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The Allelopathic Effect of Aqueous Extract of *Calotropis Procera* on The Chemical Compstion of *Catharanthus Roseus*

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Abstract

It is known that some plants, especially trees, have a chemical antagonistic effect on plants growing under them by not growing their seeds or not reaching the flowering stage. Therefore, this study showed this effect, as the effect of some concentrations of Calotropis procera plant extract was studied on some indicators of Catharanthus roseus (L.) G.Don growth. and its chemical characteristics, as it was noticed that the plant decreases with growth and the formation of lateral branches whenever the concentration increases compared to the control samples that were irrigated with water. Also, the number of flower buds decreases with increasing concentrations of C. procera plant extract , the concentrations used for the extract affected the height of C. vinca plant , while the leaf area also decreased with increasing concentration.

The number of active chemical compounds in C. vinca plant was also affected by C. procera extract compared with the control sample, as it was noted that the highest number of compounds was 32 in the samples that were not treated with the extract, while the highest concentration of the extract was 2.5 ppm, so the number of compounds was 25.

The concentrations of compounds in the C. vinca plant differed from one concentration to another compared to the control samples, some of which decreased, some increased, some disappeared, and some concentrations appeared, new compounds that were not present in the control plant, and most of these compounds have an important medical, therapeutic or industrial effect.

Keyword: *Calotropis procera, C. vinca,* active compounds, extract, concentrations.

Introduction

Allelopathy is the study of the harmful and beneficial effects of plants chemically, a phenomenon that occurs in every ecosystem from forests, pastures to deserts that impedes plant germination, and also leads to a decrease in plant diversity if its effect is harmful, so we notice that wild herbs do not grow under some trees and others grow under trees themselves, as defined as any direct or indirect harmful or beneficial interference with plants through the production of chemical compounds that are secreted into the environment from their roots or leaves (Rice, 1984).

Randhawa *et al*. (2002) The effect of white corn extract on the germination of weed seeds that grows with white corn plant *Trianthema portulacastrum*, as high concentrations (75-100)% reduced growth by (15-20)%, respectively, and the lengths of roots and stems were affected by these concentrations. .

Azizi *et al*. (2008) Aqueous and alcoholic extracts of *Mentha piperita* and *Thymus vulgaris*, and their effects on the germination of the seeds of two harmful weeds, *Amuranthus retroflexus* and *Portulaca oleracea*. Their study proved that the mint extract had a higher effect on growth than the thyme plant Randha(wa *et al*. , 2002).

Ibrahim and Sa'eed (2008) studied the effect of soil to which the leaves of *Eucalyptus* and *Orange* trees were added on the germination of the seeds of four types of ornamental plants, and we showed that the percentage of seed germination decreased when they were planted in soil with the addition of the soft leaves of *Eucalyptus* and *Orange* separately, and an increase in the growth indicators of the plants was observed. ornamental in soils containing *Orange* leaves compared with *Eucalyptus* leaves, when the growth indicators of these plants decreased.

Al-Jubouri and Al-Zuhairi (2010) studied the effect of *Brassicai nigra* L. and *Secale cereale* plants on the growth of *Vicai faba*, if they found a significant effect on the speed of plant seed growth and the length of the shoot and root system.

Make Tamash and Bouzaqli (2012) the effect of plant residues, *Cucumis sativus* L. and *Cucurbita pepo* L., on inhibiting the growth of *Cyperus rotundus* L. and *Sorghumhalepense* L. They found that *C. rotundus* is more sensitive to the effect of the two plants' powder.

Studied Hussain *et al*. (2018) the allelopathic effect of plant residues of some crops Wheat, Barley and Corn on the germination and growth of four weed species: *Silybum marianum* L., *Lolium rigidum*. L., *Sonchus oleraceus* L., *Panicum* spp. As there was a slowdown in the germination of the weed seeds used in the experiment, which were planted in soil containing the residues of the studied crops, compared with the weeds grown in soil that did not have any crop residues added.

Kadem (2022) also studied the effect of *Conocarpus lancifolius* Engl leaf extracts. laboratory on the phenotypic characteristics in terms of seed germination percentage, feather length, root, vegetative characteristics, anatomical and chemical characteristics, at concentrations of 2.5%, 5% and 7.5% for two types of medicinal plants, Borago officinalis L. and *Brascica juncia* (L.) Czern, as it proved an increase in the percentage of Germination of the seeds of the two plants, their shoots, chlorophyll pigment, and a slight change in the anatomical characteristics. Chemically, however, chemical compounds disappeared and new ones appeared for the two plants.

Oğuz *et al*. (2022) The effect of the activity of stimulants of some plant extracts taken from plant leaves, roots and seeds (Allelopathy) on *Helianthus annuus*, which led to an increase in the absorption of nutrients available in the growth medium. It also helped to increase plant stress tolerance, as *H. annuus* seeds were treated with different doses of prepared plant extracts. The effects of plant extracts on the studied treatments of *H. annuus* differed according to the treatment time and the type of plant extract. It had a significant positive effect on physiological processes such as germination time, seedling formation, and physiological ripening processes were about 20% between applied extracts and *H. annuus* seeds and it was determined that using an external plant extract on *H. annuus* created significant differences in the examined parameters of germination to harvest(Kadem ,2022).

Flayyih and Almarie (2023) evaluated the content of phenolic secretions from sunflower remains and their allelopathic effect to combat weeds. They found an increase in phenolic compounds emitted from the studied plant remains in the field soil, which had a significant effect on the growth of the weeds and the reduction of their living mass. They concluded that this could be used Residues are used to control weeds within the Integrated Weed Management Program as an alternative method to reduce the use of chemical pesticides.

Materials and methods

Calotropis procera (allelopathic plant) and *Catharanthus roseus* (L.) G. Don (ornamental plant) were chosen for the purpose of conducting the experiment and knowing the effect of allelopathic plants on the growth and development of other plants.

The *C. roseus* plant was grown in plastic pots containing mixed soil at a rate of 3 seeds per pot and three replicates for each treatment. After the plant grew and reached a height of 10 cm, one plant was selected from the three and the rest were removed for the purpose of conducting the experiment on it.

The leaves of the *C. procera* plant were also collected, then dried in a convection oven at a temperature of 105°C for 24 hours and left to cool. They were kneaded using a ceramic mortar and sieved with a sieve with a diameter of 63 microns. The powder was collected and placed in a plastic container until used.

C. procera plant extract was prepared according to the method. Haarborn (1984) took 10 grams of the dried and ground plant and placed it in a 250 ml glass beaker with the addition of 100 ml of distilled water, and placed it on a magnetic stirrer for three hours, then left the extract for 24 hours, then filtered the mixture using filter papers. Collected the filtrate and placed In glass dishes exposed to the air in the laboratory until dry, then the extract powder was collected and placed in a glass container for the purpose of making different concentrations of it. A weight of (5, 15, 25) grams was taken from the powder and 100 ml of distilled water was added to each of them to prepare concentrations (0.5, 1.5, 2.5).)% with the control treatment being distilled water.

The plants were sprayed *C. roseus* every day for 40 days, while observing the plants and recording the readings required for the study, including plant height, leaf area, number of branches, and number of flower buds, according to the source (Ogbo *et al*., 2010).

He also took part of the plant for the purpose of determining its effective chemicals, and according to the method of Haarborn (1984), he sent the samples to the Nahran bin Omar laboratories of the Basra Oil

Company for the purpose of conducting chemical analysis of them using the gas-connected mass spectrometer technique GC-MS)-Mass Spectrometer (Gas Chromotography) made in Japan by Shimadzu Company.

Results and Discussion

Number of vegetative branches and flowers

Figure (1) shows the average number of vegetative branches and flowers formed on *C. vinca* treated with different concentrations, *C. procera*, as the highest number of vegetative branches in control and concentration treatment was 0.5%, which was 4 branches, while the lowest was in the concentration of 2.5%, it was one bud.

Also, the number of flowers formed on the studied plant had a decreasing effect from the lowest concentration to the highest, as no flowering bud was recorded in the concentration of 2.5%, compared to control treatment, which recorded the number of flowers about 7 flowers.

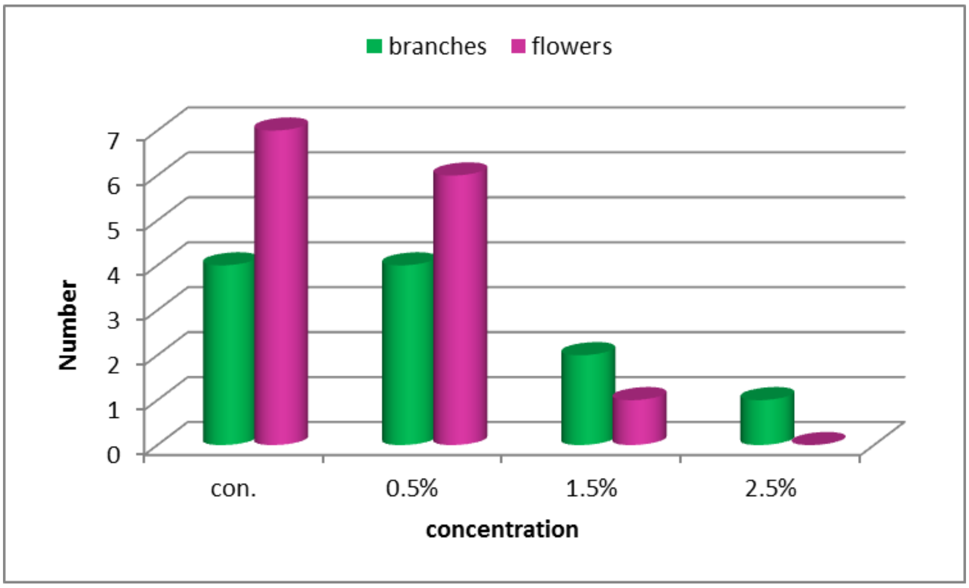


Figure (1): Effect of *C. procera* extract on the number of vegetative branches and flowers in *C. vinca*

Plant height and leaf area

Table (1) shows the effect of *C. procera* extract on *C. vinca* height and leaf area, as the highest rate of plant height was recorded when control treatment was 32 cm, and the lowest was when the concentration of 2.5% reached 20 cm. The average leaf area also decreases with increasing concentration of C. procera extract. The lowest average leaf area was 2.5 cm at 2.5% concentration compared to control treatment of 3 cm. The leaf area was not affected at 0.5% concentration, and the same average leaf area was recorded for the control treatment.

Table (1): The effect of *C. procera* extract on the height and leaf area of *C. vinca*

transactions	con.	0.5%	1.5%	2.5%
height	32	30	22	20
leaf area	3	3	2.6	2.5

The number of active chemical compounds in *C. vinca.*

Figure (2) shows the number of active chemical compounds of *C. vinca* affected by different concentrations of *C. procera* extract, as the highest number was recorded at a concentration of 2.5%, which amounted to 32 compounds compared to control treatment of 30 compounds, while the lowest number was 25 compounds at a concentration of 1.5%.

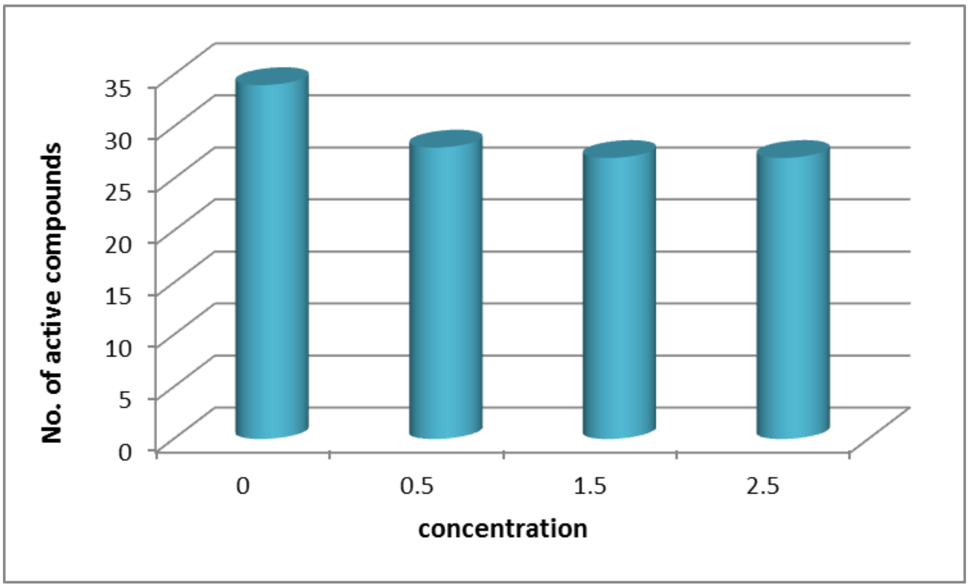


Figure (2): The effect of *C. procera* extract on number of active compounds in *C. vinca*.

Effect *C. procera* extract on chemical compounds in *C. vinca.*

Table (2) and figures (3,4) show the effect of the studied concentrations of the *C. procera* extract on the active chemical compounds in the *C. vinca.* plant, as it was noted the disappearance of some compounds and the appearance of other compounds in the studied concentrations compared with the control samples, so the highest number of chemical compounds was recorded when the control treatment and at a concentration of 0.5% recorded. The lowest number was 25 chemical compounds. In the concentrations of 1.5 and 2.5%, the number of compounds was 27, compared to the control sample, which recorded 34 chemical compounds.

The concentrations of chemical compounds differed in the *C. vinca.*plant exposed to the mixed concentrations of the *C. procera* extract, for example, the compound [1-(3,3-Dimethyloxiran-2-ylmethyl)-3,7-dimethylocta-2,6-dienyl]trimethylsilane was concentrated in the control sample. 446.410 ppm decreased to 32.718 ppm at a concentration of 2.5%. As for the compound 1,2-15,16-Diepoxyhexadecane, which recorded a concentration of 215.784 ppm in the control sample, it disappeared in the remaining concentrations, as well as the compound 11,13-Dihydroxy-tetradec-5-ynoic acid, methyl ester, its concentration was 24.288 ppm in the control sample, and no presence was recorded in the rest of the concentrations, and many of these compounds had a similar status to the above, as shown in Table (2).

Some chemical compounds that were not present in the control sample appeared, such as 1-Heptatriacotanol, 1-Methyl-8-propyl-3,6-diazahomoadamantan-9-ol, and 5-Benzofuranacetic acid, 6-ethenyl-2,4,5.6,7,7a-hexahydro-3,6-dimethyl-.alpha.-methylene-2-oxo-,methyl ester and Benzaldehyde, 4-methoxy-, oxime, which was recorded only at a concentration of 1.5% at 1.142 ppm. As well as the compound Estra-1,3,5(10)-trien-17.beta.-ol, which was recorded only at 2.5% concentration at 3.524 ppm and was not present in the rest of the concentrations.

The compound methoxy-phenyl oxime is one of the chemical compounds that bear the same chemical formula as the chemical compound Paracetamol. Paracetamol is one of the pharmacologically important compounds, as it is used as an analgesic, antipyretic, and to treat fever and headache. This compound is included as an essential ingredient in many treatments used for influenza. It recorded 51.508% at a concentration of 0.5 ppm compared to the control treatment, whose percentage was 127.855%.

The highest percentage of the compound Undec-10-ynoic acid, butyl ester was recorded in *C. roseus* about 920.646% at a concentration of 2.5 parts per million, while the control treatment recorded 203.748%, which is one of the chemical compounds that play an important role in the effects of biochemical antagonism and play the role of a natural pesticide Against fungi, insects and weeds (Sridhar *et al.*, 2003).

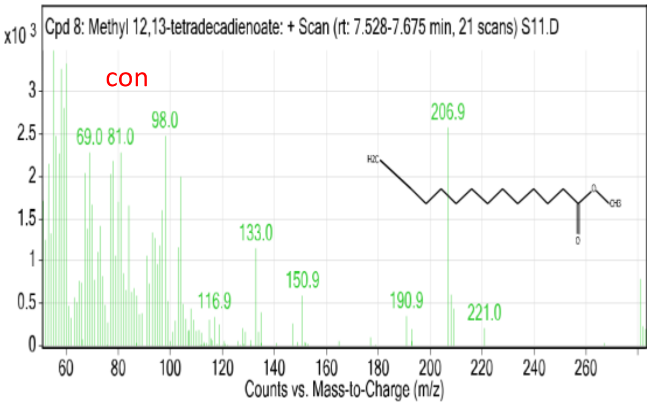
The highest percentage of Dicyclopentadiene diepoxide was recorded in *C. roseus* about 0.476% at a concentration of 2.5 parts per million, compared to the control treatment, which had a percentage of 5.612%. Teeth. (Johnson *et al.*, 1999).

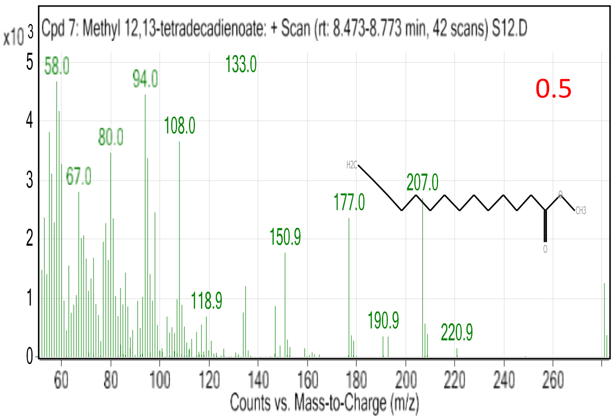
Table (2): Effect of concentrations of *C. procera* extract on the active chemical compounds in *C. vinca.*

Name	Con.	0.5%	1.5%	2.5%
[1-(3,3-Dimethyloxiran-2-ylmethyl)-3,7-dimethylocta-2,6-dienyl]trimethylsilane	446.410	100.182	72.440	32.718
1-(1,4-cyclohexadienyl)-2-methylaminopropane	48.315	25.913	-	12.451
1,2-15,16-Diepoxyhexadecane	215.784	-	-	-
1,25-Dihydroxyvitamin D3, TMS derivative	152.658	50.266	-	3.932
11,13-Dihydroxy-tetradec-5-ynoic acid, methyl ester	24.288	-	-	-
12-Hydroxy-14-methyl-oxa-cyclotetradec-6-en-2-one	49.671	13.616	-	1.544
1-Ethynyl-3,trans(1,1-dimethylethyl)-4,cis-methoxycyclohexan-1-ol	207.832	8.039	3.634	-
1-Heptatriacotanol	-	-	0.557	0.648
1-Methyl-8-propyl-3,6-diazahomoadamantan-9-ol	-	-	0.662	0.836
2,2-Dimethyl-6-methylene-1-[3,5-dihydroxy-1-pentenyl]cyclohexan-1-perhydrol	22.037	11.418	0.903	0.422
2,5-Octadecadiynoic acid, methyl ester	902.011	207.513	76.614	45.286
2,7-Diphenyl-1,6-dioxopyridazino[4,5:2',3']pyrrolo[4',5'-d]pyridazine	0.766	0.391	1.388	2.59
2-Pentene, 3-(chloroethylboryl)-2-(chlorodimethylsilyl)-, (E)-	32.267	17.520	-	0.860
2-Pyridinamine, 3,6-dimethyl-	204.814	6.433	-	-
3-trsns-(1,1-dimethylethyl)-4-trans-methoxycyclohexanol	32.340	0.943	-	-
5-Amino-1-benzoyl-1H-pyrazole-3,4-	119.489	2.254	1.754	2.502

Name	Con.	0.5%	1.5%	2.5%
dicarbonitrile				
5-Benzofuranacetic acid, 6-ethenyl-2,4,5,6,7,7a-hexahydro-3,6-dimethyl-.alpha.-methylene-2-oxo-, methyl ester	-	-	0.482	0.649
9,10-Secocholesta-5,7,10(19)-triene-3,24,25-triol, (3.beta.,5Z,7E)-	0.724	0.260	0.231	-
Acetamide, N-methyl-N-[4-(3-hydroxypyrrolidinyl)-2-butynyl]-	595.451	88.019	56.843	34.975
Benzaldehyde, 4-methoxy-, oxime	-	-	1.142	-
Benzeneethanamine, N,.alpha.-dimethyl-	11.729	-	-	-
Benzenemethanol, 4-hydroxy-.alpha.-[1-(methylamino)ethyl]-, (R*,S*)-	983.707	103.207	68..442	46.330
Bicyclo[2.2.1]hept-5-en-2-yl-acetaldehyde	-	-	0.408	-
Cyclotetrasiloxane, octamethyl-	106.351		-	0.845
Cyclotrisiloxane, hexamethyl-	54.673	12.651	3.018	0.756
Dicyclopentadiene diepoxide	5.612	-	-	0.476
Estra-1,3,5(10)-trien-17.beta.-ol	-	-	-	3.524
Ethanamine, N,N-diethyl-2,2-dimethyl-2-[(3,5-dimethoxy)phenyl]-	-	0.539	-	-
Ethyl Oleate	2.297	2.632	1.518	1.719
Formamide, N-methyl-N-4-[1-(pyrrolidinyl)-2-butynyl]-	72.435	-	0.720	-
gamma.-Sitosterol	2.279	-	2.651	-
Hexadecanoic acid, ethyl ester	1.397	2.448	1.817	1.625
Histamine, N-trifluoroacetyl	-	-	1.825	-
l-(+)-Ascorbic acid 2,6-dihexadecanoate	-	-	4.661	-
L-Valine, N-[2-(chloroimino)-3-methyl-1-oxobutyl]-	-	-	-	1.510

Name	Con.	0.5%	1.5%	2.5%
Methyl 12,13-tetradecadienoate	54.602	0.663		0.654
n-Hexadecanoic acid	4.659	4.821	-	-
N-Methyl-1-adamantaneacetamide	127.283	34.776	23.554	73.737
Nonacosane	12.332	-	11.095	-
Oleic Acid	3.097	2.208	2.197	1.060
Oxime-, methoxy-phenyl-_	127.855	51.508	-	1.362
Phen-1,4-diol, 2,3-dimethyl-5-trifluoromethyl-	103.036	43.992	38.417	1.926
Stigmasterol	3.630	-	3.657	--
Undec-10-ynoic acid, butyl ester	203.748	-	1.775	920.646
Total	34	25	27	27





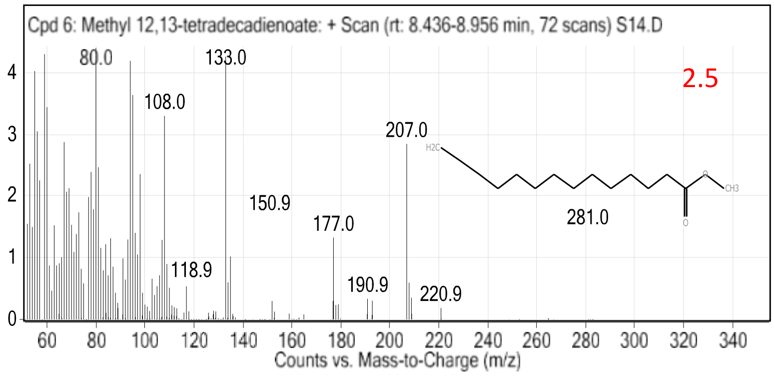


Figure (): Effect of different concentrations of *C. procera* extract on the compound Methyl 12,13-tetradecadienoate *C. roseus*

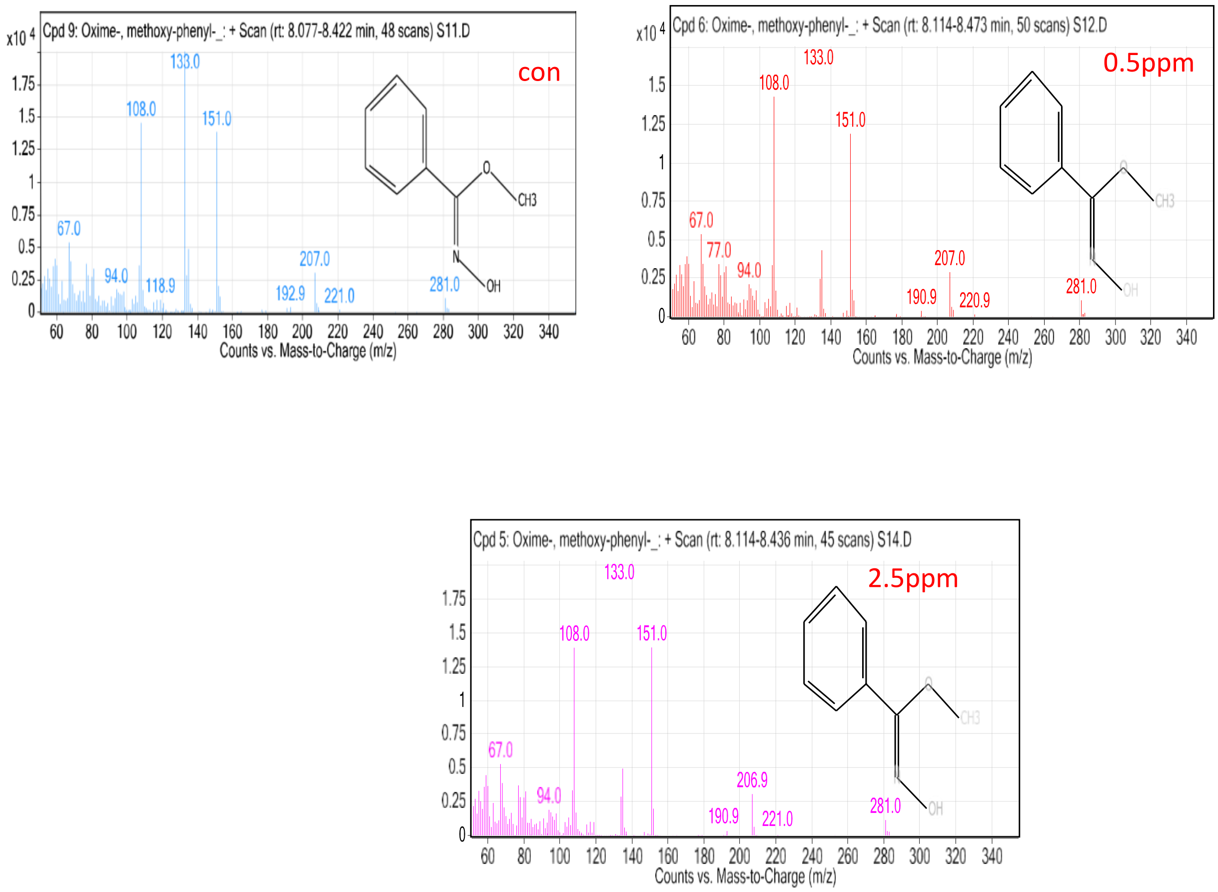
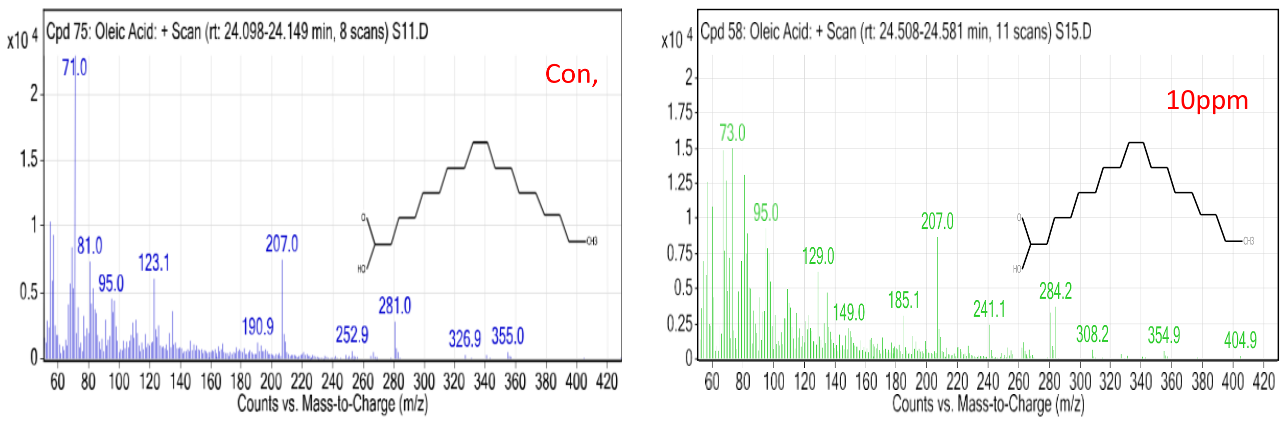


Figure (): Effect of different concentrations of *C. procera* extract on the compound Oxime-, methoxy-phenyl in *C. roseus*



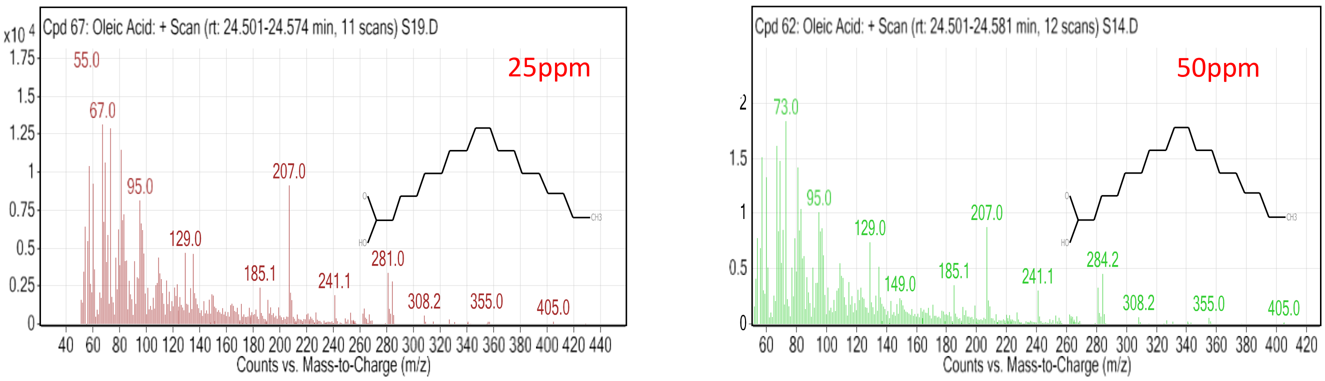


Figure (): Effect of different concentrations of *C. procera* extract on the compound Oleic Acid in *C. roseus*

Conclusions

We conclude from the current study that plants that have an allelopathic effect and effective chemicals affect negatively and positively the plants growing under them. When their leaves fall on the soil or their roots secrete these substances, they may lead to the death of plants when they are in high concentrations. Here we benefit from them as biocides for the purpose of getting rid of many From harmful jungles or it may affect the growth of plants (vegetables or crops) and thus reduce their productivity.

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