grassy and total weeds were 94.5, 94.9 and 94.6%, respectively, which recorded with Adengo herbicide treatment, followed by hand hoeing treatment (95.2, 93.1 and 94.4%, respectively), Basil oil treatment (50.0, 58.6 and 53.3%, respectively) and Camphor oil treatment (18.3, 85.9 and 45.0%, respectively) compared to un-weeded check. These results due to killed the weeds by the herbicide or hand hoeing or and the compound of oils such as terpenoids pure or in mixtures in essential oils, which have phytotoxic activity on weed species, (2), (13), (6), (16) and (12).

Table (6) Effect of medicinal oil with adjuvant fresh weight (g/m^2) of broad leaved, grassy and their total weeds in 2020, 2021 and 2022 seasons in wire house and field experiments.

Treatments	Fresh weight g/m^2 of broad leaved weeds			Fresh weight g/m^2 of grassy weeds			Fresh weight g/m^2 of total weeds		
	2020	2021	2022	2020	2021	2022	2020	2021	2022
	Wire house experiments								
Camphor oil	60.5	139.0	528.5	314.3	205.5	59.3	374.8	344.0	587.3
Basil oil	97.5	239.3	323.8	358.5	232.0	174.0	456.0	471.3	497.8
Adengo herbicide	-	-	35.8	-	-	21.3	-	-	57.1
Hand hoeing twice	-	-	31.0	-	-	28.8	-	-	59.8
un-weeded	373.0	486.0	647.0	840.0	743.0	420	1213.0	1229.0	1067.0
L.sd 0.05	65.7	198.2	175.2	230.4	95.3	143.7	262.8	86.6	232.8
C.V.	21.4	25.6	29,8	26.4	14.0	31.3	22.3	7.35	25.8
	Field experiments								
Camphor oil	-	532.5	917.7	-	75.0	359.7	-	607.5	1276.3
Basil oil	-	313.8	653.0	-	232.0	0.0	-	545.8	643.0
Adengo herbicide	-	30.8	920.5	-	11.2	504.7	-	42.0	1427
Hand hoeing twice	-	20.0	215.5	-	8.8	385.7	-	28.8	529.3
un-weeded	-	653.0	1335.8	-	420.0	2165.3	-	1073.0	3803.7
L.S.D. 0.05	-	102.2	538.0	-	167.3	56.3	-	181.4	90.4
C.V.	-	21.4	43.3	-	72.7	5.4	-	25.6	3.82

Field experiments

All tested treatments significantly reduced the fresh weight of broad leaved, grassy and total weeds in the two seasons (2021 and 2022), table (6).

In 2021 season, the highest reductions in fresh weight of total weed were 97.3% and 96.1% recorded with hand hoeing and Adengo herbicide treatments, respectively without significant different between the two treatments followed by 49.1% and 43.4% which recorded with camphor oil and Basil Oil treatments, respectively, also without any significant different between the two treatments, compared to un-weeded check.

In 2022 season, the highest reductions in fresh weight of broad leaved, grassy and total weeds were (83.9, 82.2 and 86.1%) recorded with hand hoeing treatment followed by (54.1, 100 and 83.1%) with camphor oil treatment, (31.3, 83.4 and 66.4%) with basil oil treatment and (31.1, 76.7 and 62.5%) with Adengo herbicide treatment, compared to un-weeded check. These results due to killed or and the effect of herbicide and essential oils on the inhibitory carotenoid and DNA synthesis in the root meristem then die the weed plant, These results were egreement with the obtained by (13), (6) and (16).

Anatomical studies

The transverse sections of stem and root of dicots weeds *Chenopodium mural* and *Phalaris paradoxa* as Monocots, in the control plant presented the well-known anatomic regions. The zones were identified in the mean roots transverse section were root hairs zone, epidermis, cortex, xylem, xylem ray and phloem. The root hairs and cortex region was less and very thickens in the plant under basil and camphor oils treatments, compared to the plants in un-weeded control, (8).

The effect of the two essential oils caused great anatomical changes as appeared in transverse sections of roots and stem of both *Chenopodium mural* and *Phalaris paradoxa* plants as shown in the Fig. 4.

Cells of the epidermis, cortex and stele shapes had irregular and decreased in number of xylem, epidermis layers accompanied by inhibition of root formation, due to changes in the hormone balance particularly, auxin, ethylene and gibberellin which affected on cell specification, proliferation and expansion of the two studied species, (13).

Essential oils caused epidermal necrotic the area cells of cortex with the small cell size and compaction in its cell layers, which were inhibited as compared with untreated check. The anatomical abnormalities in the stem or root's cross section and decreased in cell division which induced from essential oils defense in both roots and stem of *Chenopodium mural* and *Phalaris paradoxa* plants as compared with those of the untreated check it may be inhibited respiration, (17), (2), (5) **and** (13).

C. mural plant in control, the xylem parenchyma tissue form in the stems, which gives support to the growing organs, but the effect of essential oils on the stem cross section presented the increased of pith size and less parenchyma tissue. These results due to exert antigen-toxic effects and changes in intracellular redox potential and mitochondrial dysfunction induced by essential oils **(**(17), (2), (5) **and** (13)..

The tested chemicals of cinnamic acid was inhibited root hairs and changes the structure of the vascular system, the phloem elements were the most affected, (8). squalene content of some vegetable oils, Nergiz and Çelikkale (2011). Cinnamic acid chemical treatments were effected on the growth of bean plants, biosynthesis of polyphenols and growth of roots, in the seedling stage, at the concentration 114.6 µg cm-^{2}, (7). Essential oils (EOs) and their components, mainly terpenes, terpenoids, genranyl, phenol and squalene caused changes the structure of the vascular system, interact with the mitochondrial membrane and to impair mitochondrial respiration directly, (17), (7), (8) **and** (13).

Figure 4, Effect of different essential oils on cross section of (1) *Chenopodium mural* as Dicots and (2) *Phalaris paradxa* as Monocots, in the root and stem

Wire house experiment: Table (7)

In 2021 season, the treatments affected significantly the maize plant height, number of leaves/plant, ear weight and ear length, in which the highest values of plant height and number of leaves/plant (162.5 cm and 14.3, respectively) were recorded with camphor oil treatment whereas the highest values of ear weight and ear length (140.7 g and 22.6 cm, respectively) were recorded with Basil oil treatment, compared with un-weeded treatment.

In 2022 season, the treatments has significant effect on ear weight and length in which the highest ear weight (155.7g) recorded with Basil oil treatment and the highest ear length (22.6 cm) recorded with camphor oil treatment, compared with un-weeded treatment, while, the oils under study had no significant effect on maize plant height and number of leaves/plant. These results due to the reduced maize/weed competition during the early stage of maize plant and increased vegetative growth due to the decreased of weed competition by weed control treatments and increased the fertility elements round the maize root, (13).

Field experiment: Table (7)

In 2021 season, the treatments affected significantly the maize plant height, number of leaves/plant, ear weight and ear length.

The highest value of plant height (252.9 cm) was recorded with hand hoeing treatment followed by camphor oil, Adengo herbicide, un-weeded and basil oil treatments (242.8, 140.0, 235.0 and 232.0 cm, respectively)

The highest number of leaves/plant (14.0) was recorded with camphor oil treatment followed by, Adengo herbicide, hand hoeing, basil oil and un-weeded treatments (13.5, 13.5, 13.5 and 12.3, respectively). These results due to the reduced maize/weed competition during the early stage of maize plant and increased vegetative growth due to the decreased of weed competition by weed control treatments and increased the fertility elements round the maize root, (13).

The highest ear weight (163.4 g) was recorded with camphor oil treatment followed by hand hoeing, Adengo herbicide, basil oil and un-weeded treatments (162.5, 160.8, 134.1 and 128.0 g, respectively).

The highest ear length (25.0 cm) was recorded with Adengo herbicide followed by camphor oil, hand hoeing, basil oil and un-weeded (24.3, 24.3, 21.8 and 20.0 cm, respectively).

In 2022 season, the treatments affected significantly the maize plant height, ear weight and ear length but the treatments has no significant effect on number of leaves/plant.

The highest value of plant height (248.0 cm) was recorded with basil oil treatment followed by Adengo herbicide, hand hoeing, camphor oil, un-weeded and treatments (247.3, 238.0, 224.0 and 217.0 cm, respectively).

The highest ear weight (161.5 g) was recorded with hand hoeing treatment followed by basil oil, Adengo herbicide, camphor oil and un-weeded treatments (156.5, 156.3, 142.5 and 79.3 g, respectively).

The highest ear length (22.6 cm) was recorded with camphor oil followed by Adengo herbicide, hand hoeing, basil oil and un-weeded (20.6, 20.5, 19.5 and 15.1 cm, respectively). These results due to the increased of maize growth characters and increase competitive crop due to the killed weeds in early stage of grow maize. These results were agreements the results obtained by (13).

Table (7) Effect of medicinal oil with adjuvant on growth characters of maize in 2021 and 2022 seasons in wire house and field experiments.

Wire house experiments								
Treatments	Plant height cm		Number of leaves/plant		ear weight g		Ear length cm	
	2021	2022	2021	2022	2021	2022	2021	2022
Camphor oil	279.0	260.0	14.8	14.5	134.1	136.1	19.6	22.6
Basil oil	260.5	261.5	14.3	14.5	140.7	155.7	22.6	15.1
un-weeded	243	259.5	13.0	14.1	83.5	89.1	15.1	15.1
L.sd 0.05	11.6	N.S	1.2	N.S	39.5	66.2	1.47	1.6
C.V.	2.58	4.1	4.9	5.1	19.14	30.0	10.2	4.7
Field experiments								
Camphor oil	242.8	224.5	14.0	13.7	163.4	142.5	24.3	20.6
Basil oil	232.0	248.0	13.3	12.5	134.1	156.5	21.8	19.5
Adengo herbicide	240.0	247.3	13.5	13.5	160.8	156.3	25.0	20.6
Hand hoeing twice	252.9	238.0	13.5	13.8	162.5	161.5	24.3	20.5
un-weeded	235.0	217.0	12.3	13.8	128.0	79.3	20.0	15.1
L.S.D. 0.05	14.6	20.4	1.0	N.S.	26.4	34.8	1.5	1.4
C.V.	3.9	5.7	5.0	7.3	11.4	16.2	4.2	4.5

Table (8): -

Wire house experiment:

In 2021 season, the tested treatments had no significant effect on ear diameter, number of rows/ear and number of kernals/row.

In 2022 season, the treatments has significant effect on ear diameter, number of rows/ear and number of kernals/row where camphor oil treatment gave the highest values for ear diameter and number of kernals/row (7.2 cm and 23.9) while the greatest number of rows/ear (12.9) was recorded with Basil oil, compared with un-weeded treatment. The maize yield ton ha^{-1} was affected significantly by the tested treatments in the two seasons.

In the 2021 season, the greatest yield (5.9 ton ha^{-1}) was recorded with Basil oil treatment followed by camphor oil treatment which was 4.6 ton ha^{-1}, which mean that Basil oil and camphor oil treatments produced increasing in maize yield by 90.3% and 46.2%, respectively, compared to the un-weeded yield (3.1 ton ha^{-1}).

In the 2022 season, the greatest yield (5.7 ton ha^{-1}) was recorded with camphor oil treatment followed by Basil oil treatment which was 4.9 ton ha^{-1}, which mean that camphor oil and Basil oil treatments produced increasing in maize yield by 62.7% and 44.1%, respectively, compared to the un-weeded yield (3.4 ton ha^{-1}).

Field experiment: concerning data in table (8)

The tested treatments had significant effect on ear diameter, number of rows/ear, number of kernals/row and grain yield ton ha^{-1} in the two seasons.

In 2021 season, the highest ear diameter (8.4 cm) was recorded with Adengo herbicide followed by hand hoeing (7.9 cm), camphor oil, basil oil treatments (7.7 cm) and un-weeded (6.4 cm).

The highest number of row/era (15.8) was recorded with basil oil treatment followed by Adengo herbicide (15.5), hand hoeing (15.3), camphor oil (14.9) and un-weeded (11.4).

The highest number of kernals/row (45.5) was recorded with hand hoeing treatment followed by camphor oil (43.3), Adengo herbicide (42.0), basil oil (41.3) and un-weeded (33.0).

In 2022 season, the highest ear diameter (8.6 cm) was recorded with hand hoeing followed by Adengo herbicide (7.8 cm), camphor oil, basil oil treatments (7.2 cm) and un-weeded (6.9 cm).

The highest number of row/era (15.4) was recorded with hand hoeing treatment followed by Adengo herbicide (13.6), basil oil (12.2), un-weeded (11.9) and camphor oil (11.1).

The highest number of kernals/row (39.4) was recorded with hand hoeing treatment followed by Adengo herbicide (34.8), camphor oil (31.0), basil oil (26.2) and un-weeded (23.5).

In the 2021 season, the greatest yield (6.7 ton ha^{-1}) was recorded with Basil oil treatment followed by camphor oil (6.4 ton ha^{-1}), Adengo herbicide (6.3 ton ha^{-1}), hand hoeing (6.0 ton ha^{-1}) and un-weeded (5.4 ton ha^{-1}), which mean that Basil oil and camphor oil treatments produced increasing in maize yield by 23.8% and 18.8%, respectively, compared to the un-weeded yield (5.4 ton ha^{-1}).

In the 2022 season, the greatest yield (10.2 ton ha^{-1}) was recorded with hand hoeing treatment followed by Adengo herbicide (9.5 ton ha^{-1}), camphor oil (8.7 ton ha^{-1}), Basil oil treatment (8.3 ton ha^{-1}), and un-weeded (5.0 ton ha^{-1}). These results due to the increase ear weight and diameters, number of kernals/row and number of row/ear.

Table (8) Effect of medicinal oil with adjuvant on yield and yield components of maize 2021 and 2022 seasons in wire house and field experiments.

Wire house experiments								
Treatments	Ear diameters cm		Number of row/ear		Number of kernals/row		Grain yield ton ha^{-1}	
	2021	2022	2021	2022	2021	2022	2021	2022
Camphor oil	6.4	7.2	9.9	12.7	24,1	23.9	4.6	5.7
Basil oil	5.8	7.2	9.6	12.9	25.7	20.9	5.9	4.9
un-weeded	6.5	6.9	9.5	9.6	20.9	16.0	3.1	3.4
L.sd 0.05	N. S.	1.1	N. S.	1.8	N. S.	6.7	2.4	0.4
C.V.	8.5	8.7	18.0	8.8	26.7	26.7	20.2	6.2
Field experiments								
Camphor oil	7.7	7.2	14.9	11.1	43.3	31.0	6.4	8.7
Basil oil	7.7	7.2	15.8	12.2	41.3	26.2	6.7	8.3
Adengo herbicide	8.4	7.8	15.5	13.6	42.0	34.8	6.3	9.5
Hand hoeing twice	7.9	8.6	15.3	15.4	45,5	39.4	6.0	10.2
Un-weeded	6.4	6.9	11.4	11.9	33.0	23.5	5.4	5.0
L.S.D. 0.05	0,8	0.9	1.4	2.6	6.1	6.95	0.5	1.4
C.V.	6.9	7.9	6.2	13.2	9.7	14.6	5.1	17.3

Results in table (9) show that all test treatment had significant effect on fresh weight of broad leaved, grassy and total weeds and sunflower growth trait, yield and yield components.

The highest reduction in fresh weight of broad leaved, grassy and total weeds were (71.4, 72.4 and 71.9%) recorded with camphor oil treatment followed by (50.7, 68.8 and 61.7%) with basil oil treatment, compared to un-weeded check. These results due to the essential components terpenoids, as pure natural compounds or in mixtures, more effected on their structural and strong phytotoxic activity, (13) **and** (16).

Results in table (9) showed that Sunflower yield was affected significantly by the tested treatment in which the highest yield (4.3 ton ha^{-1}) was recorded with camphor oil treatment followed by the Basil oil treatment which gave yield about (4.0 ton ha^{-1}) which mean that using basil oil and camphor oil for weed control in sunflower caused increasing in yield by 90.9% and 63.6%, respectively, compared with un-weeded yield (2. ton ha^{-1}).

All tested component had no significant effect on head weight and diameter and the 100-seeds weight, where the highest value of the pervious parameter wear recoded with Camphor and Basil oil treatment.

Table (9) Effect of medicinal oil with adjuvant fresh weight (g/m^2) of broad leaved, grassy and total weeds, yield and yield components of sun flower 2022 seasons.

Treatments	Fresh weight g/m^2 of weeds			Sunflower yield and yield component			
	Broad leaved weeds	**Grassy weeds**	**Total weeds**	**Head weight g/head**	**Head diameters cm**	**100 seed weight g**	**Seed yield ton ha^{-1}.**
Camphor oil	139.0	205.5	344.5	312.1	15.9	9.4	4.3
Basil oil	239.3	232.0	471.2	302.0	15.5	9.0	4.0
Un-weeded	485.5	743.5	1229.0	216.1	13.1	8.5	2.6
L.S.D. 0.05	80.8	95.3	86.6	N. S.	N. S.	N. S.	1.5
C.V.	16.2	14.0	7.3	24.0	12.0	11.7	21.9

Results in tables (10 and 11) indicated that all test treatment had significant effect on fresh weight of broad leaved, grassy and total weeds and sorghum growth trait, yield and yield components. These results due to essential oils can act as prooxidants affecting inner cell membranes and organelles such as mitochondria, depending on type and concentration, they changes in intracellular redox potential and mitochondrial dysfunction induced by essential oils can be associated with their capacity to exert antigen-toxic effects. (2). Inhibition of carotenoid biosynthesis giving rise to chlorosis of new growth and effect on meristemtic regions become chlorotic and necrotic, followed by general foliar chlorosis and necrosis. Hand hoeing killed weeds by cutting the growing weeds above or under soil surface.
The herbicides treatments undrt studies had phototoxic effect on sorghum plants which caused their death. These results due to the chemical weed control in sorghum crop is limited by the low quantity of herbicides registered for the crop, (9). (3) mentioned that S-metolachlor + mesotrione and S-metolachlor fb prosulfuron reduced sorghum yields by 1009 to 1121 kg ha^{-1} compared to other treatments.

The highest reduction in fresh weight of broad leaved, grassy and total weeds were (91.1, 100 and 94%) recorded with hand hoeing twice treatment followed by (93.1, 68.2 and 85.1%) with basil oil treatment and (86.4, 33 and 69.1%) camphor oil treatment, compared to un-weeded check.

Basil oil treatment the highest value of plant height (cm) plant weight (g) and the number of leaves/plant which were (194 cm, 977.8 and 15.1, respectively) followed by camphor oil treatment (190 cm, 956.5 and 13.2, respectively).

Table (10) Effect of medicinal oil with adjuvant fresh weight (g/m^2) of broad leaved, grassy and total weeds in sorghum

Treatments	Fresh weight g/m^2 of weeds			Sorghum growth traits		
	Broad leaved weeds	Grassy weeds	Total weeds	Plant height cm	Plant weight g/plant	Number of leaves/plant
Camphor oil	109.7	258.0	367.7	190.0	956.5	13.2
Basil oil	55.7	122.3	178.0	194.0	977.8	15.1
Stomp extra	18.0	0.0	18.0	0.0	0.0	0.0
Adengo extra	0.0	0.0	0.0	0.0	0.0	0.0
Cleaner	0.0	171.0	171.3	0.0	0.0	0.0
Equip	0.0	0.0	0.0	0.0	0.0	0.0
Hand hoeing twice	72.0	0.0	72.0	204.6	972.2	15.3
un-weeded	806.7	385.0	1191.7	180.8	695.7	11.9
L.S.D. 0.05	13.9	12.4	26.0	17.0	75.3	2.4
C.V.	9.8	9.8	9.7	5.5	5.2	11.0

Table (11) Effect of medicinal oil with adjuvant on yield and yield components of sorghum

Treatments	Spike length cm	Spike diameters cm	Number of tillers/spike	Grain weight g / spike	Biological yield ton ha^{-1}	Grain yield ton ha^{-1}
Camphor oil	29.7	19.2	65.6	51.0	5.8	0.27
Basil oil	32.8	21.7	70.9	69.0	8.1	0.38
Hand hoeing twice	41.7	22.4	74.7	65.2	7.7	0.36
un-weeded	29.0	16.1	59.6	44.7	4.5	0.21
L.S.D. 0.05	7.4	3.7	4.4	1.6	1.6	0.08
C.V.	13.9	11.6	4.0	1.7	16.7	16.7

Conclusion

The results obtained from this scientific paper reflect that it is possible to recommend the use of medicinal and aromatic oils as an element of integrated weed control to avoid weed problems, as well as the repeated use of herbicides. The Weeds can be causing higher reductions in crop yield about 30% of potential losses and continuous use of synthetic herbicides for their management is increasing the development of herbicide-resistant weeds, environment risks and human health. Natural products such as essential oils, plant extracts, allele-chemicals, are environmentally friendly and have low toxicity. So the using medicinal and aromatic plants as source of bio-herbicides as multi target site activity for sustainable agricultural production,

Declarations

Author Contribution

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Data Availability

Availability of data and materialThe data sets generated during the current study are available from the corresponding author on reasonable request.

References

1. Assaeed, A.; A., Elshamy; A., El Gendy; B., Dar; S., Al-Rowaily & A., Abd-ElGawad, 2020. Sesquiterpenes-rich essential oil from above ground parts of *Pulicaria somalensis* exhibited antioxidant activity and allelopathic effect on weeds Agronomy 10, 399: 1–14.
2. Bakkali, F.; S., Averbeck; D., Averbeck & M., Idaomar, 2008. Biological effects of essential oils–a review. Food Chem. Toxicol; 46(2):446–475.
3. Bararpour, T.; R. R., Hale; G., Kaur; B., Singh; T. M. P., Tseng; T. H., Wilkerson & C. D., Willett, 2019. Weed management programs in grain sorghum (*Sorghum bicolor*). Agriculture v. 9, n 182, p 1–13.
4. (Gomez, K.A. & A.A., Gomez, 1991). Statistical Procedures for Agricultural Research. 2nd Ed., jhon Wiley and Sons Inc., New York,: 95–109.
5. (Hussain, I.M. & M.J., Reigosa, 2011). Allelochemical stress inhibits growth, leaf water relations, PSII photochemistry, non-photochemical fluorescence quenching, and heat energy dissipation in three C3 perennial species. J. Exp. Bot. 62 (13), 4533–4545.
6. Kamel, E. M.; S. D. M., Eid & H. M. A. Elian, 2020. Allelochemicals Effect of Aqueous Sweet Basil (*Ocimum basilicum* L.) on Weed Control in Peanut and Cowpea Crops. Egypt. J. Chem. Vol. 65, No. 5 pp. 153–164.
7. Jităreanu, A.; G., Tătărîngă; A-M., Zbancioc & U., Stănescu, 2011. Toxicity of some cinnamic acid derivatives to common bean (*Phaseolus vulgaris*). Not. Bot. Horti. Agrobo., 39(2), 130, 134.
8. Jităreanu, A.; I., Boz; G., Tătărîngă; A., Zbancioc & U. Stănescu, 2013. The effects of some cinnamic acid derivatives on the architecture of *Phaseolus vulgaris* roots. Romanian Biotechnological Letters, Vol. 18, No. 3: 8317–8326.
9. Machado, F. G.; A., Jakelaitis; E. A., Gheno; R. S., Oliveira; F. A., Rios; L, H. M., Franchini & M. S., Lima, 2016. Performance of herbicides for weed control in sorghum. Revista Brasileira de Herbicidas, v.15, n.3, p.281–289.
10. Mastro, D. G.; El Mahdi, J. & C., Ruta, 2021. Bioherbicidal Potential of the Essential Oils from Mediterranean Lamiaceae for weed control in organic farming. Plants 10, 818, p 1–17. https://doi.org/10.3390/plants10040818.
11. Maurya, P.; A., Mazeed; D., Kumar; I. Z., Ahmad and P., Suryavanshi, 2022. Medicinal and aromatic plants as an emerging source of bioherbicides. Current Science, vol. 122, no. 3, p 258–266.
12. (Mekky, M.S. & A. M. A., Hassanein, 2021). Allelopathic effect of sweet basil (*Ocimum basilicum* L.) as phytotoxic extract on Vegetative growth of commercial crop plants and it associated weed. IJLS/ 10(1): 1–7.
13. Mekky, M.S.; A.M.A. Hassanien; E.M. Kamel & A.E.A., Ismail, 2019. Allelopathic effect of *Ocimum basilicum* L. extracts on weeds and some crops and its possible use as new crude bio-herbicide. Contents lists available at ScienceDirect Annals of Agricultural Sciences journal homepage: .

14. (Nergiz, C. & D., Çelikkale, 2011). The effect of consecutive steps of refining on squalene content of vegetable oils J Food Sci Technol 48(3):382–385. DOI 10.1007/s13197-010-0190-2
15. (15)Smith, R.L.; S.M., Cohen; J., Doull; V.J., Feron; J.I., Goodman; L.J., MarnettP.S., Portoghese; W.J., Waddell; B.M., Wagner; R.L., Hall; N.A., Higley; C., Lucas-Gavin & T. B., Adams, 2005. A procedure for the safety evaluation of natural flavor complexes used as ingredients in food: essential oils. Food Chem. Toxicol., 43, pp. 345–363.
16. Verdeguer, M.; A. M., Sánchez-Moreiras & F., Araniti, 2020, Phytotoxic E_ects and Mechanism of Action ofEssential Oils and Terpenoids Plants 9, 1571; doi:10.3390/plants9111571 p 1–52. .
17. Weir, L.; S., Park & J., Vivanco, 2004. Biochemical and physiological mechanisms mediated by allelochemicals current opinion in plant biology. 7, 472–479.

Figures

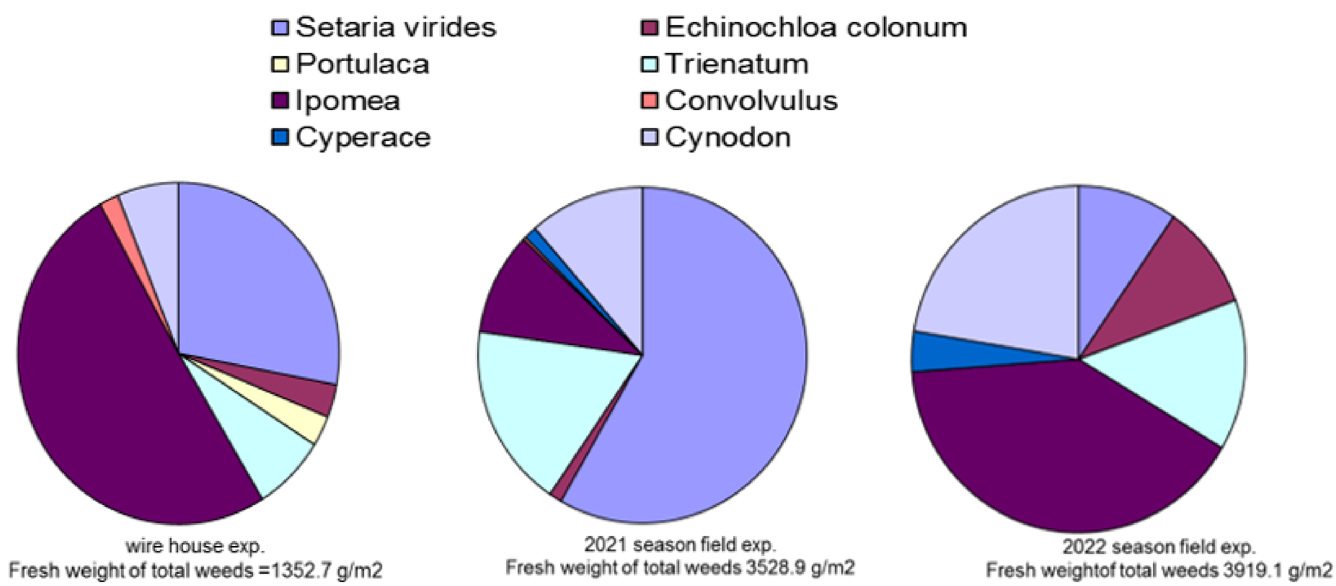

Figure 1

Relative of weed species from total weed composition fresh weight of weed species

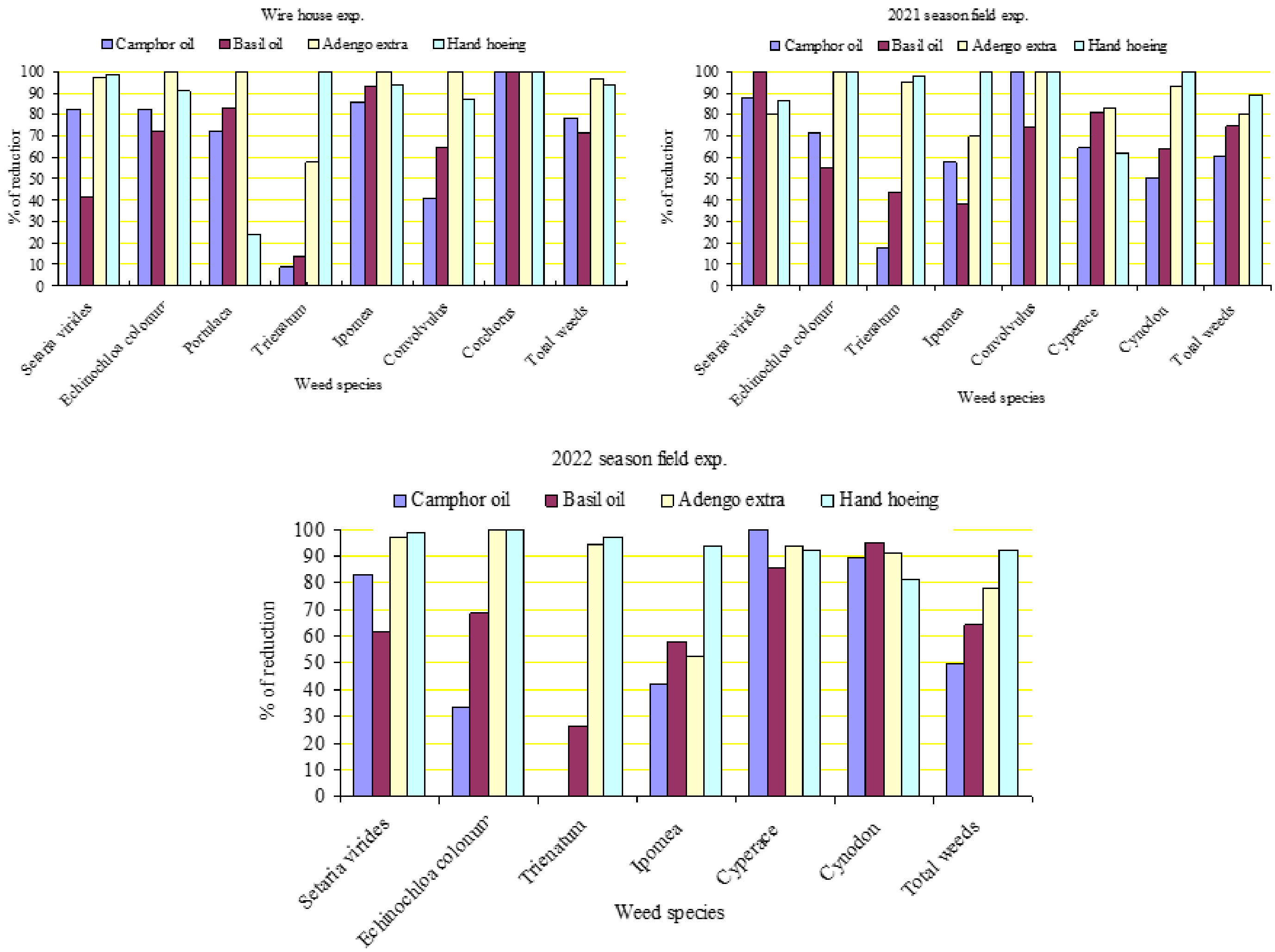

Figure 2

Reduction % in fresh weight of weed species and their totals weeds

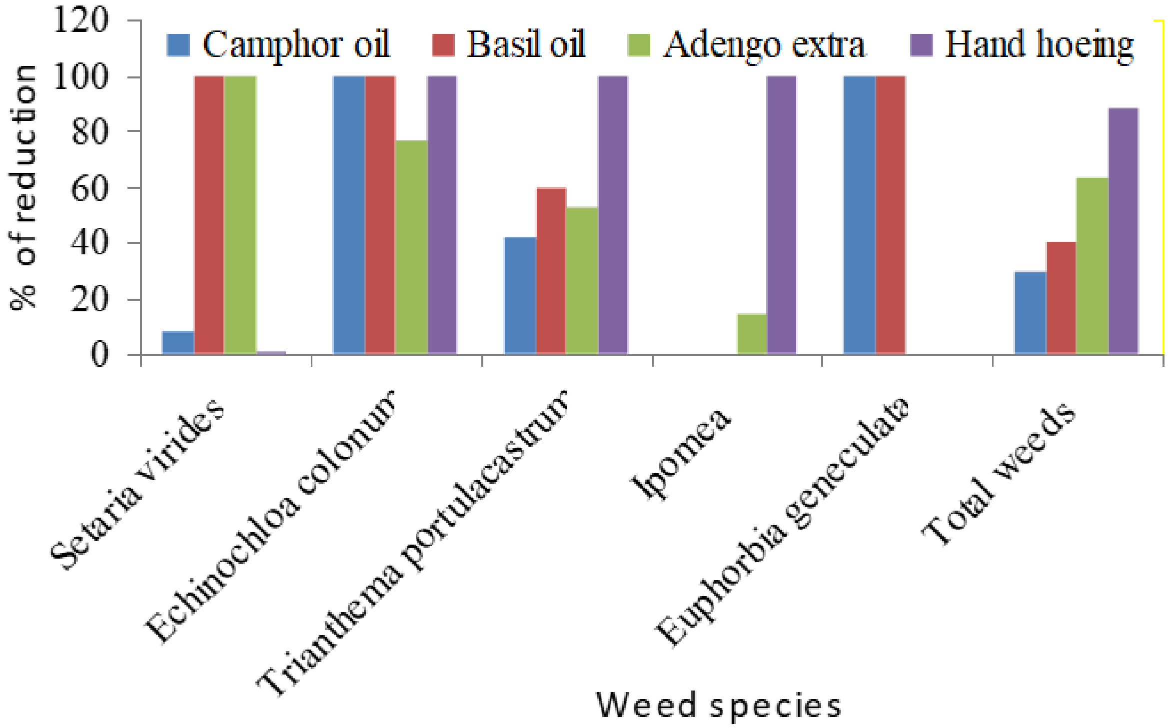

Figure 3

Reduction % in fresh weight of weed species and their totals weeds

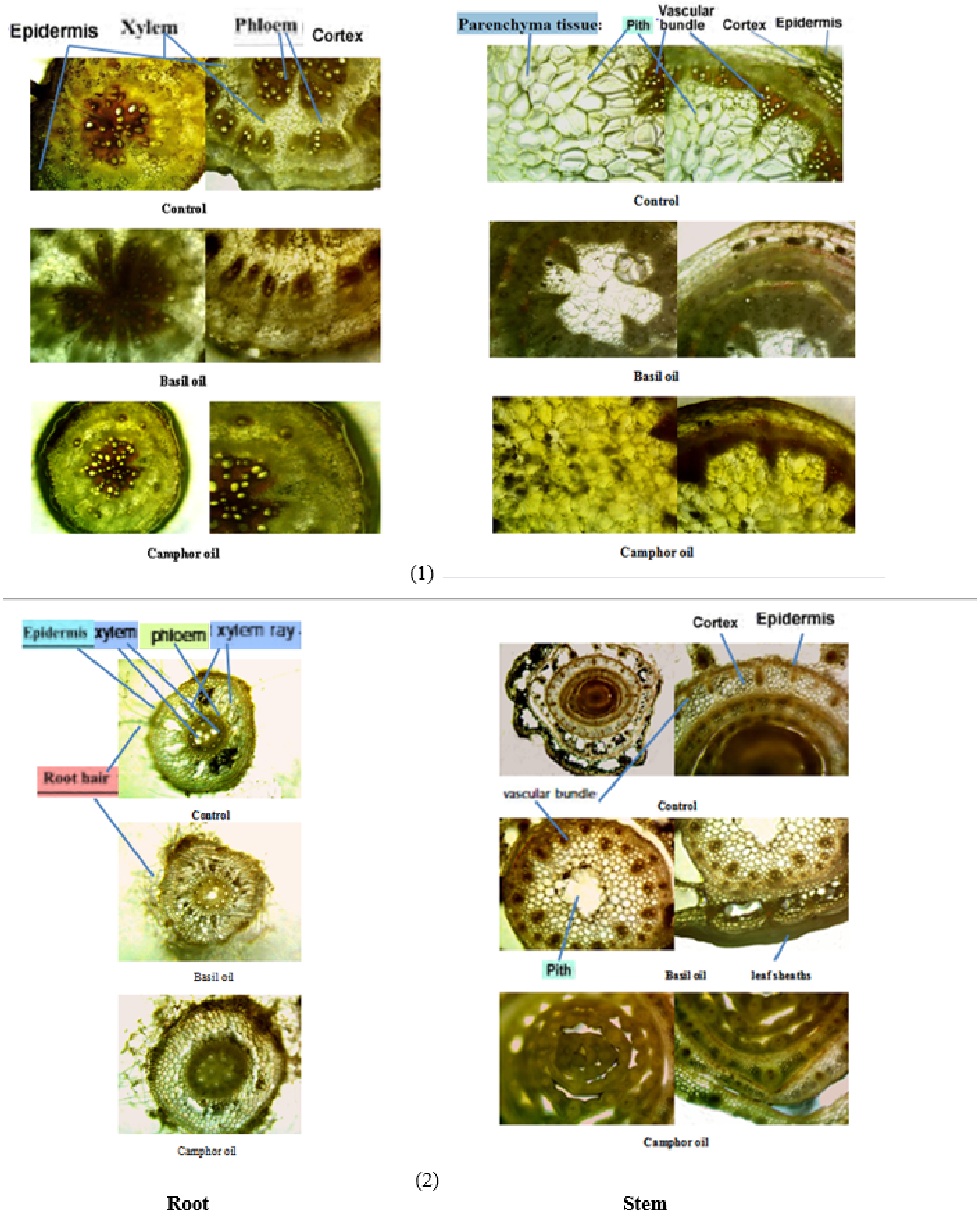

Figure 4

Effect of different essential oils on cross section of (1) *Chenopodium mural* as Dicots and (2) *Phalaris paradxa* as Monocots, in the root and stem