UNIVERSITY OF BENGHAZI

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DEPARTMENT OF BOTANY SCIENCE

Allelopathic effects of *solanum elaeagnifolium Cav* . aqueousExtracts on different plant receptors

A Thesis presented to the department of botany faculty of science Benghazi University in partial fulfillment of the requirement for the degree of Master of Science

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بِسْـــــمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿ألم تر أن الله أنزل من السماء ماءً فأخرجنا به ثمراتٍ مُختلفاً ألوانُها ومن الجبالِ جُدَدٌ بيضٌ وحمرٌ مختلفٌ ألوانُها وغرابيبُ سُودٌ ومن النَّاسِ والدَّوابِّ والأنعامِ مُختلفٌ ألوانُهُ كذلك إنَّما يَخشى اللهَ من عبادِهِ العلماءُ إنَّ اللهَ عزيزٌ غفور﴾

صـــــدَقَ اللهُ العَظِيم

((سورة فاطر آية : 27- 28))

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I would like to start by thanking Allah for my existence and for the support He has provided me throughout my life. I would also like to thank my parents for their encouragement and support. They are the reason for my success thus far and will always be the most influential people in my life.

I want to thank my husband who supported me and were supportive and help me in my studies and I like to dedicate this to my son my beloved and I wish him success in his scientific and practical.

I thank my friends for providing me with the experience of a lifetime.

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At the end I would like express appreciation to my beloved husband who was always my support in the moments when there was no one to answer my queries.

Dedication

I actually dedicate this research work first to

my loving parents who are always proud of

me, to husband, friends and all people who

gave me help and advices.

Abstract

(*Solanum elaeagnifolium*) is a serious perennial broadleaf weed in many semi-arid areas of the world including South Africa. It is one of the important invasive plant species in Mediterranean Basin countries. *S. elaeagnifolium* has a negative impact on crops, causing up to 75% yield loss, as well as an indirect impact by harboring plant pests and diseases. This study was conducted to determine the allelopathic effect of *S. elaeagnifolium* on germination four receptor plants (radish, wheat, tomato and lettuce) also to study this effect on root and shoot growth in addition to study this effect on dry and fresh weight of the receptors. The study was conducted by preparing five aqueous extracts of *Solanum elaeagnifolium parts* (root, stem, leaves, flowers, and berries) at six concentrations (0%, 1%, 2%, 5%, 10% and 20%), for experimentation of the allelopathy of *S. elaeagnifolium* seeds of these receptors were distributed in petri dishes containing whatmann filter paper moistened with 5ml of the aqueous extract, and allowed to germinate at room temperature, The plates containing the receptor plant were maintained wet using by the same treatment concentration added to the plates day after day. Germination percentage of all extracts were calculated, shoot and root length, fresh and dry weigh were measured. The results of this study showed that germination of radish and tomato were less inhibited by *S. elaeagnifolium* extracts compared with wheat and lettuce which showed inhibited growth at all concentrations of all *S. elaeagnifolium* parts. Areal parts (leaves, flowers and berries) of *S. elaeagnifolium* contain more allelochemichals that inhibit germination than roots and stems. *S. elaeagnifolium* inhibit the root growth of radish and wheat but it doesn't inhibit shoot growth, but it inhibit shoots growth of tomato.

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Chapter one

1. Introduction

Allelopathy where a plant species chemically interferes with germination, growth or development of other plant species has been known for over 2000 years occurs in several plants and refers to the beneficial or harmful effects of one plant on another plant by release of some chemicals from plant parts by leaching, root exudation, volatilization, residue decomposition and another processes in both natural and agricultural systems (Rice, 1984).

The term allelopathy, was introduced by Molisch in 1937. and is derived from the Greek words allelon ‘of each other’ and pathos ‘to suffer’ and mean the injurious effect of one upon the other (Rizvi *et al*., 1992). However, the term is today generally accepted to cover both inhibitory and stimulatory effects of one plant on another plant (Rice, 1984). Some use the term in a wider sense, for instance entomologists, who include the effects of secondary compounds on plant-insect interactions. In 1996 The International Allelopathy Society defined allelopathy as follows: “Any process involving secondary metabolites produced by plants, micro-organisms, viruses, and fungi that influence the growth and development of agricultural and biological systems (excluding animals), including positive and negative effects” (Torres *et al*., 1996).

In the following, the term is used in accordance with Rice (1984), but effects of the chemical compounds involved in plant-plant interactions and the effects of allelopathic plants are discussed in a broader perspective than strictly related to the plant-plant interactions.

Allelopathy involves a plant's secretion of biochemical materials (allelochemicals or allelochemics) into the environment to inhibit germination or growth of surrounding vegetation, theses chemicals released from plants and imposing allelopathic influences. Most allelochemicals are classified as secondary metabolites and are produced as offshoots of the primary metabolic pathways of the plant. Often, their functioning in the plant is unknown, but some allelochemicals are known also to have structural functions (e.g. as intermediates of lignifications) or to play a role in the general defense against herbivores and plant pathogens (e.g. Niemeyer, 1988; Corcuera, 1993; Einhellig, 1995).

Allelochemicals can be present in several parts of plants including roots, rhizomes, leaves, stems, pollen, seeds and flowers. Allelochemicals are released into the environment by root exudation: Roots secrete chemical compounds either as exudates from live roots or from the cells that are sloughed off as they age (Rice, 1974; Putnam, 1985), leaching from aboveground parts Allelopathic compounds may be leached with rainwater or with irrigation water from aerial plant parts into the soil or onto plant surfaces (Lovett, 1982), volatilization: the release

allelochemicals through their surfaces in the form of gases into the atmosphere (Muller, 1965; Del Moral and Muller, 1971; Neill and Rice, 1971). and/or by decomposition of plant material : The greatest amounts of allelochemicals released from plants into the environment are released through plant material decomposition and through leaching from plant material (Putnam and Duke, 1974).

For allelochemicals to be effective in their function, they need to be released from the plant and transferred to the target plant species in sufficient amounts that would cause the effect. Hence, Muller (1974) states that for allelopathy to occur a chemical should be (1) synthesized and produced by a plant, (2) transported from the producing organism to the target plant, and (3) the target plant should be exposed to the chemical at a concentration sufficient to cause an effect. When susceptible plants are exposed to allelochemicals, germination, growth and development may be affected. The most frequent reported gross morphological effects on plants are inhibited or retarded seed germination, effects on coleoptile elongation and on radicle, shoot and root development, they may be largely classified as secondary plant metabolites, which are generally considered to be those compounds (such as alkaloids, phenolics, flavonoids, terpenoids, and glucosinolates, Allelochemicals can be present in several parts of plants including roots, rhizomes, leaves, stems, pollen, seeds and flowers (Niemeyer,1988; Corcuera, 1993) .

One of the best known allelopathic and invasive plants is Silverleaf nightshade (*Solanum elaeagnifoliumm*) also known as “satansbos” it is seed-or vegetatively-propagated deep-rooted summer growing perennial geophyte from the tomato family Solanaceae (EPPO, 2007).

This multi-stemmed plant grows to one meter tall, with the aerial growth normally dying back during winter, the plants have an extensive root system spreading to over two meters deep. These much branched vertical and horizontal roots bear buds that produce new aerial growth each year

S. elaeagnifoliumm is a serious perennial broad leaf weed in many semi-arid areas of the world including South Africa, Australia, Algeria, Egypt, Greece, India, Israel, Zimbabwe, Sicily and Spain (Henderson and Anderson, (1966); Hawkes and Edmonds ,(1972); D’arcy, (1974); Boyd *et al*., (1984)). It is one of the important invasive plant species in Mediterranean Basin countries. *S. elaeagnifolium* has a negative impact on crops, causing up to 75% yield loss, as well as an indirect impact by harboring plant pests and diseases. *S. elaeagnifolium* is toxic to livestock and has a negative effect on the quality of life for humans. It is listed as a noxious weed in its native region (Americas) and as an invasive alien plant in many other countries (Mekki, 2007).

Buck *et al*., (1960) isolated both the tropane alkaloid Solanine and steroidal alkaloid solanidine from *S. elaeagnifolium*. Glycoalkaloids as bioactive compounds were isolated from its seeds and leaves (Bekkouche *et al*., 2000). Chiale *et al*. (1991) identified kaempferol and kaempferol 3- glucoside as monoacylated flavonoid glucosides from its aerial parts. Cholesterol, campesterol, sitosterol, stigmasterol, As-avenasterol, A'avenasterol, A'-stigmasterol and β-spinasterol were also identified from the seeds of 13 species of *Solanum*, including silverleaf nightshade (Keeler *et al*., 1990; Zygadlo, 1994).

Negative impacts of silverleaf nightshade have been reported worldwide on cotton, peanuts *(Arachis hypogaea),* grain sorghum (*Sorghum bicolor),* alfalfa *(Medicago sativa),* cereal grains and cultivated pastures (Boyd *et al.,* 1984). The main documented cause of the interference of silverleaf nightshade with crops is competition for growth factors (Green *et al.,* 1987; Green *et al.,* 1988; Jacobson *et al.,* 1994).

The most serious crop losses have been recorded in lucerne (in Australia, South Africa and the USA); cotton, sorghum, maize and groundnut (Morocco, USA); wheat (Australia, Greece); and cultivated pastures (Australia, Greece, Morocco, USA) (Cuthbertson, 1976; Molnar and McKenzie, 1976; Robinson *et al*., 1978; Abernathy and Keeling, 1979; Boyd *et al*., 1984; Wassermann *et al*., 1988; Eleftherohorinos *et al*., 1993).

Aim of the study:

To study allelopathic effect of different concentration of *S. elaeagnifolium* plant aqueous extract on different germinating seeds that serve as receptors.

Chapter two

2. Literature review

The earliest reference to phytotoxicity of one plant on another dates back to ancient agriculture when Theophrastus (300 B.C.) observed that some plants inhibit the growth of other plants. At that time various assumptions without proper experimentation were made concerning problems in crop production that could not be rectified through nutrient amendments. De Candolle (1832) was the first to assume that chemicals secreted by crops caused 'soil sickness' and suggested that crop rotation was the only solution to this problem. Schreiner and Reed (1908) were the first to conduct proper research on this subject. They isolated chemical compounds from plants and from the soil. Since then, studies and research on allelopathy have been improving. The term allelopathy, however, was coined by Hans Molisch, a German scientist, in 1937 from two Greek words, *'allelon'*, meaning to each other, and *'pathos'*, meaning to suffer (Molisch, 1937; Rizvi *et al*., 1992). Allelopathy refers to the direct or indirect effect of a plant on another plant through the production and release of chemical compounds into the environment (Rice, 1984). The effect may be inhibitory or stimulatory depending on the amount of the chemical reaching the receiving plant (Putnam & Tang, 1986; Rice, 1995). The discovery of chemical interactions amongst plants provided new knowledge

that, apart from competition for growth factors, plants can affect the growth of neighboring plants by secreting chemicals into the environment. A clear distinction between allelopathy and competition is that, in the former case, something is released into the environment (allelochemicals), whilst in the latter case, something is removed from the environment (nutrients, water, etc.). Allelopathic interactions can involve plants of the same species (intraspecific or autotoxicity) or species that are taxonomically different (interspecific or heterotoxicity or teletoxicity) (Kushal, 1987; Kumar, 1991; Kohli *et al.*, 1998). Identification of allelochemicals and the explanation of the concept of allelopathy have advanced greatly in the last three decades and had been encouraged by the development of research techniques that did not exist in the past. These modern techniques allow for the identification and isolation of the different plant chemicals. Many different compounds released from plants and from microbes are now known to affect the growth or aspects of function of the receiving species (Einheillig, (1995a). Whittaker & Feeny (1971) classified these phytochemicals into five groups: phenyl propanes, acetogenins, terpenoids, steroids and alkaloids.

S. elaeagnifolium is considered to be native to the Americas, although it may have been introduced to the northern and eastern parts of North America (EPPO, 2007). The species has spread primarily as a seed contaminant in soil and crops. Spanish or Portuguese colonists may have been instrumental in spreading the species across the

Americas, and it is thought to have been introduced to California by contaminated railway cars (Boyd *et al*., 1984). The species was first recorded for Australia in 1901, for Israel during the 1956 war, and to Morocco in 1958 through contaminated crop seeds (EPPO, 2007). In South Africa, the species is thought to have been imported as either a contaminant of pig fodder around 1905 or as a hay contaminant during the 1940s or 1950s, before it was declared a weed in 1966 (EPPO, 2007). The species is thought to have been introduced from Mexico to the Philippines sometime during the Spanish colonial period through the Manila-Acapulco galleon trade (1585-1615), and from there to China and the rest of Asia . Date of introduction to the West Indies is uncertain but may have been relatively recent. Smithsonian Herbarium specimens of this species were collected in Cuba in 1919, Curaçao in the 1950s, and Puerto Rico in the 1960s; for the West Indies, as of 2007 EPPO only reported its presence in Puerto Rico (EPPO, 2007).

Sarah and others investigated the effects of aqueous extracts of *S. lycocarpum* leaves on the germination and growth of *Sesamum indicum* (sesame) by preparing aqueous leaf extracts at concentrations of 1%, 2%, 3%, 4% and 5% (w / v). The experiments were carried out on petri dishes lined by two layers of filter paper plus the solutions to be tested. For the germination experiments the number of germinated seeds was checked every 8 hours. For the growth experiments sesame seeds were previously germinated in water and disposed to grow in the extracts. After five days of incubation the root and

shoot length of the seedlings was measured. All the experiments were performed at 22 ° C, 30 ° C and 38 ° C. they found that, the extracts did not affect the germinability but increased the average germination time in a dose-dependent Manner at the three temperatures. The root growth was more affected by the extracts, showing tip-necrosis, absence of root hairs, and formation of secondary roots (Sarah *et al*., 2004).

Amra in 2012 conducted a study to examine the allelopathic potential of silverleaf nightshade by testing the effect that aqueous extracts of silverleaf leaves and leaf residues in the soil have on germination and post-germination growth of sunflower, lentil and barley. Leaf residues as the part of the pot study did not seem to have an allelopathic effect onto the growth of indicator plants. Water extracts, on the other hand, while not affecting the germination percentage, significantly, impaired the initial growth in all indicator plants, which was expressed in reduced length of radicles and hypocotyls. Results of the study shed some light on the tools and mechanisms through which *Solanum elaeagnifolium* Cav. achieves its spread, opening new prospects for research towards the better understanding of the allelotoxicity of silverleaf nightshade, all for the purposes of more efficient management of this exceptionally invasive weed species .

Wassermann and others in 1988 examined the effect of the invasive *S. elaeagnifolium* (Solanaceae) on flower visitation patterns and seed set of the co-flowering native *Glaucium flavum (*Papaveraceae*).* they observed flowering *G. flavum* plants in invaded and uninvaded sites and found that *G. flavum* flowers in uninvaded sites received significantly more total visits. In addition, they hand-pollinated flowers on plants of *G. flavum* with (i) pure conspecific pollen, (ii) pure *S. elaeagnifolium* pollen and (iii) three different mixtures of the two types of pollen (containing 25, 50 and 75% invasive pollen). As a control, flowers were left unmanipulated or were permanently bagged. Seed set did not differ significantly between flowers receiving pollen mixtures and pure conspecific pollen. However, in the open pollination treatment, seed set was significantly lower than in the 100% conspecific pollen treatment, which suggests pollen limitation. Bagged flowers had very low seed set. *G. flavum* was generally resilient against the deposition of *S. elaeagnifolium* pollen.

Chapter three

3. Materials and methods.

3.1. Study site and sample collection:

This experiment was conducted at Benghazi city, the second largest city in Eastern Libya a part of the Mediterranean sea, about 1000 km far from the capital Tripoli.

Samples of solanum plant were collected from different regions of Benghazi during May which is the typical time to gather this plant, The entire plant samples of *Solanum elaeagnifolium* were collected, roots, stem, leaves and flowers, the plant were transported to the study laboratory immediately after collection, kept at room temperature. This experiment was performed during the period June to August 2016 at laboratory of Benghazi medical university.

Seeds of receptors (Tomato, wheat, Radish and Lettuce seeds) were obtained from different locations in Benghazi and Tunisia.

Fig. (3-1) Fully grown *Solanum elaeagnifolium* in May.

3.2. Preparation of aqueous extracts and concentrations of *Solanum elaeagnifolium*:

3.2.1. Material used:

1. **Porcelain mortar:** used to make plant powder**.**
2. **Graduated cylinder:** a 100 ml graduated cylinder was used to measure the volume of distilled water.
3. **Sensitive balance:** an electronic scale used to take the weight of the powdered *Solanum elaeagnifolium.*

3.2.2. Steps for preparation of aqueous extracts and concentrations of *Solanum elaeagnifolium*:

1. The plant was cleaned properly and the different parts of the plant were separated from each other and dried individually by normal method (exposure to natural air and sunlight) for 15-20 days.

2. The plant parts were will grounded by mortar individually and kept in separated cans.

3. For preparation of 1% of aqueous extract 1 g of the grounded plant part were added to 99 ml of distilled water measured by graduated cylinder, the process were repeated for each plant parts.

4. For preparation of 2% of aqueous extract, 2 g of the grounded plant parts were putted in graduated cylinder, the volume completed by 98 ml of distilled water the process were repeated for each plant parts.

5. For preparation of 5% of aqueous extract, 5 g of the grounded plant parts were putted in graduated cylinder, the volume completed by 95 ml of distilled water the process were repeated for each plant parts.

6. For preparation of 10% of aqueous extract, 10 g of the grounded plant parts were putted in graduated cylinder, the volume completed by 90 ml of distilled water the process were repeated for each plant parts.

7. For preparation of 20% of aqueous extract, 20 g of the grounded plant parts were putted in graduated cylinder, the volume completed by 80 ml of distilled water the process were repeated for each plant parts.

8. A solution containing only distilled water 0% will be used as a control treatment.

3.3. Experimentation of allelopathic effect of *Solanum elaeagnifolium* on different plant receptors (germinating tomato, wheat, radish and lettuce seeds):

3.3.1. Material used:

1. **Sterile petri dishes:**

Petri dishes of 9 cm diameter were used in this experiment.

1. **Whatman filter paper No.9:**

3.3.2. Steps for experimentation of allelopathic effect of *Solanum elaeagnifolium* on different plant receptors:

The allelopathic effect of different concentration of *Solanum elaeagnifolium* will be tested on germinating tomato, wheat, radish and lettuce seeds, the experiment will be conducted at room temperature (20 C°± 2).

1. Ten seeds of each receptor plant will be distributed randomly and grown on petri dishes of 9 cm diameter .

2. Whatmann No. 9 filter paper moisten with 5ml of each concentration will be used as a medium for seed germination, while 5 ml of distilled water (0%) will serve as a control treatment.
3. Five replicates of each treatment concentration for each receptor plant seeds were used (the total number of plates were 30 plates for each plant).
4. The plates containing the receptor plant were maintained wet using the same treatment concentration added to the plates day after day.
5. The counting of seed germination will be performed each 24 hours .
6. Germination percentage will be calculated for 10 days period by measuring , the total percentage of germination will be calculated by dividing the number of germinating seeds by the total number of seeds and multiplied by 100.

$$\text{Germination \%} = \frac{\text{Total number of germinated seeds in a particular treatment}}{\text{Total number of treated seeds}} \times 100$$

7. Germination percentage, shoot and root length were determined after five days. Only seeds with a radical length of more than 2 mm were considered to have germinated successfully.

8. The fresh weight of the germinating seeds were taken by the scale, then the dry weight of the seeds were taken after dryness in the oven at 105◦C.

3.4. Statistical analysis:

Data collected from the experiment (germination percentage, shoot and root length, dry and wet weight) were summarized in an excel sheet and after entering all data the collected information were validated by comparison and manual checking with the original paper form data were exported to SPSS for statistical analysis to explore the allelopathic effect of different concentration of *S. elaeagnifolium* plant parts. Data were analyzed using SPSS software (social package statistic software, version 18),One way Anova test was performed to explore the effect of the extract concentration on radish, tomato, wheat and lettuce seeds germination, significance was accepted at *P*-values below 0.05 the confidence interval was set at 95%.

Chapter four

4. Results.

4.1. Allelopathic effect of *S. elaeagnifolium* on radish:-

4.1.1. Allelopathic effect of *S. elaeagnifolium* root extract on radish

A. Effect of root extract on radish germination percentage:-

The effect of *S. elaeagnifolium* roots extract on radish seed germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in radish seeds at concentration of 10% as it is shown in the table (4-1) and figures (4-1).

Table (4-1) Radish germination percentage at different concentrations of solanum roots extract.

Solanum extract conc.	Radish seeds germination %
0%	90%
1%	70%
2%	60%
5%	20%
10%	No germination
20%	10%

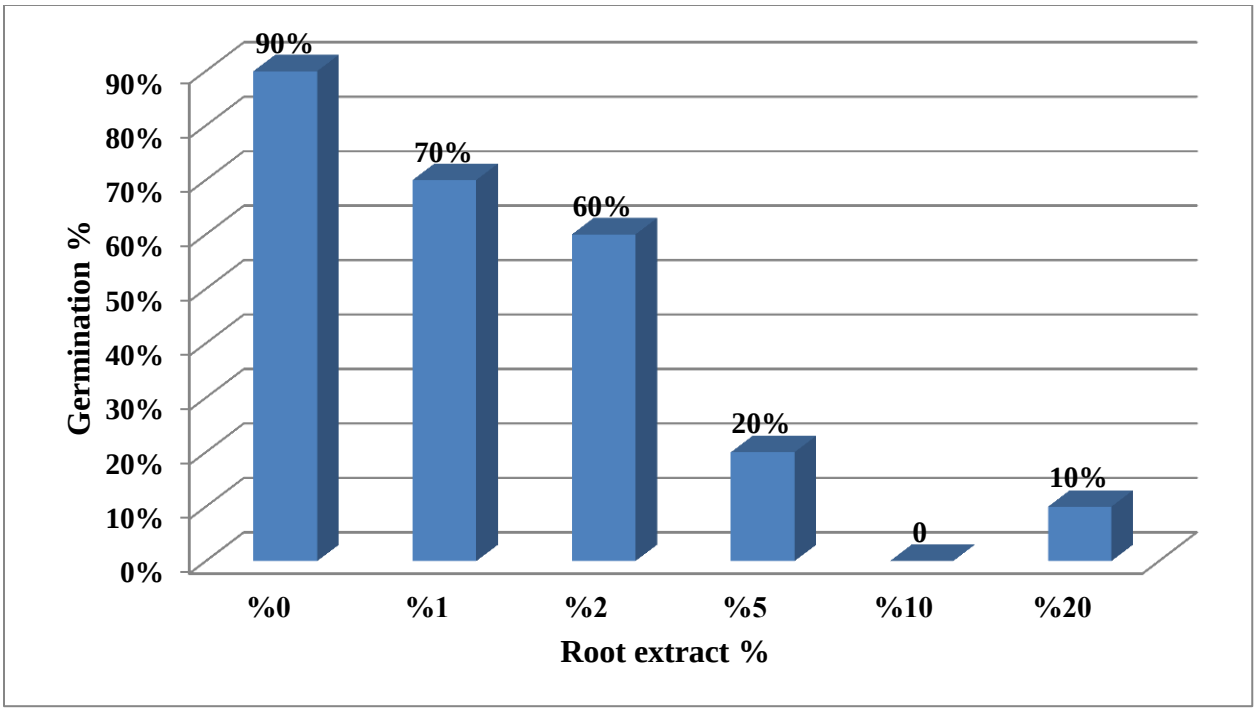

Fig. (4-1) Radish seeds germination percentage at different concentrations of solanum roots extract.

B. Effect of *S. elaeagnifolium* root extract on radish root and shoot elongation:

Allelopathy of *S. elaeagnifolium* roots extracts concentrations on radish roots and shoot was examined by Anova test, which showed no significant effect on radish seeds roots and shoots elongation (p-0.076, 0.17) as it is shown in table (4-2).

Table (4-2) The effect of *S. elaeagnifolium* roots extract on radish root and shoot length.

Plant part	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.673	0.279	2.491	0.076
	1%	0.449	0.329		
	2%	0.408	0.245		
	5%	0.1	0.156		
	10%	-	-		
	20%	0.13	-		
Shoot	0%	0.603	0.194	1.79	0.17
	1%	0.673	0.391		
	2%	0.517	0.259		
	5%	1.01	0.480		
	10%	-	-		
	20%	0.2	-		
*The mean difference is significant at the 0.05 level.					

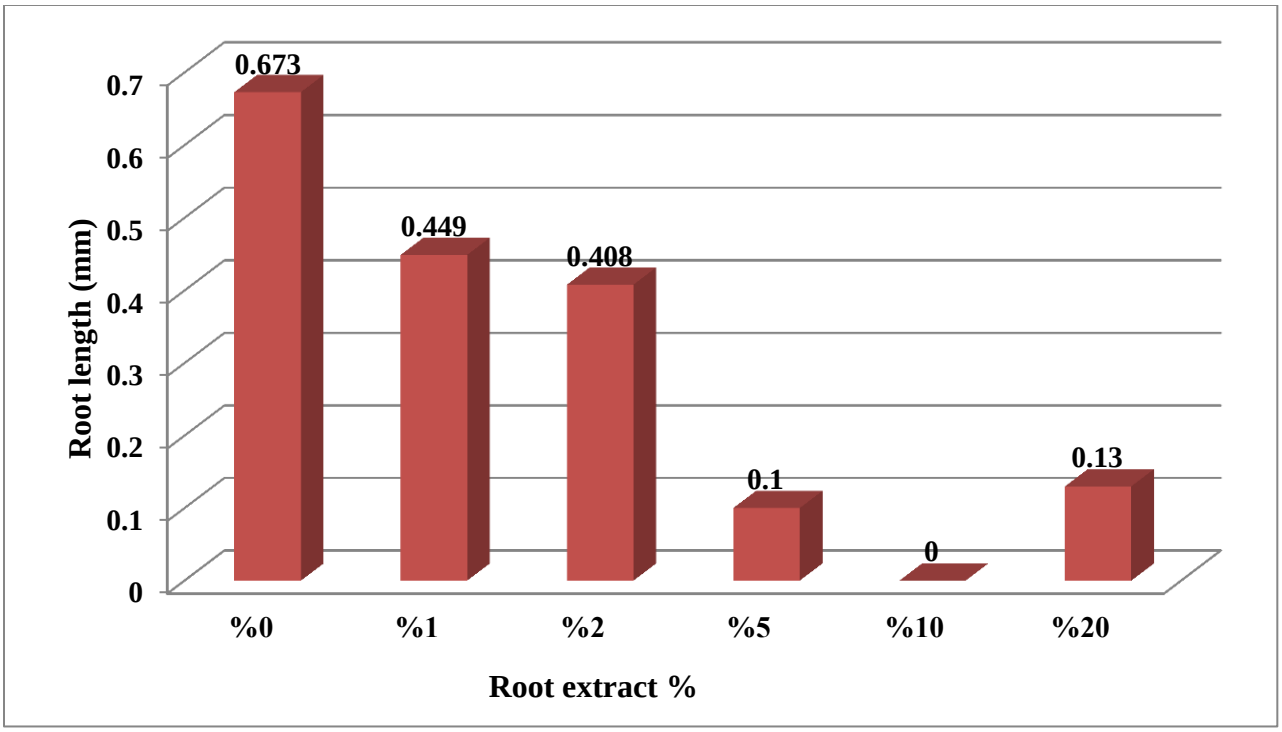

Fig. (4-2) The effect of solanum root extract on radish root elongation.

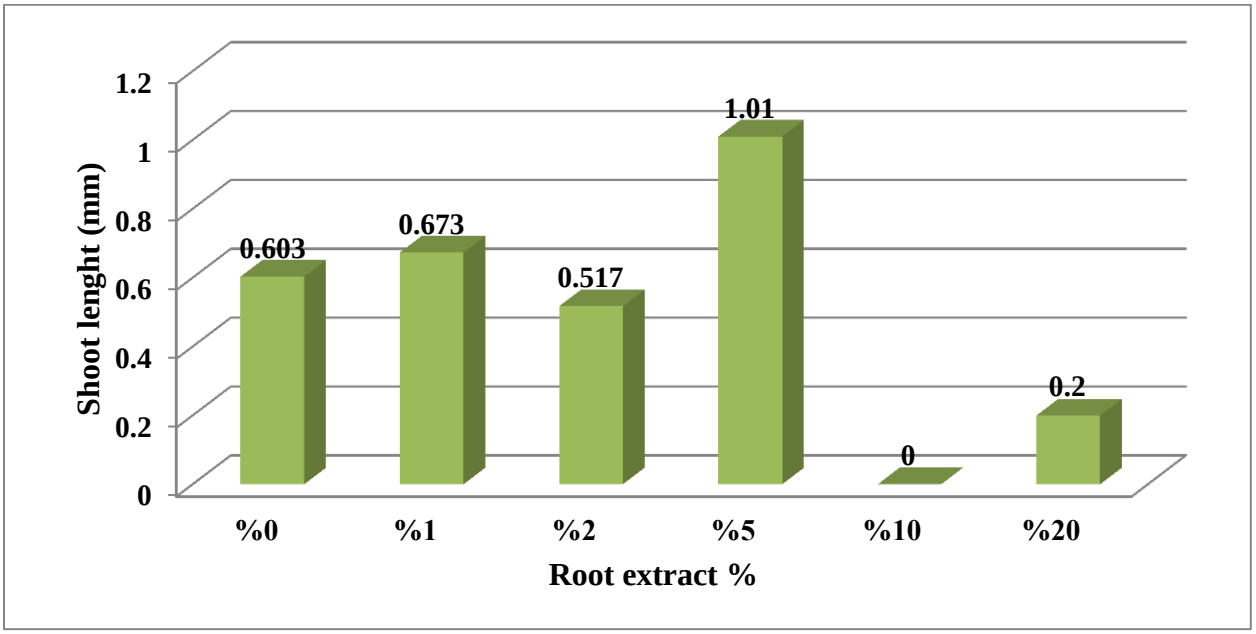

Fig. (4-3) The effect of solanum root extract on radish shoot elongation.

C. Effect of root extract on radish dry and fresh weight:-

The effect of different concentrations of *S. elaeagnifolium* roots extract on radish dry and fresh weight showed decrease of the both dry and fresh weight anova test was performed to explore the significance of this effect but this effects was not significant (p- value 0.68 and 0.613>0.05). as it is shown in table (4-3) and figure (4-4).

Table (4-3) The effect of *S. elaeagnifolium* roots extract on radish seeds fresh and dry weight.

weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.120	0.030		0.680
	1%	0.112	0.034		
	2%	0.098	0.040		
	5%	0.100	0.052		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.0203	0.025		0.613
	1%	0.019	0.021		
	2%	0.007	0.005		
	5%	0.0204	0.008		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

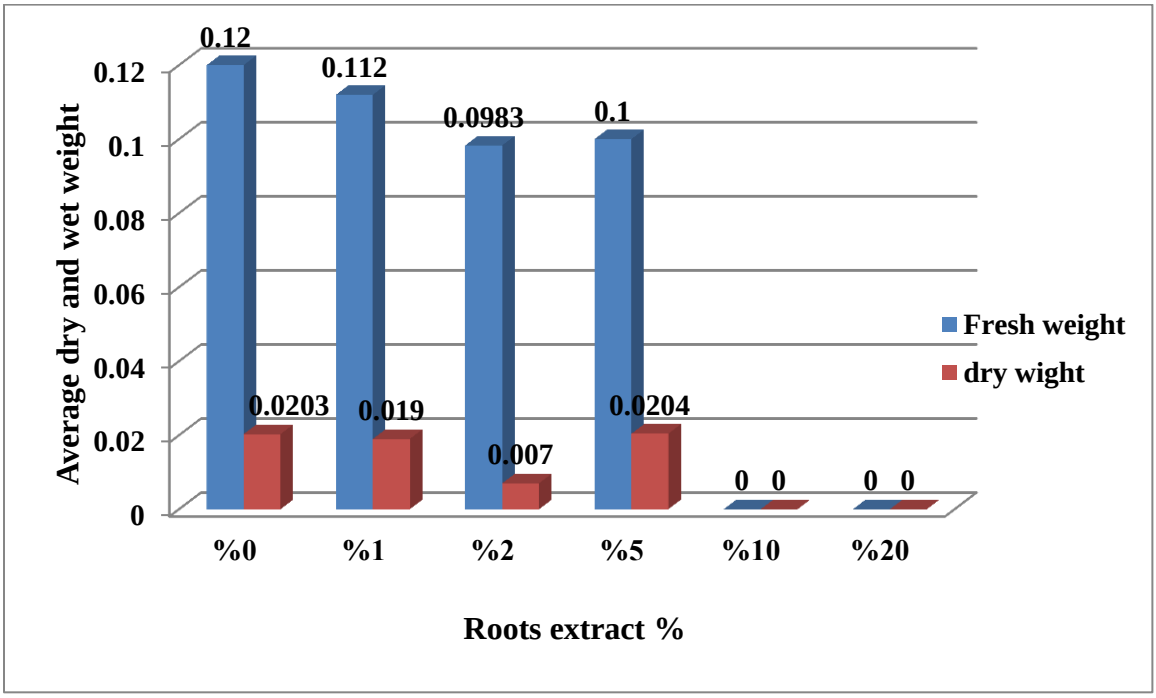

Fig. (4-4) The effect of *S. elaeagnifolium* roots extract on radish fresh and dry weight.

4.1.2 Allelopathic effect of *S. elaeagnifolium* stem extract on radish:-

A. Effect of *S. elaeagnifolium* stem extract on radish germination percentage:-

The effect of *S. elaeagnifolium* stem extract on radish germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in radish at concentration of 10%nd 20% as it is shown in the table (4-3) and figure (4-4).

Table (4-4) Radish germination percentage at different concentrations of solanum stem extract.

Solanum extract conc.	Radish seeds germination %
0%	90%
1%	60%
2%	60%
5%	50%
10%	No germination
20%	No germination

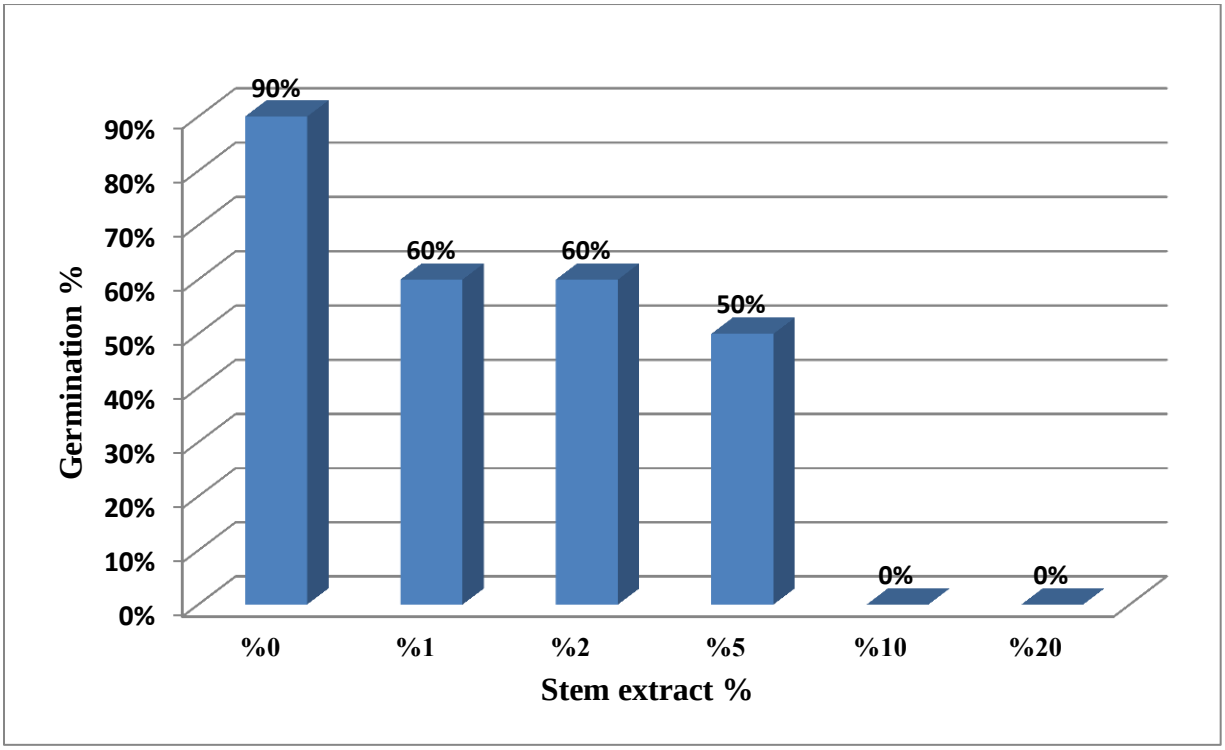

Fig. (4-5) Radish germination percentage at different concentrations of solanum stem extract.

B. Effect of *S. elaeagnifolium* stem extract on radish root and shoot elongation:

Allelopathiy of *S. elaeagnifolium* stem extracts concentration on radish root and shoot elongation were examined by Anova statistical test, which showed a significant effect on root length (p-value 0.032), while no significant effects were detected on shoot length (p-value 0.541) as shown in table (4-3), figures (4-5) and (4-6).

Table (4-5) The effect of *S. elaeagnifolium* stem extract on radish root and shoot length.

Descriptive				ANOVA	
Plant part	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.67	0.28	3.527	0.032
	1%	0.18	0.078		
	2%	0.68	0.365		
	5%	0.5	0.483		
	10%	-	-		
	20%	-	-		
Shoot	0%	0.60	0.194	0.737	0.541
	1%	0.68	0.294		
	2%	0.60	0.262		
	5%	0.452	0.325		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

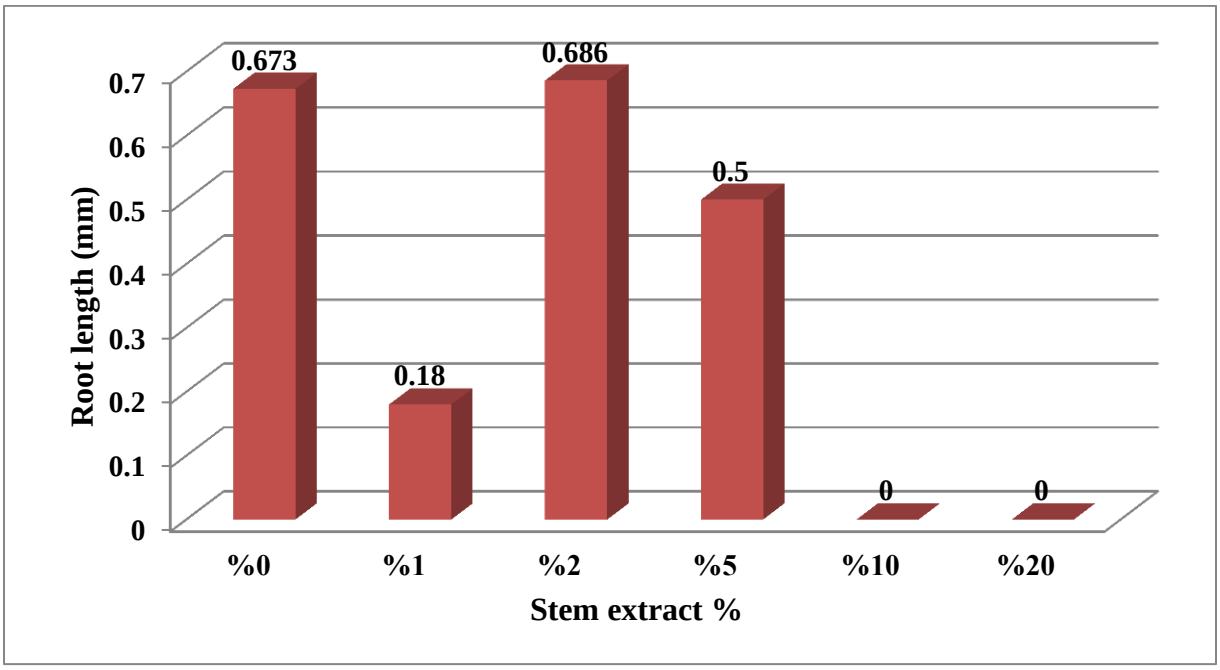

Fig. (4-6) The effect of solanum stem extract on radish roots elongation.

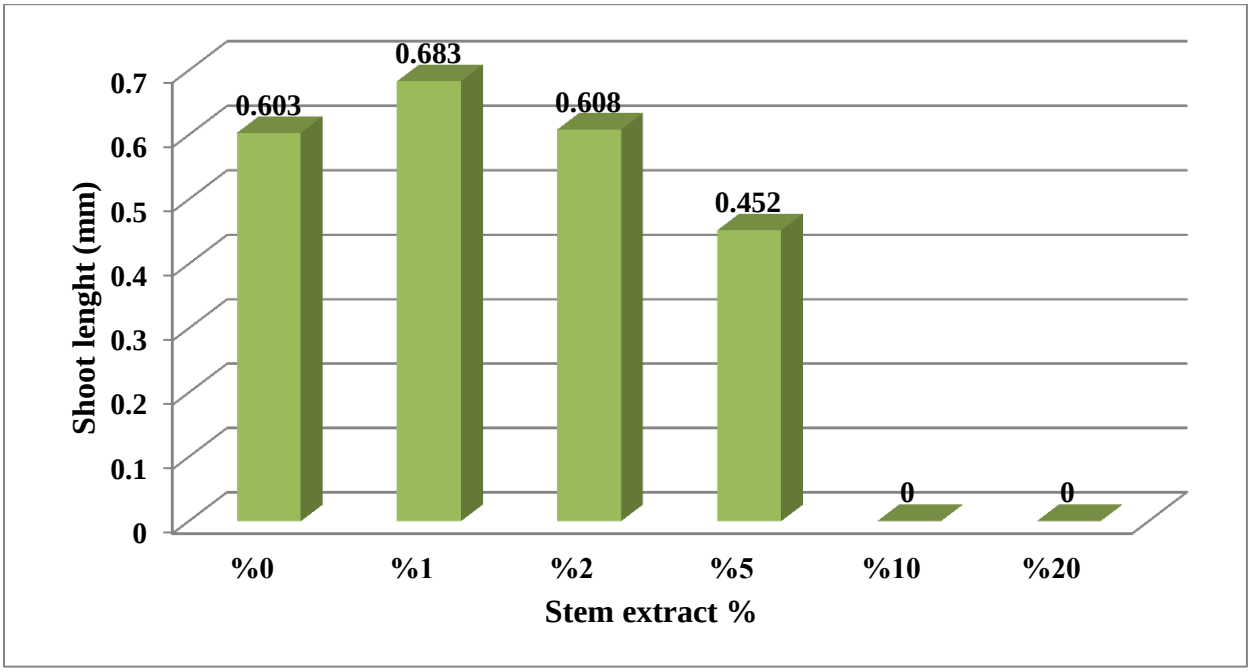

Fig. (4-7) The effect of solanum stem extract on radish shoot elongation.

C. Effect of *S. elaeagnifolium* stem extract on radish dry and fresh weight :

The effect of different concentrations of *S. elaeagnifolium* stem extract on radish dry and fresh weight showed decrease of the both dry and fresh weight, anova test was performed to explore the significance of this effect , the effect on fresh weight was significant (p- value 0.005 < 0.05), but this effects was not significant on dry weights (p- value 0.224 > 0.05). as it is shown in table (4-6) and figure (4-8).

Table (4-6) The effect of *S. elaeagnifolium* stem extract on radish fresh and dry weight.

Weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.073	0.033		0.005
	1%	0.110	0.050		
	2%	0.178	0.005		
	5%	0.176	0.091		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.008	0.006		0.224
	1%	0.034	0.033		
	2%	0.031	0.034		
	5%	0.029	0.029		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

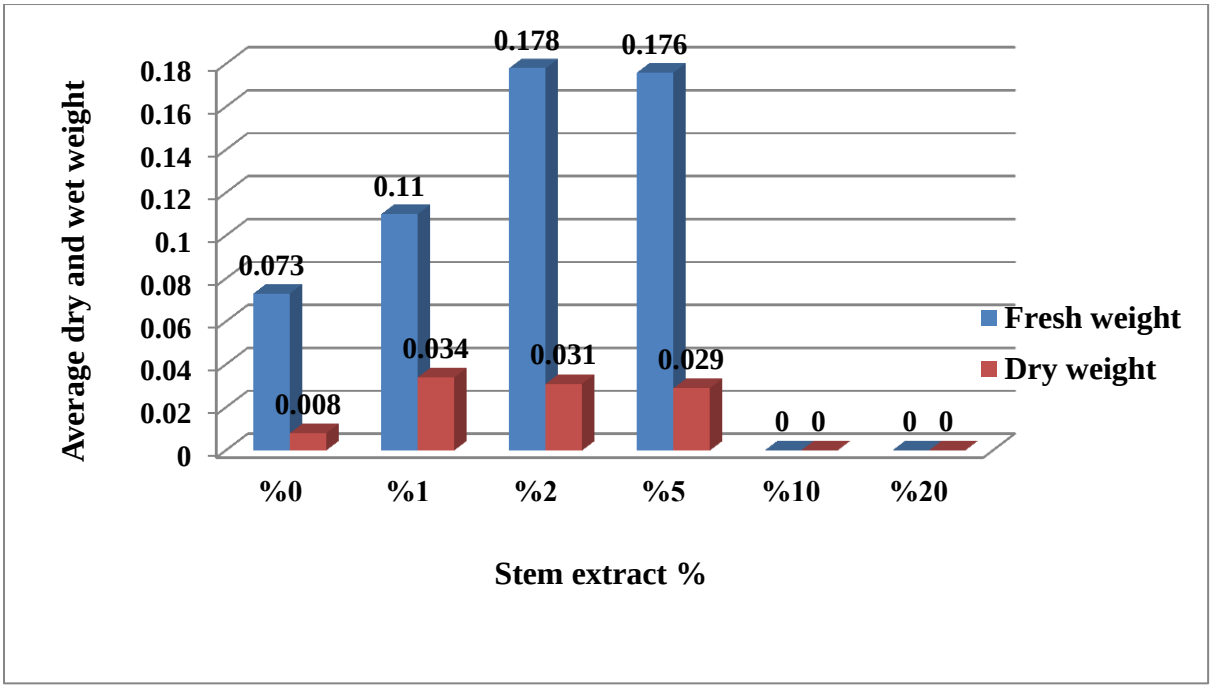

Fig. (4-8) The effect of *S. elaeagnifolium* stem extract on radish fresh and dry weight.

4.1.3. Allelopathic effect of *S. elaeagnifolium* leaves extract on radish:

A. Effect of *S. elaeagnifolium* leaves extract on radish germination percentage:

The effect of *S. elaeagnifolium* leaves extract on radish germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in radish at concentration of 5% and 20%, only one seed was grown at 10% concentration as it is shown in the table (4-7) and figure (4-9).

Table (4-7) Radish germination percentage at different concentrations of solanum leaves extract.

Solanum extract conc.	Radish seeds germination %
0%	90%
1%	60%
2%	30%
5%	No germination
10%	10%
20%	No germination

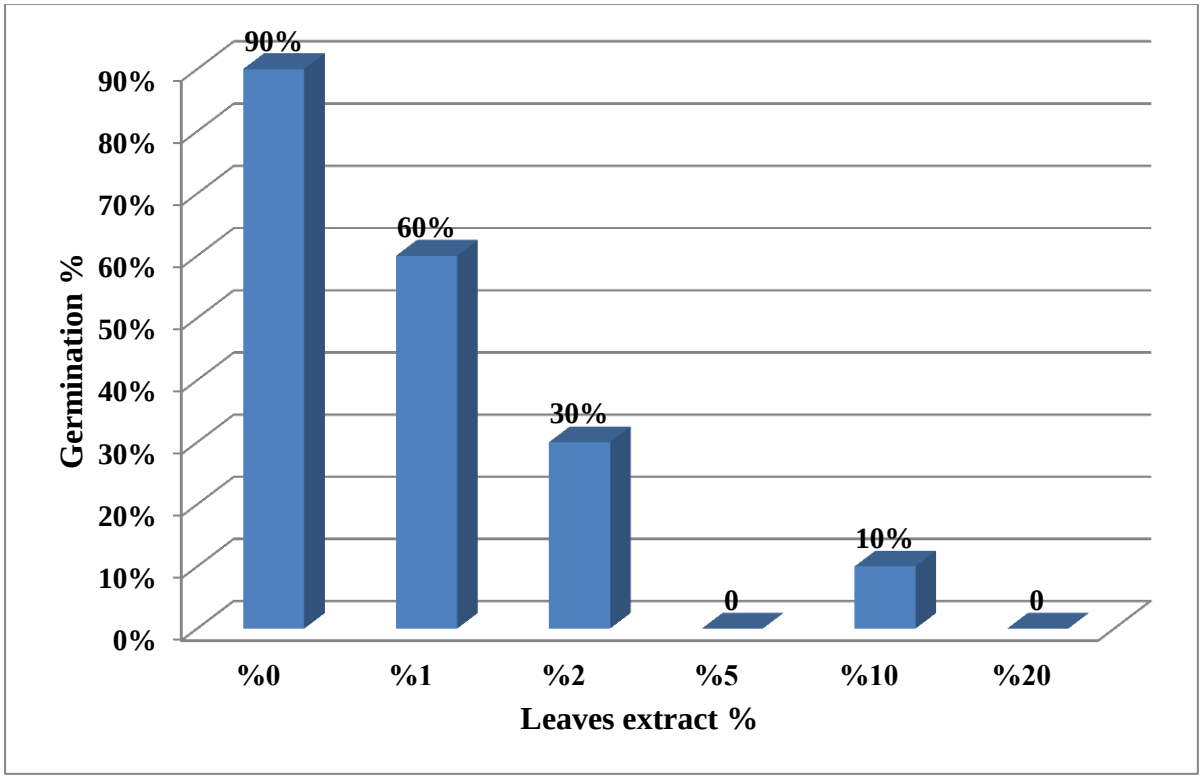

Fig. (4-9) Radish germination percentage at different concentrations of solanum leaves extract.

B. Effect of *S. elaeagnifolium* leaves extract on radish root and shoot elongation:-

Allelopathy of *S. elaeagnifolium* leaves extracts concentration on radish root and shoot elongation were examined by Anova statistical test, which showed a significant effect on root length (p-value 0.026), while no significant effects were detected on shoot length (p-value 0.97) as shown in table (4-8), figures (4-10) and (4-11).

Table (4-8) The effect of *S. elaeagnifolium* leaves extract on radish root and shoot length.

Plant part	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.673	0.279	4.107	0.026
	1%	0.34	0.188		
	2%	0.303	0.172		
	5%	-	-		
	10%	0.08	-		
	20%	-	-		
Shoot	0%	0.603	0.194	2.520	0.97
	1%	0.618	0.232		
	2%	0.327	0.192		
	5%	-	-		
	10%	0.2	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

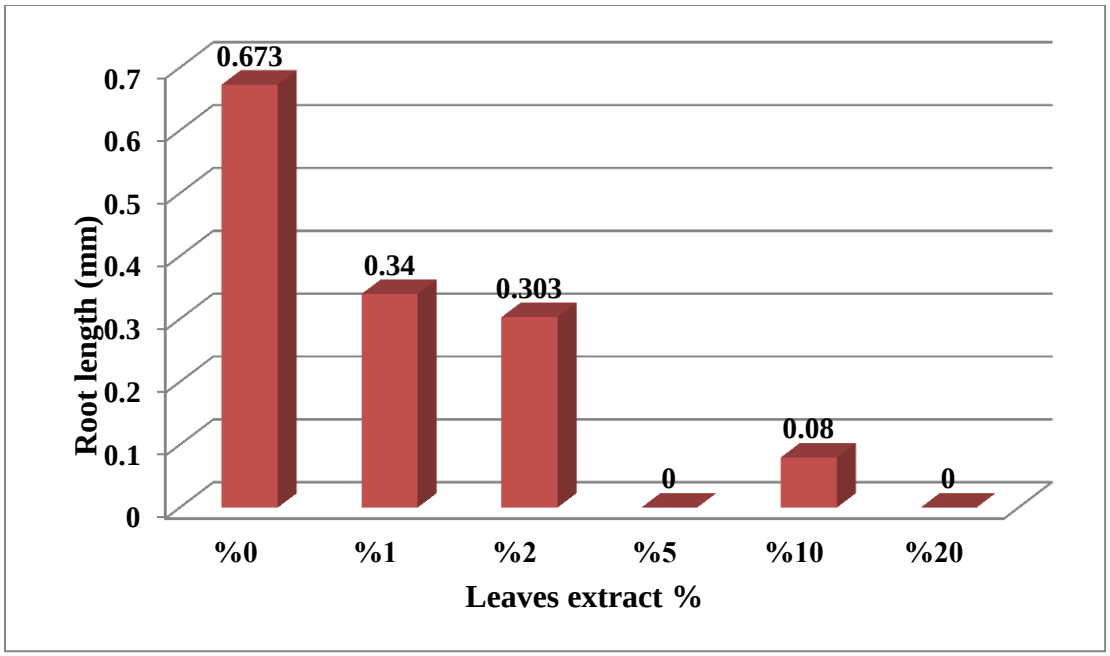

Fig. (4-10) The effect of *S. elaeagnifolium* leaves extract on radish root elongation.

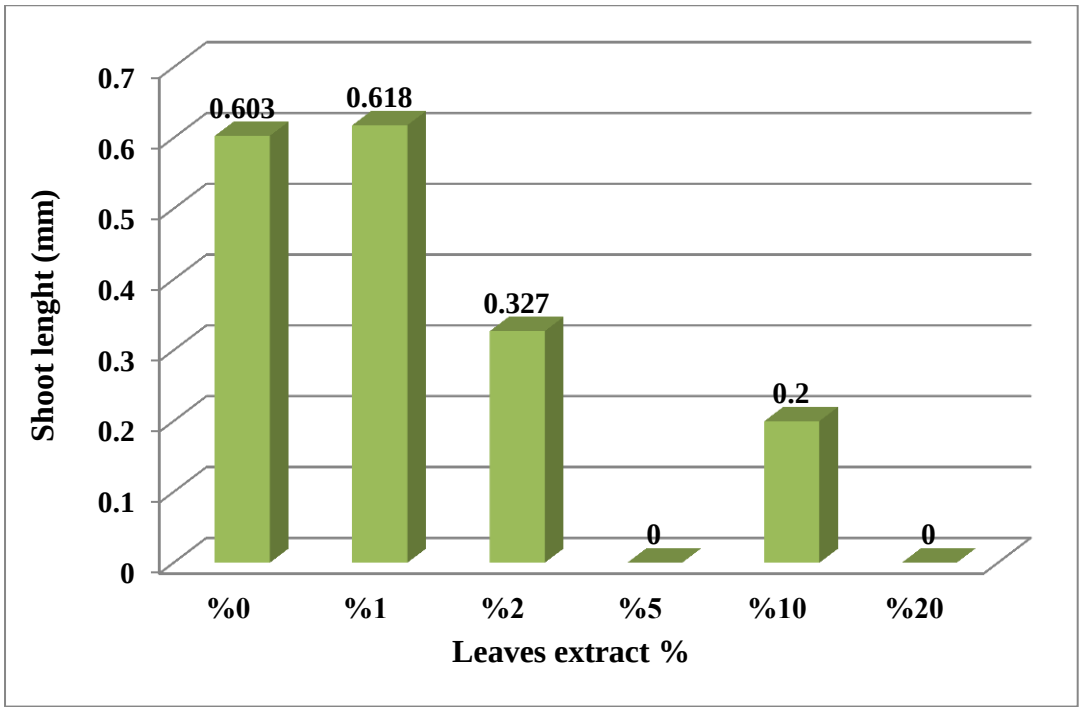

Fig. (4-11) The effect of *S. elaeagnifolium* leaves extract on radish shoot elongation.

C. Effect of *S. elaeagnifolium* leaves extract on Radish dry and fresh weight :

The effect of different concentrations of *S. elaeagnifolium* leaves extract on radish dry and fresh weight showed decrease of the both dry and fresh weight, anova test was performed to explore the significance of this effect, the effect on fresh weight was significant (p- value 0.005 < 0.05), but this effects was not significant on dry weights (p- value 0.174 > 0.05) as it is shown in table (4-9) and figure (4-12).

Table (4-9) The effect of *S. elaeagnifolium* leaves extract on radish fresh and dry weight.

weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.106	0.023		0.005
	1%	0.173	0.053		
	2%	0.092	0.038		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.017	0.012		0.174
	1%	0.031	0.033		
	2%	0.006	0.003		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

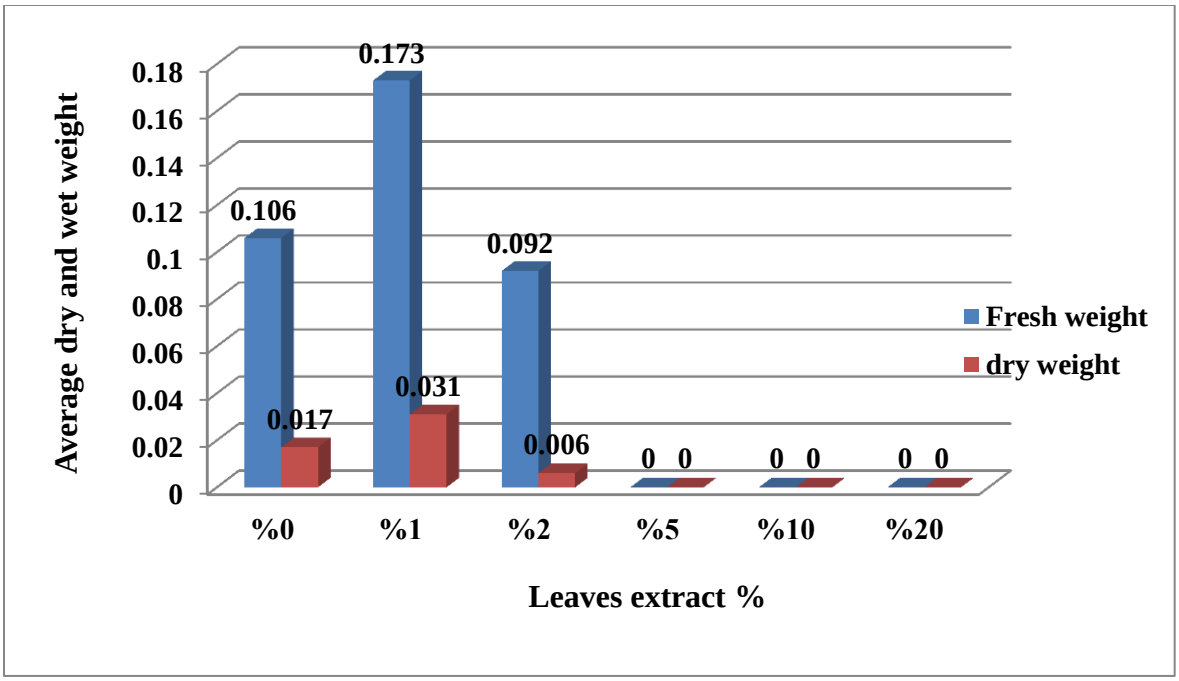

Fig. (4-12) The effect of *S. elaeagnifolium* leaves extract on radish fresh and dry weight.

4.1.4. Allelopathic effect of *S. elaeagnifolium* flowers extract on radish:-

A. Effect of *S. elaeagnifolium* flowers extract on radish germination percentage:-

The effect of *S. elaeagnifolium* flowers extract on radish germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in radish at concentration of 5%, 10% and 20% as it is shown in the table (4-10) and figure (4-13).

Table (4-10) Radish germination percentage at different concentrations of solanum flowers extract.

Solanum extract conc.	Radish seeds germination %
0%	90%
1%	40%
2%	30%
5%	No germination
10%	No germination
20%	No germination

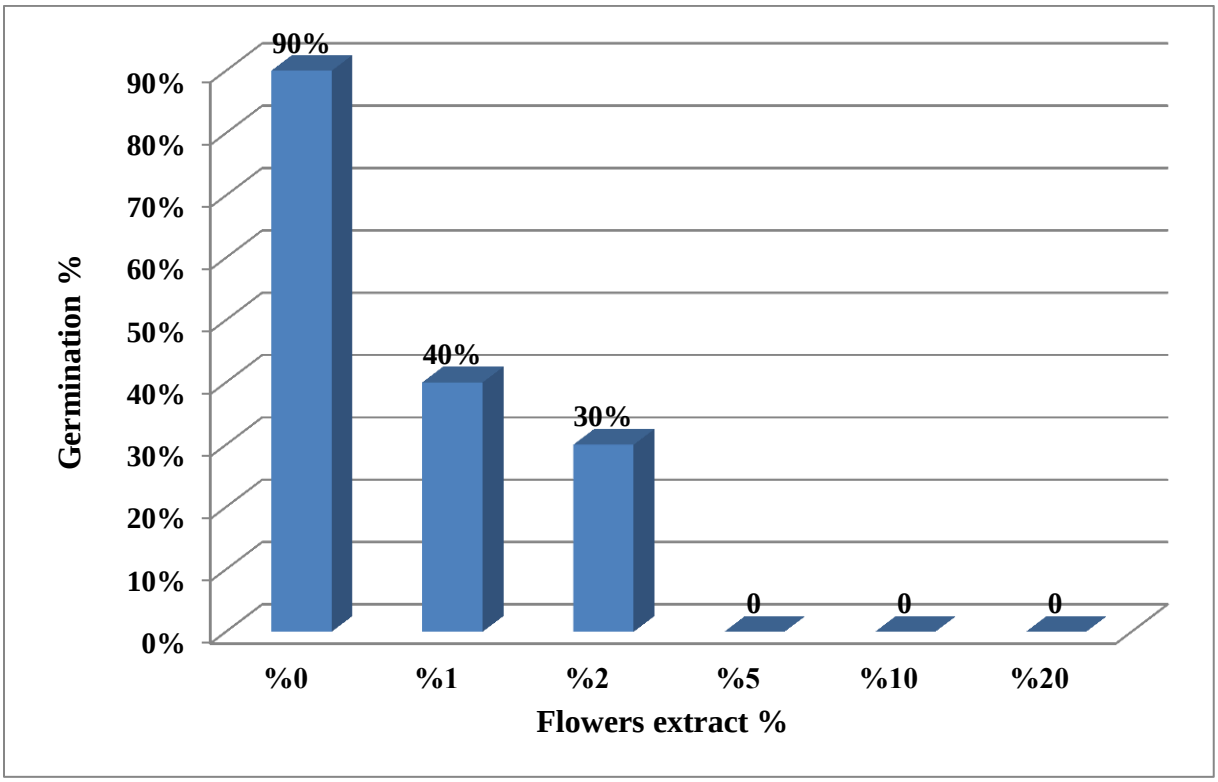

Fig. (4-13) Radish germination percentage at different concentrations of solanum flower extract.

B. Effect of *S. elaeagnifolium* flowers extract on radish root and shoot elongation:

Allelopathiy of *S. elaeagnifolium* flowers extracts concentration on radish root and shoot elongation were examined by Anova statistical test, which showed no significant effect of solanum flowers extract on root and shoot length (p-value 0.457 and 0.58), as shown in table (4-11), figures (4-14) and (4-15).

Table (4-11) The effect of *S. elaeagnifolium* flowers extract on radish root and shoot length.

Type of seeds	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.673	0.279	0.832	0.457
	1%	0.545	0.37		
	2%	0.432	0.538		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Shoot	0%	0.603	0.194	3.005	0.58
	1%	0.558	0.205		
	2%	0.297	0.134		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

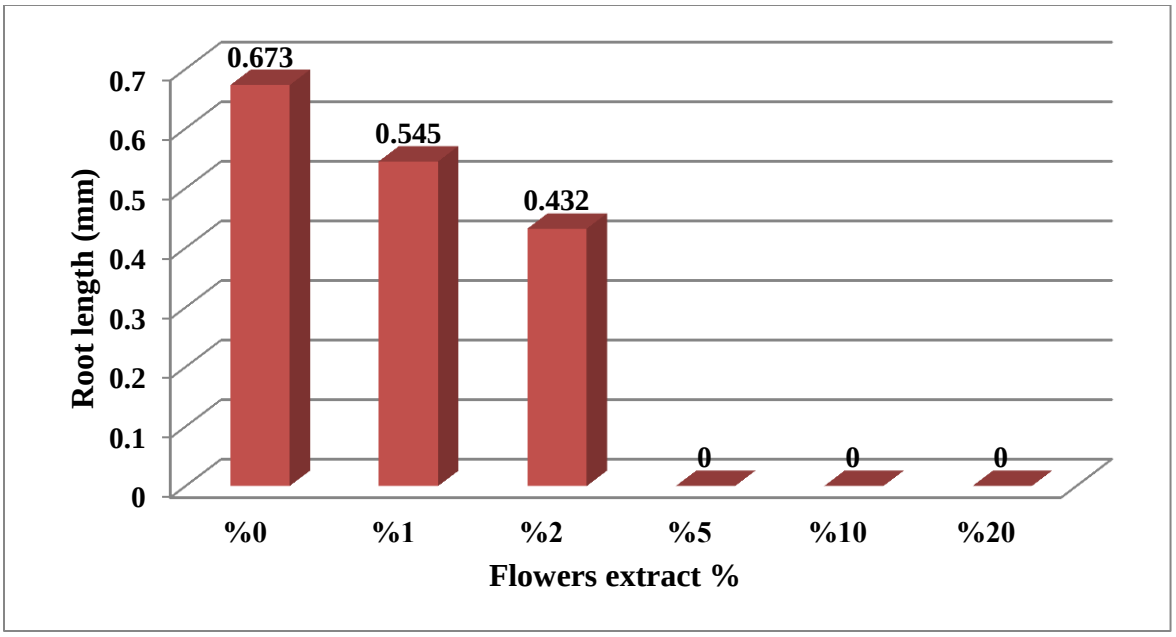

Fig. (4-14) The effect of solanum flowers extract on radish root elongation.

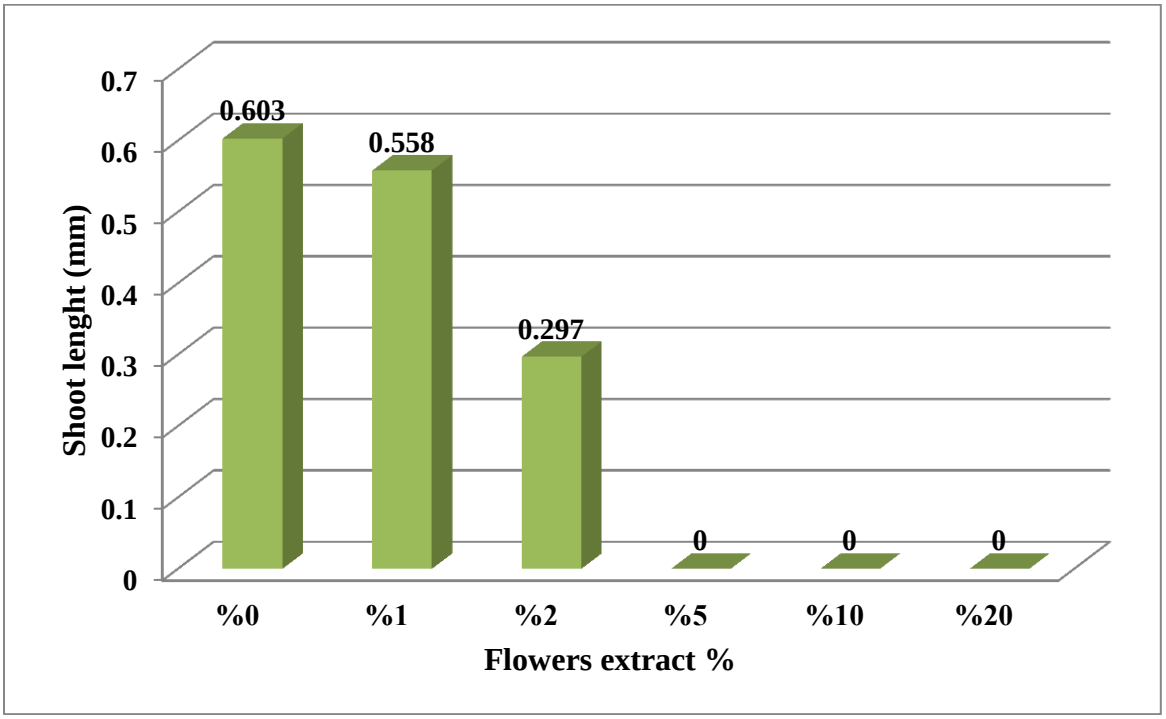

Fig. (4-15) The effect of solanum flowers extract on radish shoot elongation.

C. Effect of *S. elaeagnifolium* flowers extract on radish dry and fresh weight:

The effect of different concentrations of *S. elaeagnifolium* flowers extract on radish fresh weight showed increased fresh weight at 1% and 2% concentrations compared with the control, but decreased dry weights at 1% and 2% concentrations compared with the control. Anova test was performed to explore the significance of this effect but this effects was not significant (p- value 0.119 and 0.742 >0.05) as it is shown in table (4-12) and figure (4-16).

Table (4-12) The effect of *S. elaeagnifolium* flowers extract on radish fresh and dry weight.

weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.095	0.049		0.119
	1%	0.165	0.049		
	2%	0.110	0.045		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.020	0.030		0.742
	1%	0.0153	0.010		
	2%	0.007	0.003		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

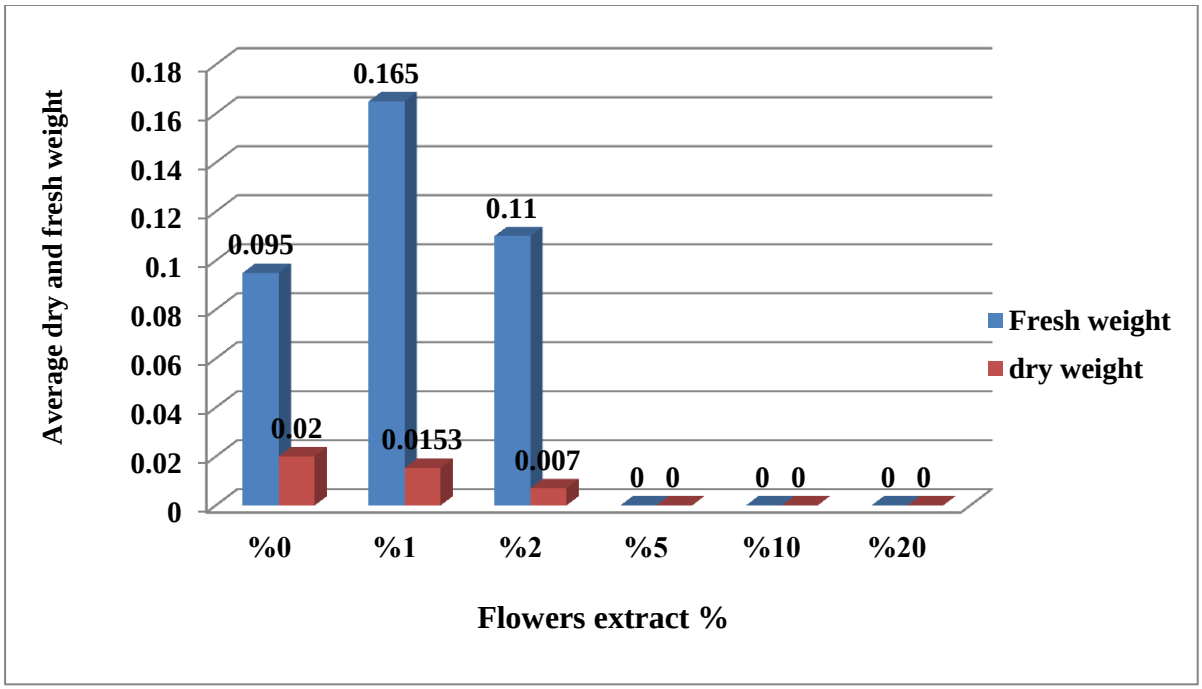

Fig. (4-16) The effect of *S. elaeagnifolium* flowers extract on radish fresh and dry weight.

4.1.5. Allelopathic effect of *S. elaeagnifolium* fruits extract on radish:-

A. Effect of *S. elaeagnifolium* fruits extract on radish seed germination percentage:

The effect of *S. elaeagnifolium* fruits extract on radish germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in radish at concentration of 5% , 10% and 20% as it is shown in the table (4-13) and figure (4-17).

Table (4-13) Radish germination percentage at different concentrations of solanum flowers extract.

Solanum extract conc.	Radish seeds germination %
0%	90%
1%	60%
2%	10%
5%	No germination
10%	No germination
20%	No germination

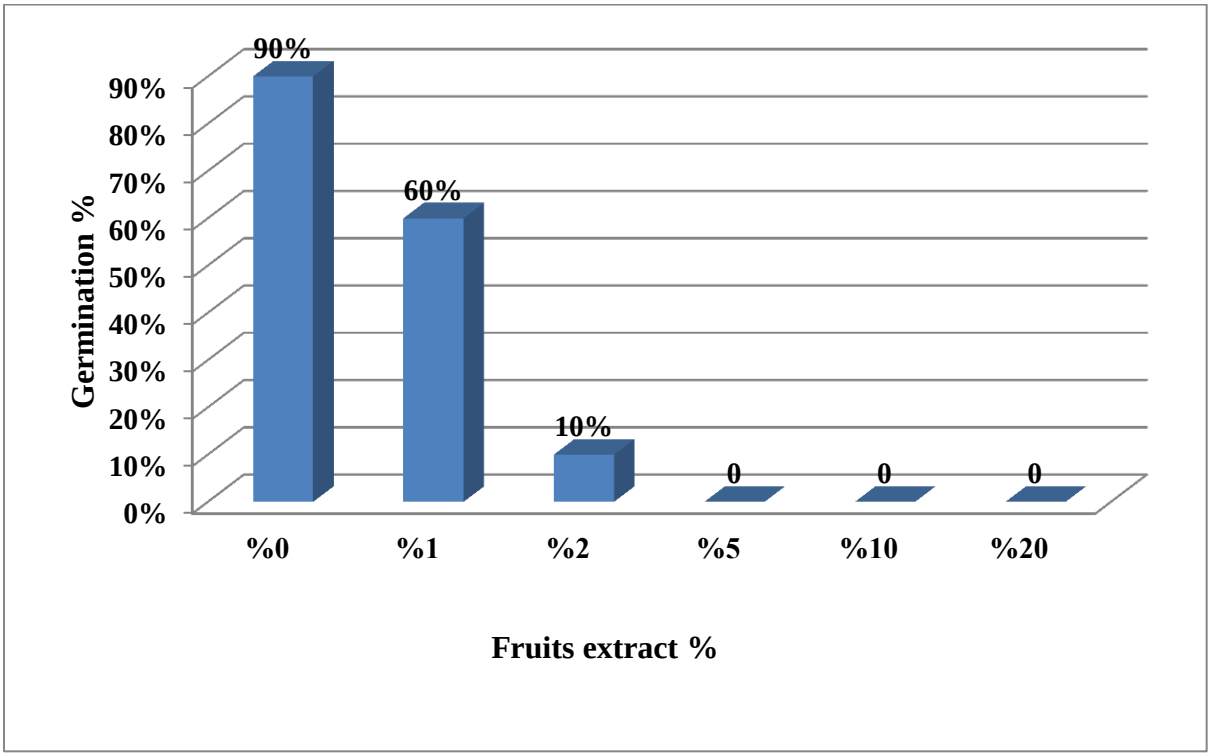

Fig. (4-17) Radish germination percentage at different concentrations of solanum fruits extract.

B. Effect of *S. elaeagnifolium* fruits extract on Radish root and shoot elongation:

Allelopathiy of solanum fruits extracts concentration on radish root and shoot elongation were examined by Anova statistical test, which showed a significant effect of solanum flowers extract on root length (p-value 0.016 < 0.05), while no significant effects where observed on radish shoot length . (p-value 0.077> 0.05) as shown in table (4-14), figures (4-18) and (4-19).

Table (4-14) The effect of *S. elaeagnifolium* fruits extract on radish root and shoot length.

Plant part	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.673	0.279	5.66	0.016
	1%	0.268	0.216		
	2%	0.2	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Shoot	0%	0.603	0.194	3.097	0.077
	1%	0.359	0.261		
	2%	0.12	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

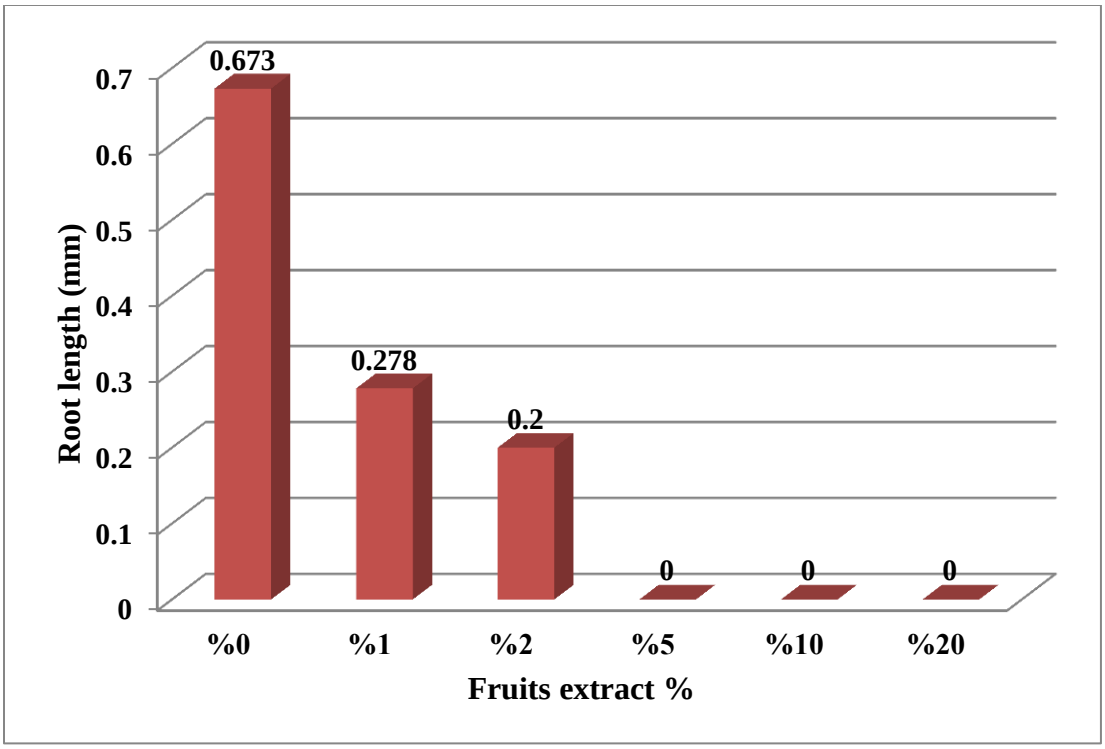

Fig. (4-18) The effect of solanum fruits extract on radish root elongation.

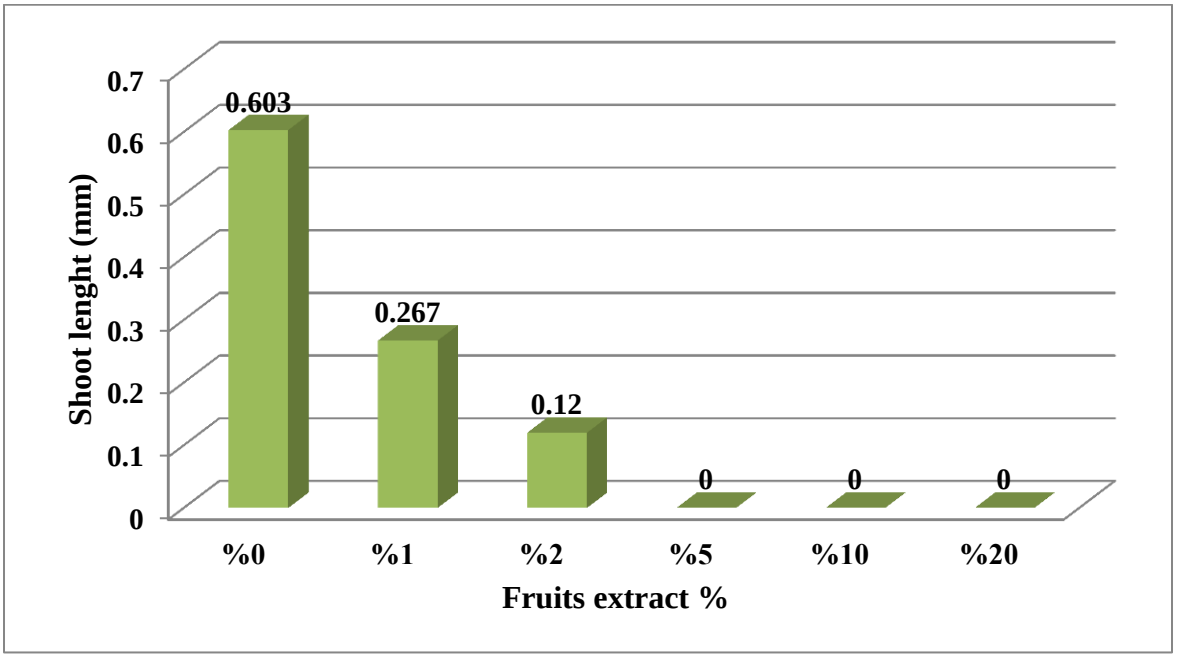

Fig. (4-19) The effect of solanum fruits extract on radish shoot elongation.

C. Effect of *S. elaeagnifolium* fruits extract on Radish seeds dry and fresh weight:

The effect of different concentrations of *S. elaeagnifolium* fruits extract on radish fresh and dry weight showed increased weight at 1% concentration compared with the control. Anova test was performed to explore the significance of this effect but this effects was not significant (p- value 0.09 and 0.703 >0.05) as it is shown in table (4-15) and figure (4-20).

Table (4-15) The effect of *S. elaeagnifolium* fruitss extract on radish seeds fresh and dry weight.

Plant part	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.120	0.030		0.090
	1%	0.182	0.098		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.019	0.025		0.703
	1%	0.024	0.024		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

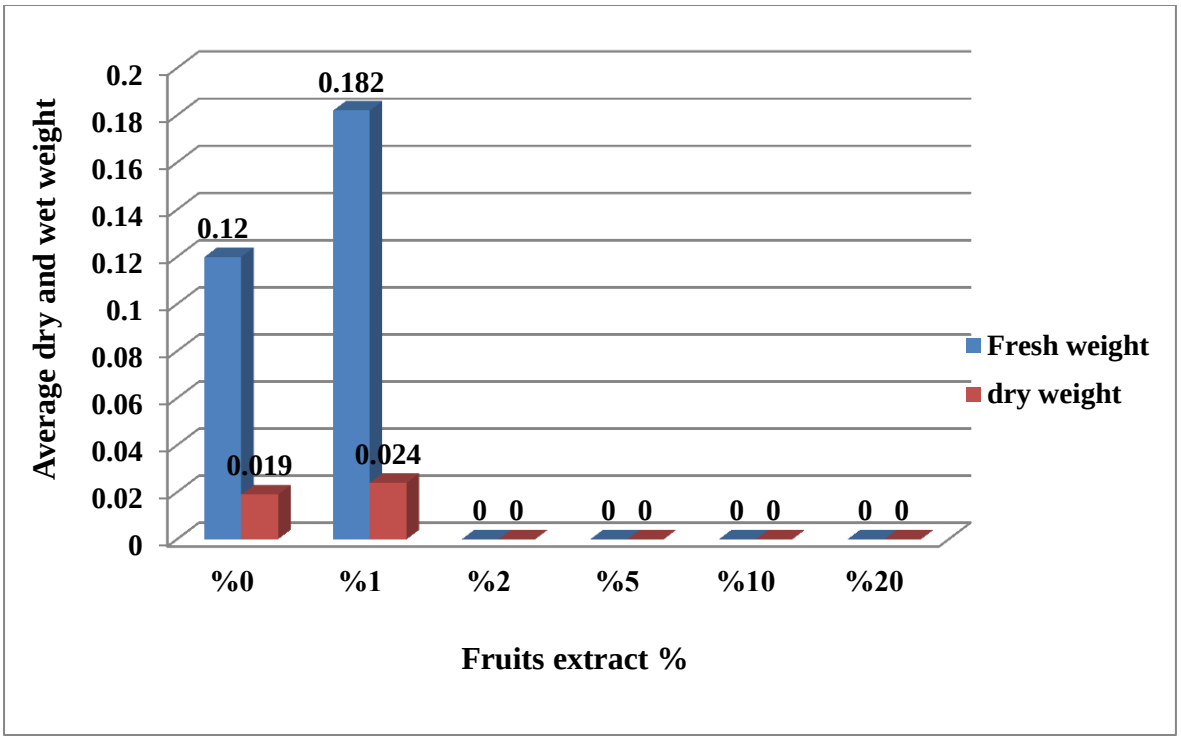

Fig. (4-20) The effect of *S. elaeagnifolium* fruits extract on radish fresh and dry weight.

4.2. Allelopathic effect of *Solanum elaeagnifolium* on tomato:-

4.2.1. Allelopathic effect of *S. elaeagnifolium* roots extract on tomato:-

A. Effect of root extract on tomato seed germination percentage:-

The effect of *S. elaeagnifolium* roots extract on tomato germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in tomato at concentration of 10% concentration, only one seed was grown at concentration 20% as it is shown in the table (4-16) and figure (4-21).

Table (4-16) Tomato germination percentage at different concentrations of solanum roots extract.

Solanum extract conc.	Radish seeds germination %
0%	100%
1%	100%
2%	50%
5%	20%
10%	No germination
20%	10%

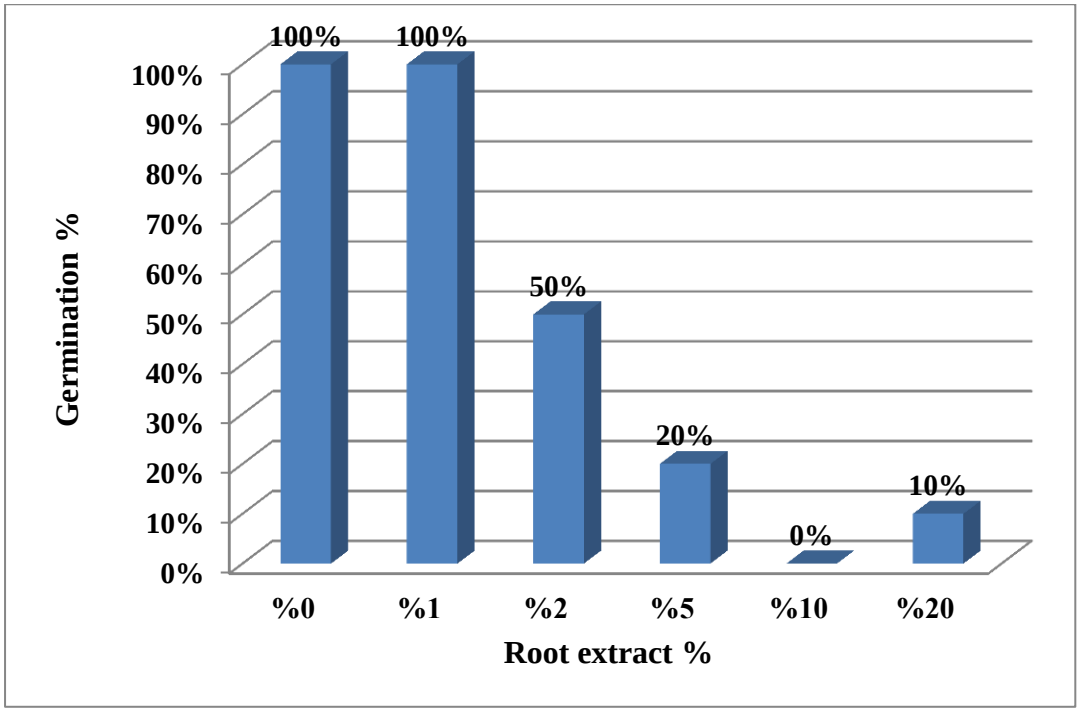

Fig. (4-21) Tomato germination percentage at different concentrations of solanum roots extract.

B. Effect of *S. elaeagnifolium* roots extract on tomato root and shoot elongation:

Allelopathiy of *S. elaeagnifolium* roots extracts concentration on tomato root and shoot elongation were examined by Anova statistical test, which showed a significant effect of solanum roots extract on shoot length (p-value 0.015< 0.05), while no significant effects where observed on tomato root length .(p-value 0.858>0.05) as shown in table (4-17), figures (4-22) and (4-23).

Table (4-17) The effect of *S. elaeagnifolium* roots extract on tomato root and shoot length.

Plant part	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.412	0.253	0.325	0.858
	1%	0.336	0.142		
	2%	0.318	0.114		
	5%	0.323	0.092		
	10%	-	-		
	20%	0.3	-		
Shoot	0%	0.388	0.256	3.901	0.015
	1%	0.616	0.616		
	2%	0.558	0.558		
	5%	0.493	0.44		
	10%	-	-		
	20%	0.06	-		
*The mean difference is significant at the 0.05 level.					

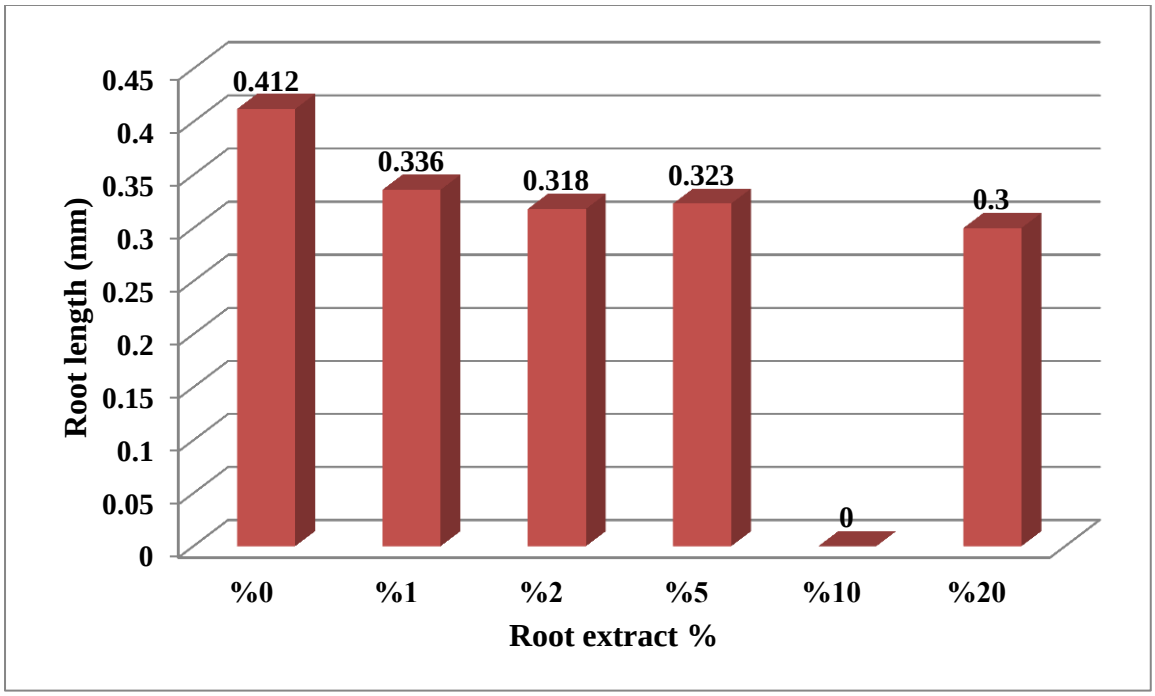

Fig. (4-22) The effect of solanum roots extract on tomato root elongation.

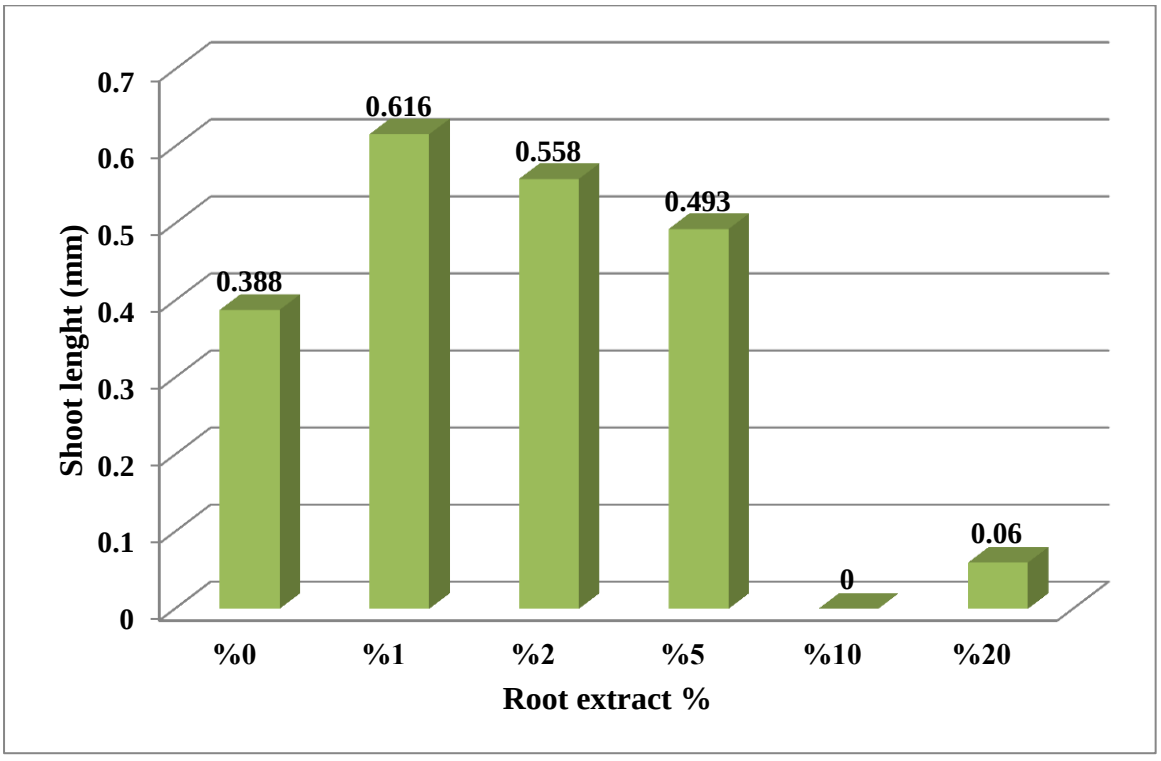

Fig. (4-23) The effect of solanum roots extract on tomato shoot elongation.

C. Effect of *S. elaeagnifolium* roots extract on tomato seeds dry and fresh weight:

The effect of different concentrations of *S. elaeagnifolium* roots extract on tomato fresh weight showed increased weight at 2% and 5% concentration compared with the control. Anova test was performed to explore the significance of this effect , this effects was not significant on dry weight (p- value 0.272) while the effect was significant on fresh weight (0.001 < 0.05) as it is shown in table (4-18) and figure (4-24).

Table (4-18) The effect of *S. elaeagnifolium* roots extract on tomato seeds fresh and dry weight.

weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.238	0.013		0.001
	1%	0.234	0.009		
	2%	0.246	0.0114		
	5%	0.270	0.0100		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.0595	0.0117		0.272
	1%	0.0041	0.0019		
	2%	0.0024	0.0009		
	5%	0.0028	0.0005		
	10%	0.238	0.013		
	20%	0.234	0.009		
*The mean difference is significant at the 0.05 level.					

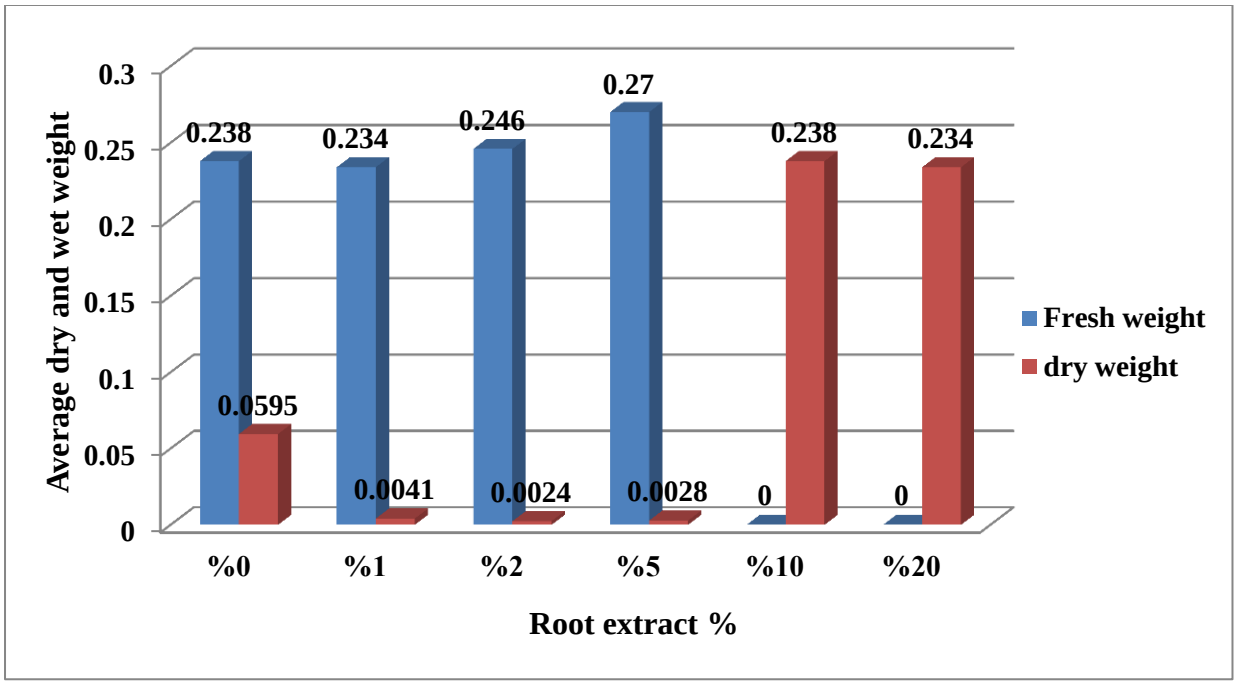

Fig. (4-24) The effect of *S. elaeagnifolium* roots extract on tomato fresh and dry weight.

4.2.2. Allelopathic effect of *S. elaeagnifolium* stem extract on tomato:-

A. Effect of *S. elaeagnifolium* stem extract on tomato germination percentage:-

The effect of *S. elaeagnifolium* stems extract on tomato germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in tomato at concentration of 5 % and 10% concentration, only one seed was grown at concentration 20% as it is shown in the table (4-19) and figure (4-25).

Table (4-19) Tomato germination percentage at different concentrations of solanum roots extract.

Solanum extract conc.	Radish seeds germination %
0%	100%
1%	90%
2%	50%
5%	No germination
10%	No germination
20%	10%

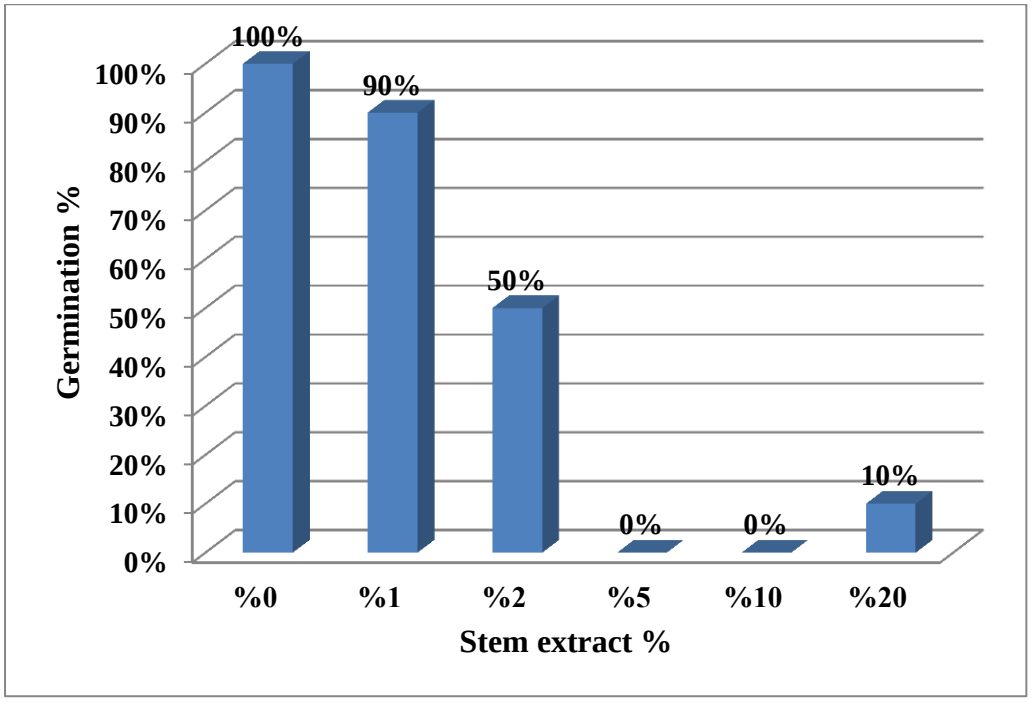

Fig. (4-25) Tomato germination percentage at different concentrations of solanum stem extract.

B. Effect of *S. elaeagnifolium* stem extract on tomato root and shoot elongation:

Allelopathiy of solanum stem extracts concentration on tomato root and shoot elongation were examined by Anova statistical test, which showed a significant effect of solanum stem extract on shoot length (p-value 0.004 < 0.05), while no significant effects where observed on tomato root length .(p-value 0.143> 0.05) as shown in table (4-20), figures (4-26) and (4-27).

Table (4-20) The effect of *S. elaeagnifolium* stems extract on tomato root and shoot length.

Type of seeds		Descriptive			ANOVA	
		Concentration	Mean	S.D (±)	F	p- values
	Roots	0%	0.412	0.235	2.014	0.143
		1%	0.426	0.114		
		2%	0.25	0.128		
		5%	-	-		
		10%	-	-		
		20%	0.03	-		
	Shoot	0%	0.388	0.255	5.925	0.004
		1%	0.705	0.118		
		2%	0.4	0.158		
		5%	-	-		
		10%	-	-		
		20%	0.15	-		
*The mean difference is significant at the 0.05 level.						

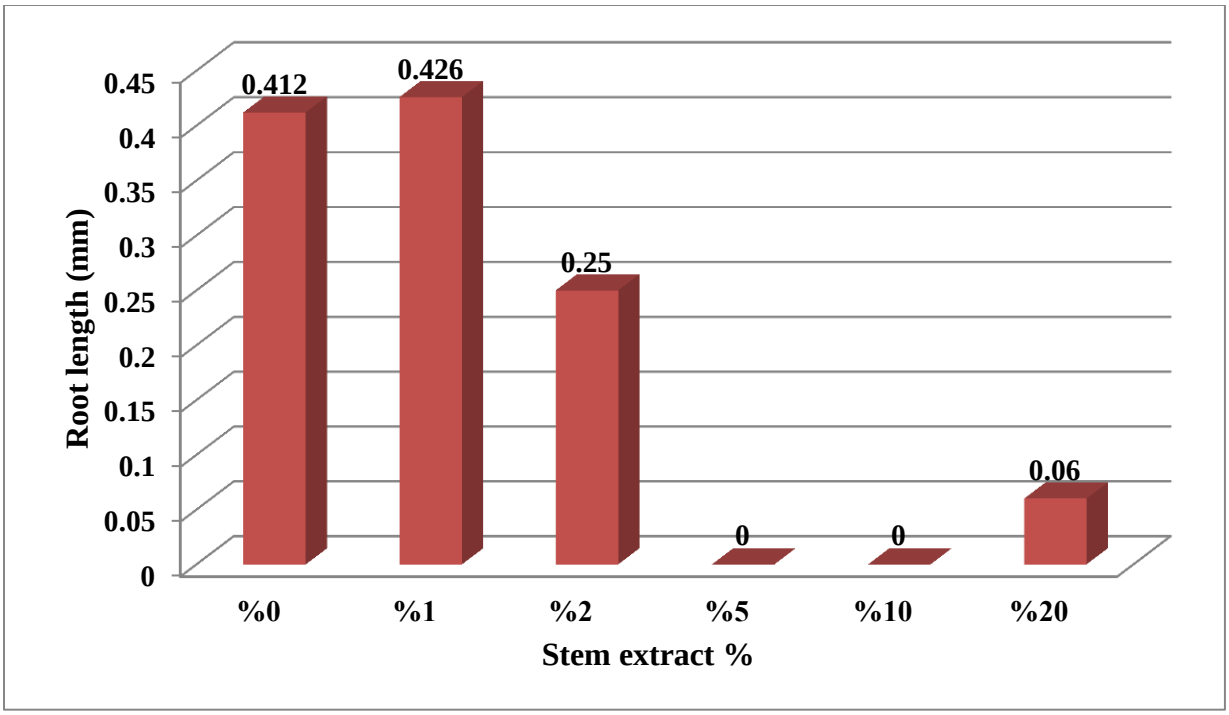

Fig. (4-26) The effect of solanum stems extract on tomato root elongation.

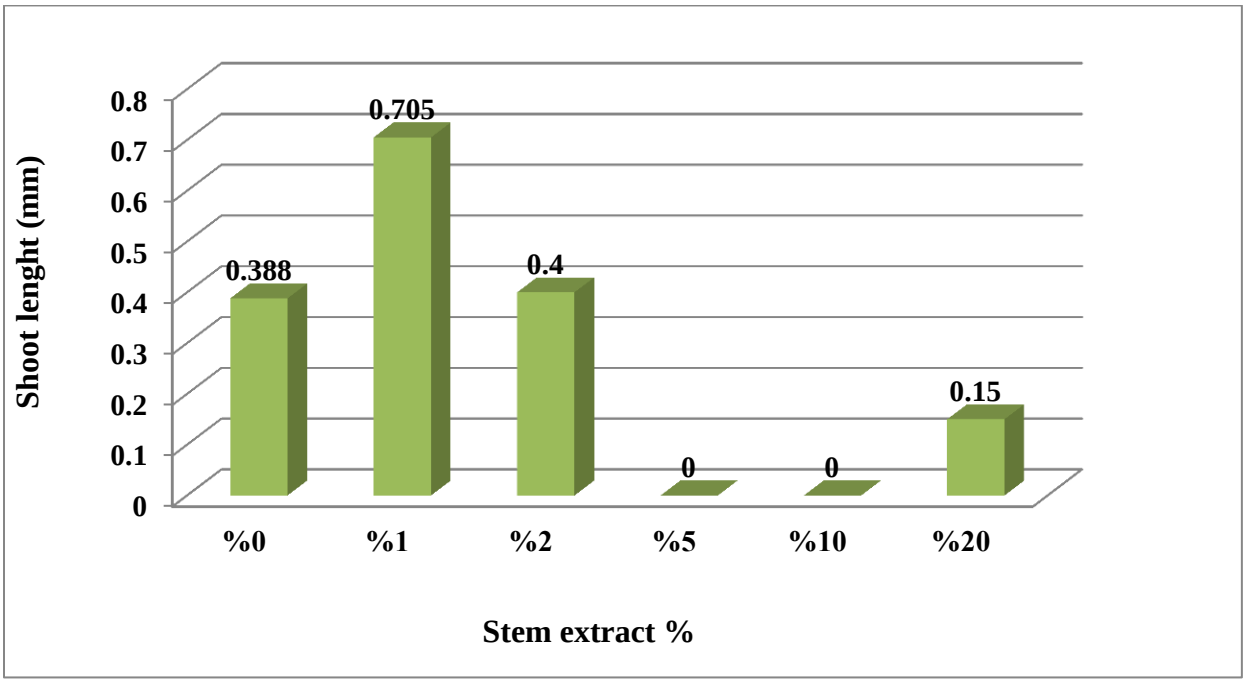

Fig. (4-27) The effect of solanum stems extract on tomato shoot elongation.

C. Effect of *S. elaeagnifolium* stems extract on tomato seeds dry and fresh weight:

The effect of different concentrations of *S. elaeagnifolium* stems extract on tomato fresh and dry weight showed increased weight with increased concentration compared with the control. Anova test was performed to explore the significance of this effect , there was a significant effect on both dry and fresh weight (0.000 and 0.023 < 0.05) as it is shown in table (4-21) and figure (4-28).

Table (4-21) The effect of *S. elaeagnifolium* stems extract on tomato fresh and dry weight.

Weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.178	0.065		0.000
	1%	0.272	0.017		
	2%	0.241	0.014		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.0020	0.0007		0.023
	1%	0.0039	0.0013		
	2%	0.0039	0.0017		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

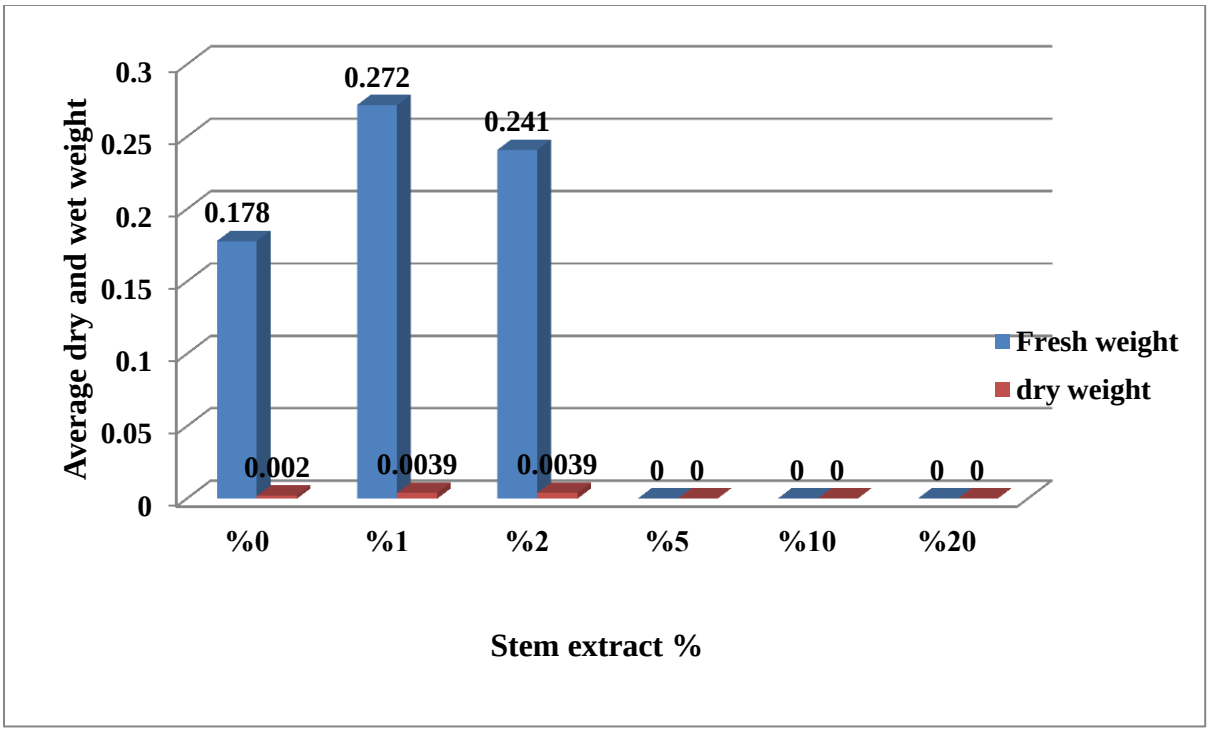

Fig. (4-28) The effect of *S. elaeagnifolium* stems extract on tomato fresh and dry weight.

4.2.3. Allelopathic effect of *S. elaeagnifolium* leaves extract on tomato seeds:

A. Effect of *S. elaeagnifolium* leaves extract on tomato seed germination percentage:

The effect of *S. elaeagnifolium* leaves extract on tomato germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in tomato seeds at concentration of 5 %, 10% and 20% concentration, as it is shown in the table (4-22) and figure (4-29).

Table (4-22) Tomato germination percentage at different concentrations of solanum leaves extract.

Solanum extract conc.	Radish seeds germination %
0%	100%
1%	80%
2%	60%
5%	No germination
10%	No germination
20%	No germination

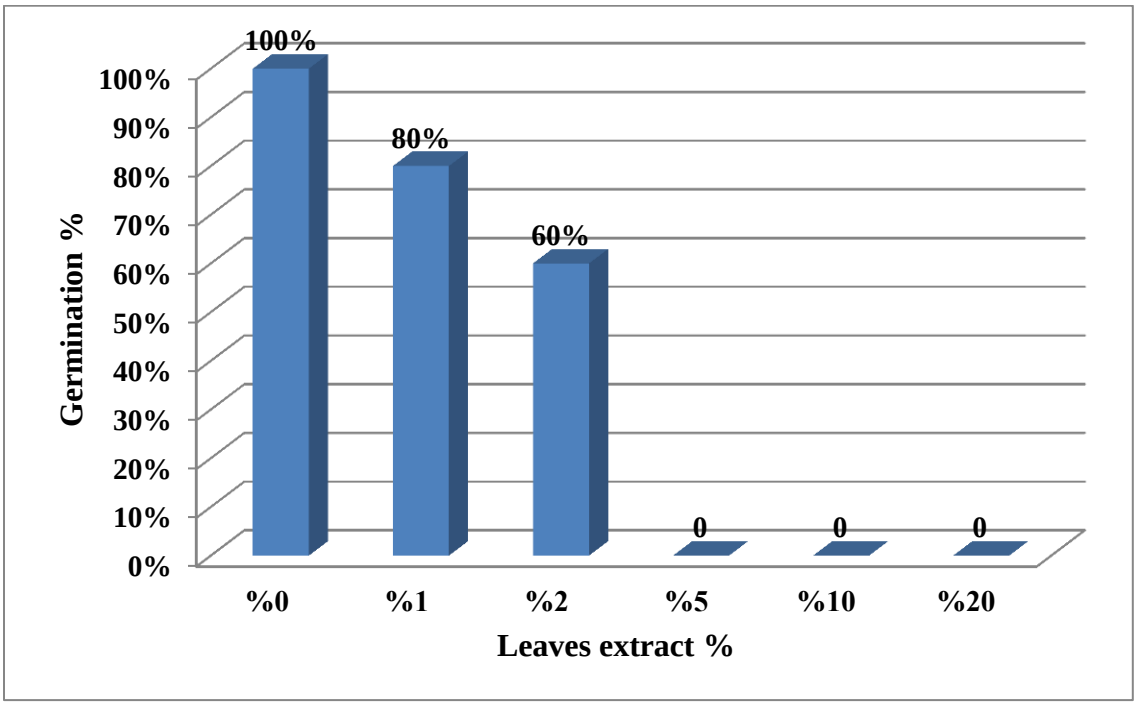

Fig. (4-29) Tomato germination percentage at different concentrations of solanum leaves extract.

B. Effect of *S. elaeagnifolium* leaves extract on tomato root and shoot elongation:

Allelopathiy of solanum leaves extracts concentration on tomato root and shoot elongation were examined by Anova statistical test, which showed a significant effect of solanum leaves extract on shoot length (p-value 0.035< 0.05), while no significant effects where observed on tomato root length .(p-value 0.076>0.05) as shown in table (4-23), figures (4-30) and (4-31)

Table (4-23) The effect of *S. elaeagnifolium* stems extract on tomato root and shoot length.

Plant part	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.412	0.430	2.916	0.076
	1%	0.25	0.270		
	2%	0.16	0.116		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Shoot	0%	0.388	0.224	3.965	0.035
	1%	0.27	0.049		
	2%	0.116	0.017		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

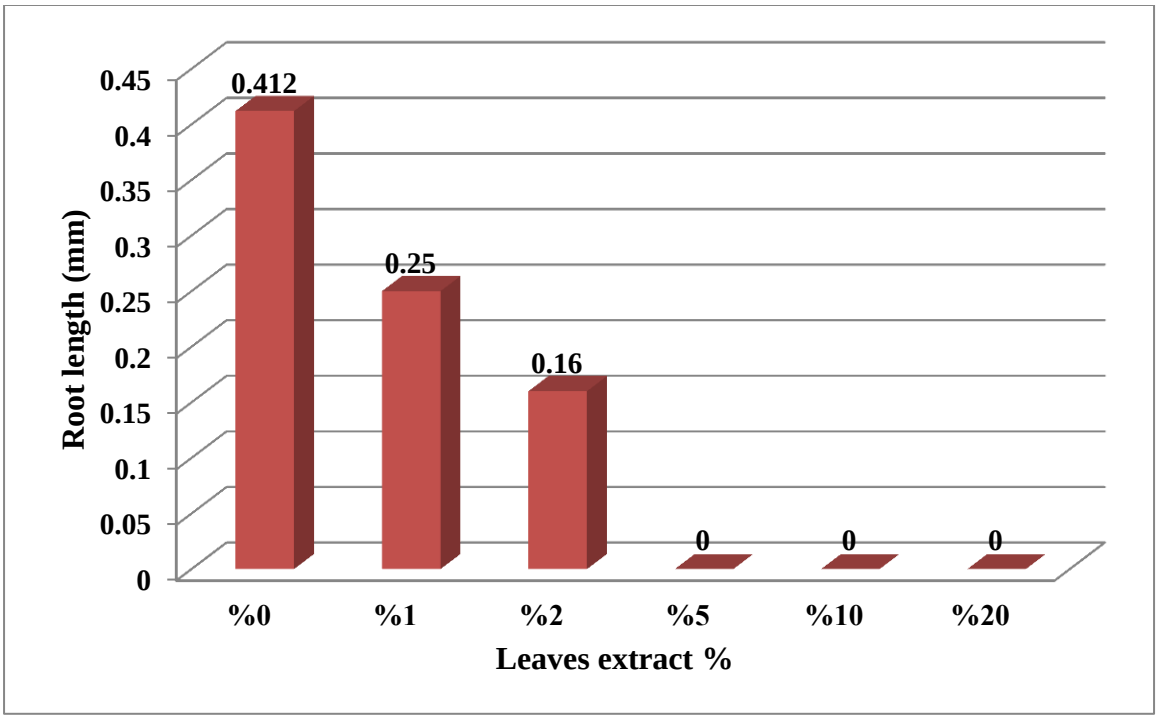

Fig. (4-30) The effect of solanum leaves extract on tomato root elongation.

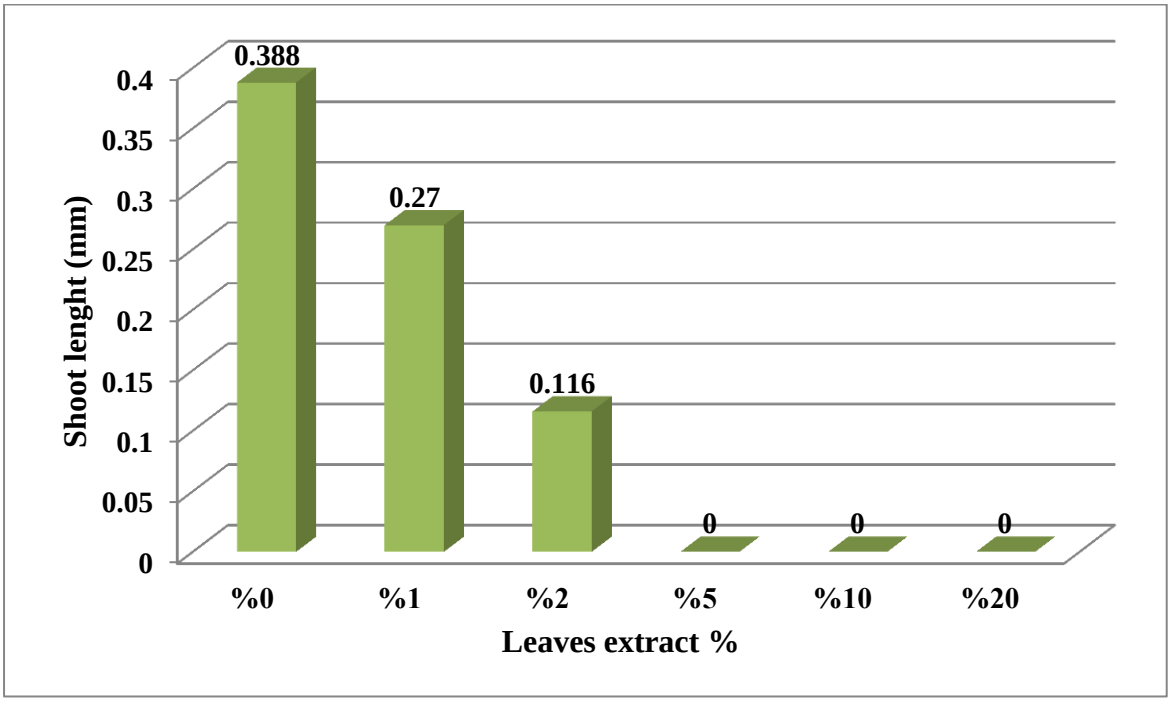

Fig. (4-31) The effect of solanum leaves extract on tomato shoot elongation.

C. Effect of *S. elaeagnifolium* leaves extract on tomato seeds dry and fresh weight:

The effect of different concentrations of *S. elaeagnifolium* leaves extract on tomato fresh weight showed decreased weight with increased concentration compared with the control, but dry weight decreased with increase extract concentration compared with the control . Anova test was performed to explore the significance of this effect, there was a significant effect on fresh weight (p- value 0.015 < 0.05) but no significant effect was observed on dry weight (p -value 0.592 > 0.05) as it is shown in table (4-24) and figure (4-32).

Table (4-24) The effect of *S. elaeagnifolium* stems extract on tomato fresh and dry weight.

weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.242	0.017		0.015
	1%	0.226	0.007		
	2%	0.225	0.005		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.0046	0.0016		0.592
	1%	0.0040	0.0014		
	2%	0.0040	0.0013		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

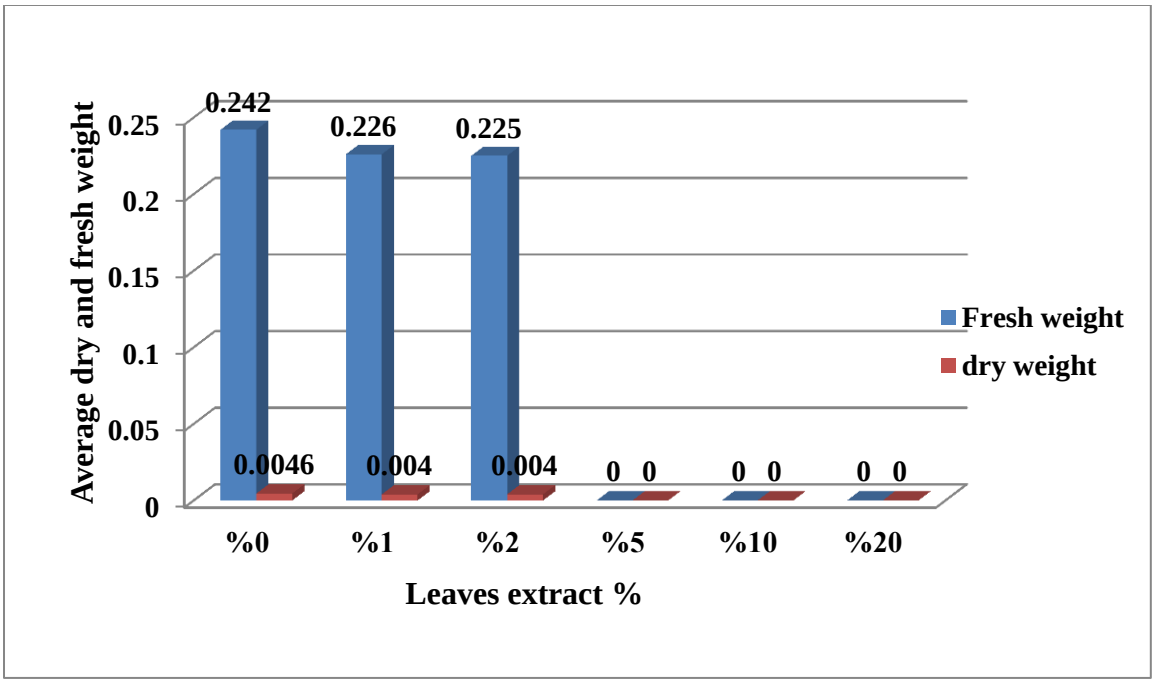

Fig. (4-32) The effect of *S. elaeagnifolium* leaves extract on tomato fresh and dry weight.

4.2.4. Allelopathic effect of *S. elaeagnifolium* flowers extract on tomato:-

A. Effect of *S. elaeagnifolium* flowers extract on tomato seeds germination percentage:-

The effect of *S. elaeagnifolium* flowers extract on tomato germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in tomato seeds at concentration of 5 %, 10% and 20% concentration, as it is shown in the table (4-25) and figure (4-33).

Table (4-25) Tomato germination percentage at different concentrations of solanum flowers extract.

Solanum extract conc.	Tomato seeds germination
0%	100%
1%	20%
2%	10%
5%	No germination
10%	No germination
20%	No germination

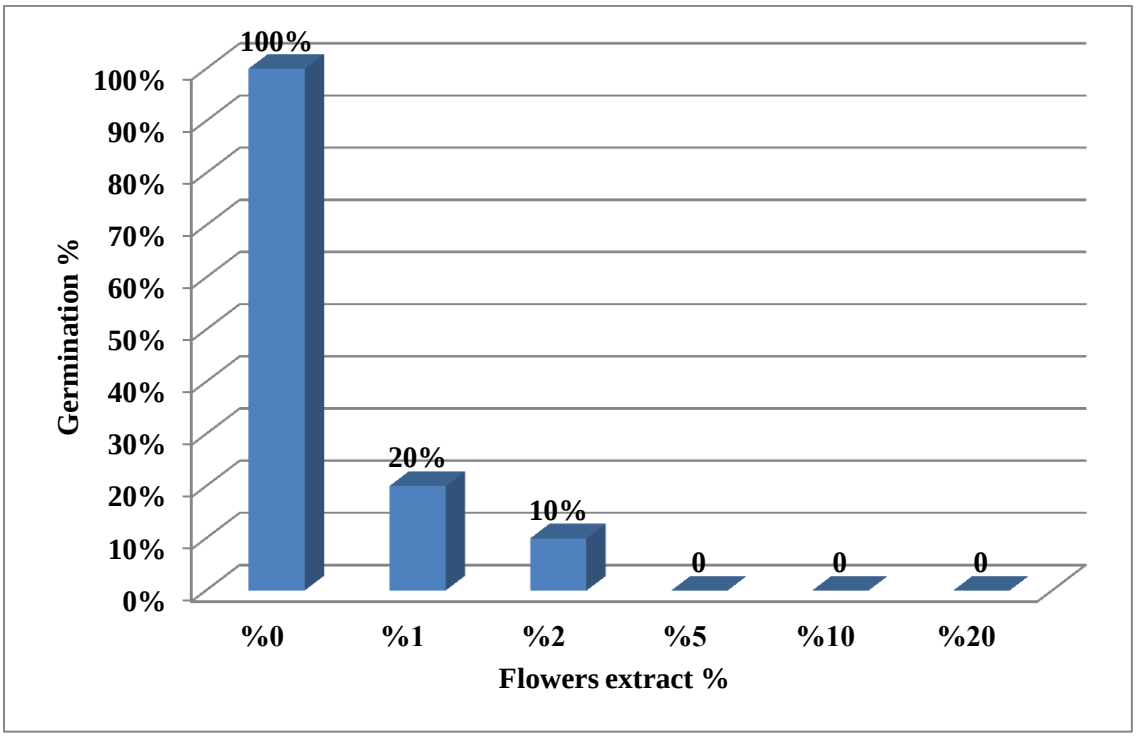

Fig. (4-33) Tomato germination percentage at different concentrations of solanum flowers extract.

B. Effect of *S. elaeagnifolium* flowers extract on tomato root and shoot elongation:

Allelopathiy of solanum flowers extracts concentration on tomato root and shoot elongation were examined by Anova statistical test, which showed no significant effect of solanum flowers extract on root and shoot length (p-value 0.201 and 0.716 > 0.05) as shown in table (4-26), figures (4-34) and (4-35).

Table (4-26) The effect of *S. elaeagnifolium* flowers extract on tomato root and shoot length.

Plant part	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.412	0.207	1.893	0.201
	1%	0.105	0.045		
	2%	0.1	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Shoot	0%	0.388	0.286	0.346	0.716
	1%	0.53	0.034		
	2%	0.05	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

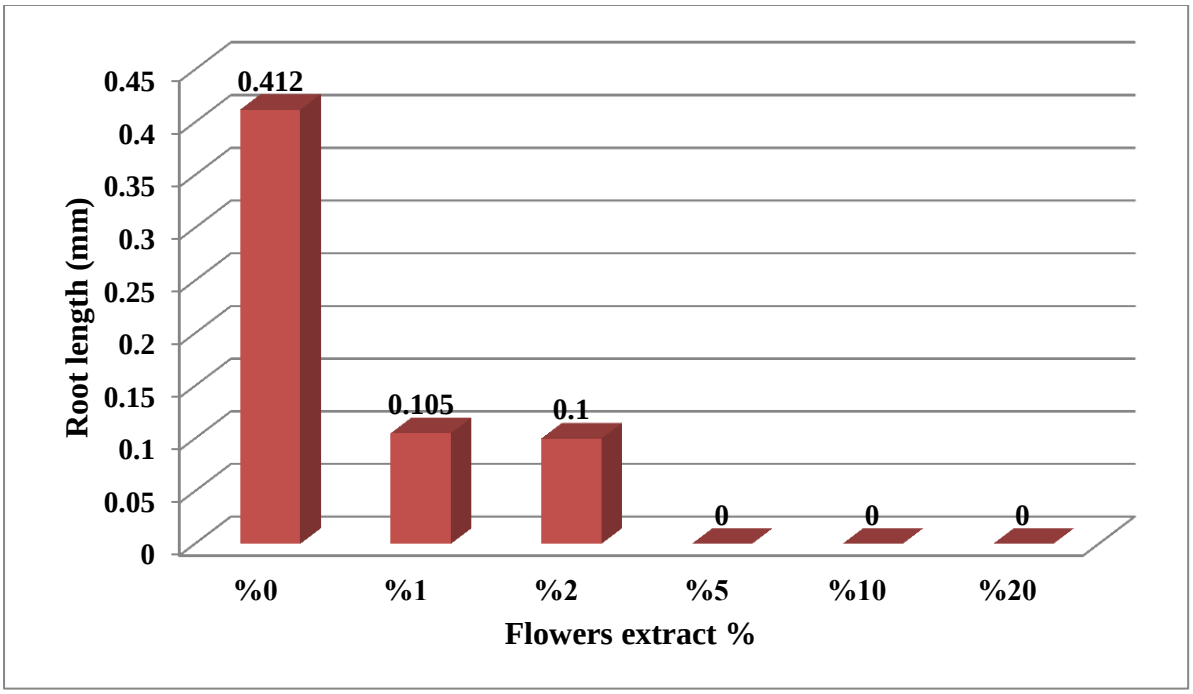

Fig. (4-34) The effect of solanum flowers extract on tomato root elongation.

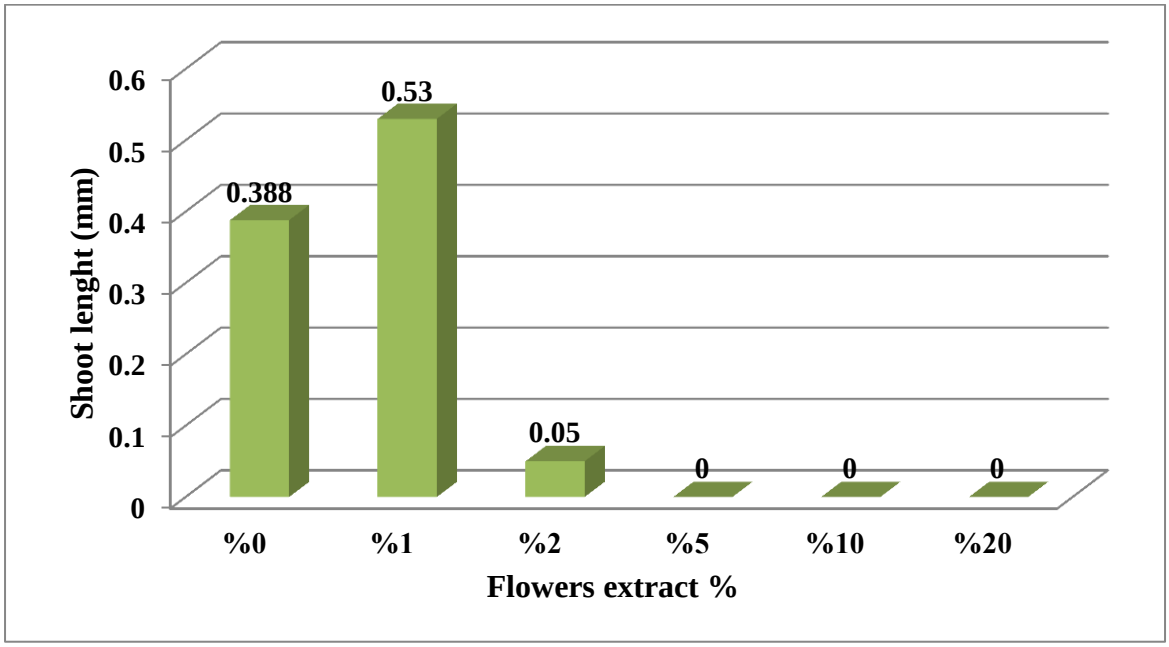

Fig. (4-35) The effect of solanum flowers extract on tomato shoot elongation.

C. Effect of *S. elaeagnifolium* flowers extract on tomato dry and fresh weight:

The effect of different concentrations of *S. elaeagnifolium* flowers extract on tomato fresh and dry weight showed decreased weight with increased concentration compared with the control, but dry weight decreased with increase extract concentration compared with the control . Anova test was performed to explore the significance of this effect, there was no significant effect on fresh and dry weights (p- value 0.766 and 0.329 > 0.05) as it is shown in table (4-27) and figure (4-36).

Table (4-27) The effect of *S. elaeagnifolium* flowers extract on tomato fresh and dry weight.

Weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.250	-0.036		0.766
	1%	0.256	-0.005		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.0033	0.0019		0.329
	1%	0.0021	0.0005		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

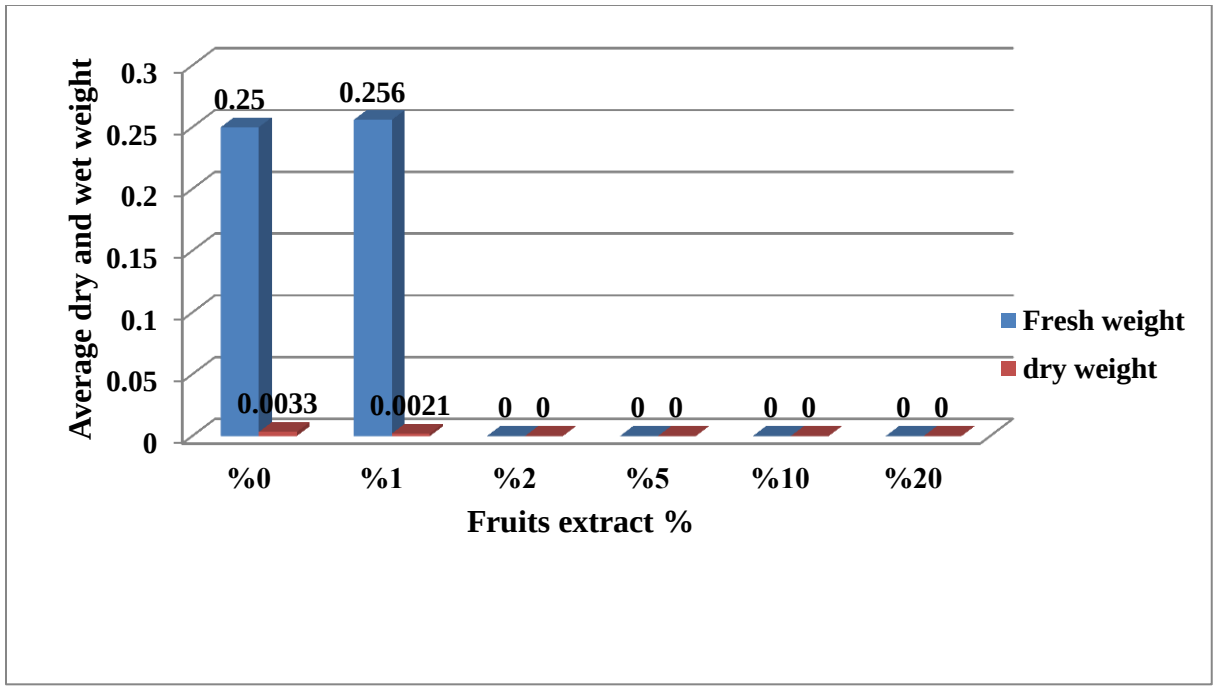

Fig. (4-36) The effect of *S. elaeagnifolium* flowers extract on tomato seeds fresh and dry weight.

4.2.5. Allelopathic effect of *S. elaeagnifolium* fruits extract on tomato:-

A. Effect of *S. elaeagnifolium* fruits extract on tomato germination percentage:

The effect of *S. elaeagnifolium* fruits extract on tomato germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in tomato at concentration of 2%, 5 %, 10% and 20% concentration, as it is shown in the table (4-28) and figure (4-37).

Table (4-28) Tomato germination percentage at different concentrations of solanum fruits extract.

Solanum extract conc.	Tomato seeds germination %
0%	100%
1%	40%
2%	No germination
5%	No germination
10%	No germination
20%	No germination

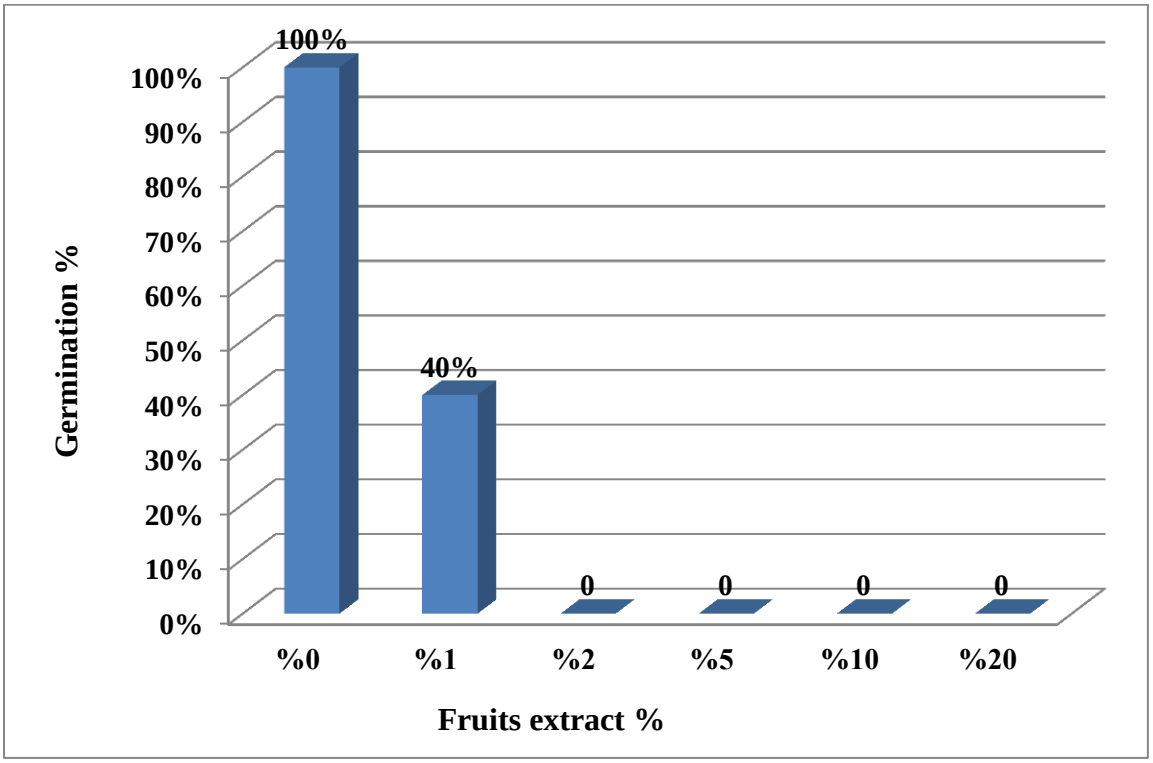

Fig. (4-37) Tomato germination percentage at different concentrations of solanum fruits extract.

B. Effect of *S. elaeagnifolium* fruits extract on tomato root and shoot elongation:

Allelopathiy of solanum fruits extracts concentration on tomato root and shoot elongation were examined by Anova statistical test, which showed no significant effect of solanum flowers extract on root and shoot length (p-value 0.68 and 0.109 > 0.05) as shown in table (4-29), figures (4-38) and (4-39).

Table (4-29) The effect of *S. elaeagnifolium* fruits extract on tomato root and shoot length.

Type of seeds	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.412	0.207	0.178	0.68
	1%	0.335	0.045		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Shoot	0%	0.388	0.286	2.99	0.109
	1%	0.355	0.034		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

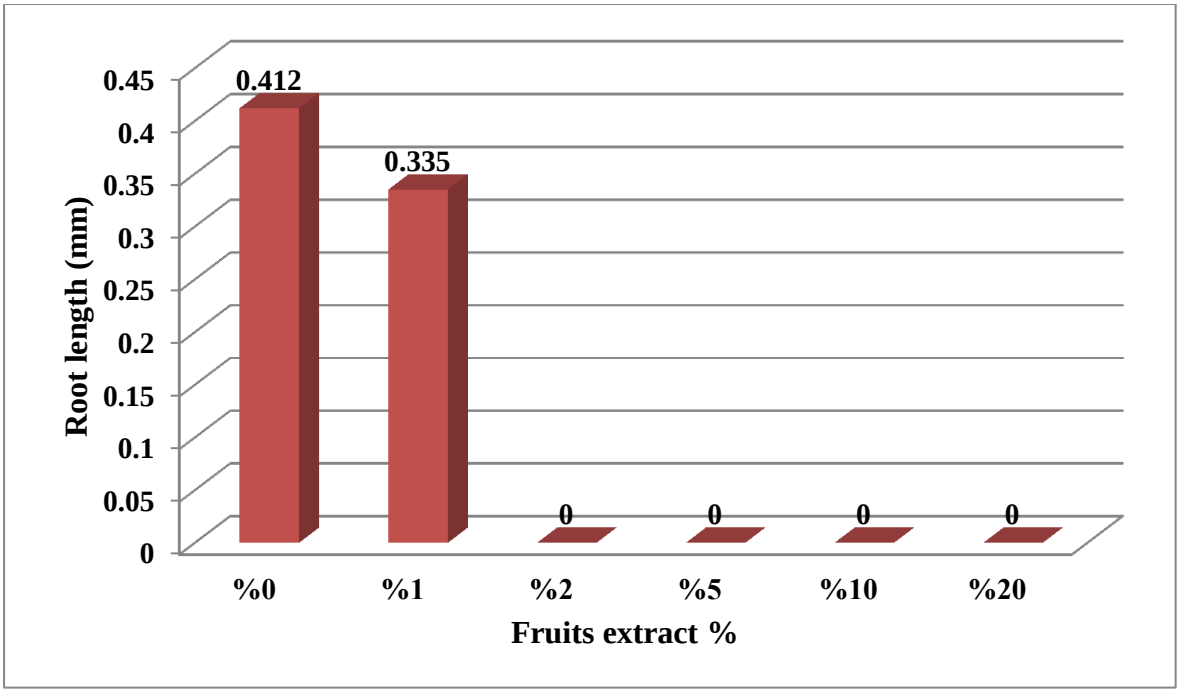

Fig. (4-38) The effect of solanum fruits extract on tomato root elongation.

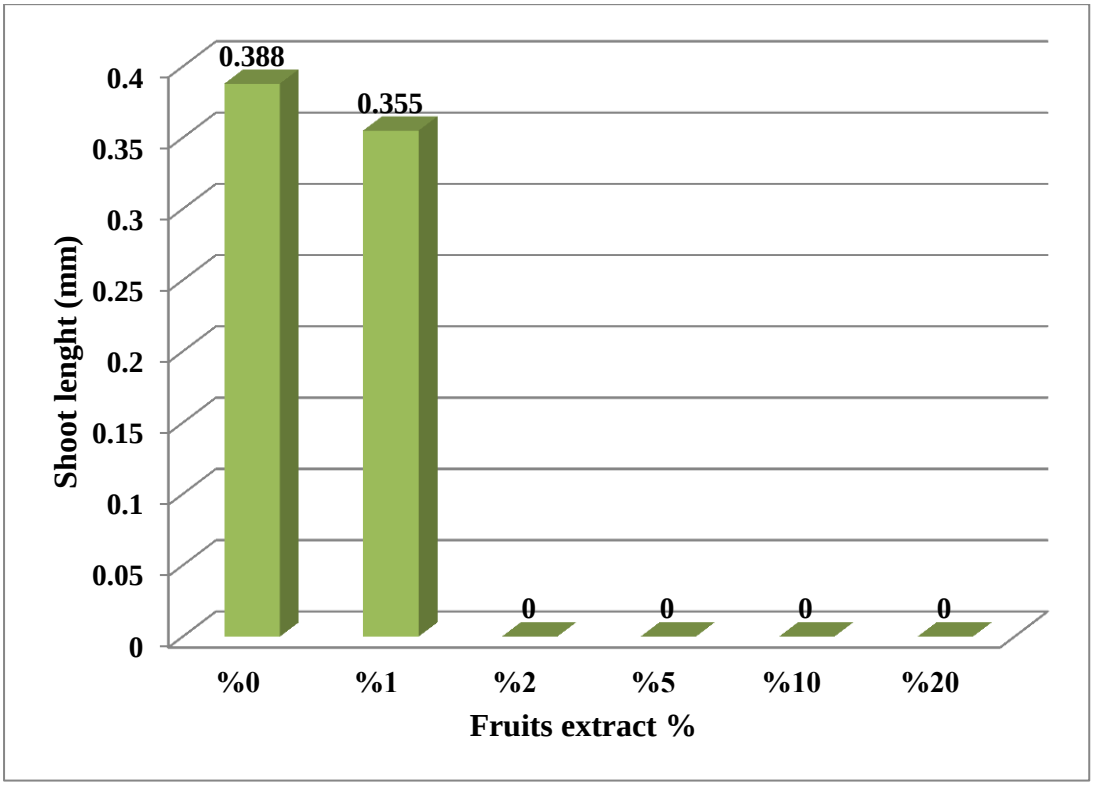

Fig. (4-39) The effect of solanum fruits extract on tomato shoot elongation.

C. Effect of *S. elaeagnifolium* fruits extract of dry and fresh weight of tomato seeds:

The effect of different concentrations of *S. elaeagnifol*ium fruits extract on tomato fresh and fresh weight showed decreased weight with increased concentration compared with the control, but dry weight decreased with increase extract concentration compared with the control. Anova test was performed to explore the significance of this effect, there was no significant effect on fresh and dry weights (p- value 0.090 and 0.703 > 0.05) as it is shown in table (4-30) and figure (4-40).

Table (4-30) The effect of *S. elaeagnifolium* fruits extract on tomato seeds fresh and dry weight.

Weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.120	0.030		0.090
	1%	0.182	0.098		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.019	0.025		0.703
	1%	0.024	0.024		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

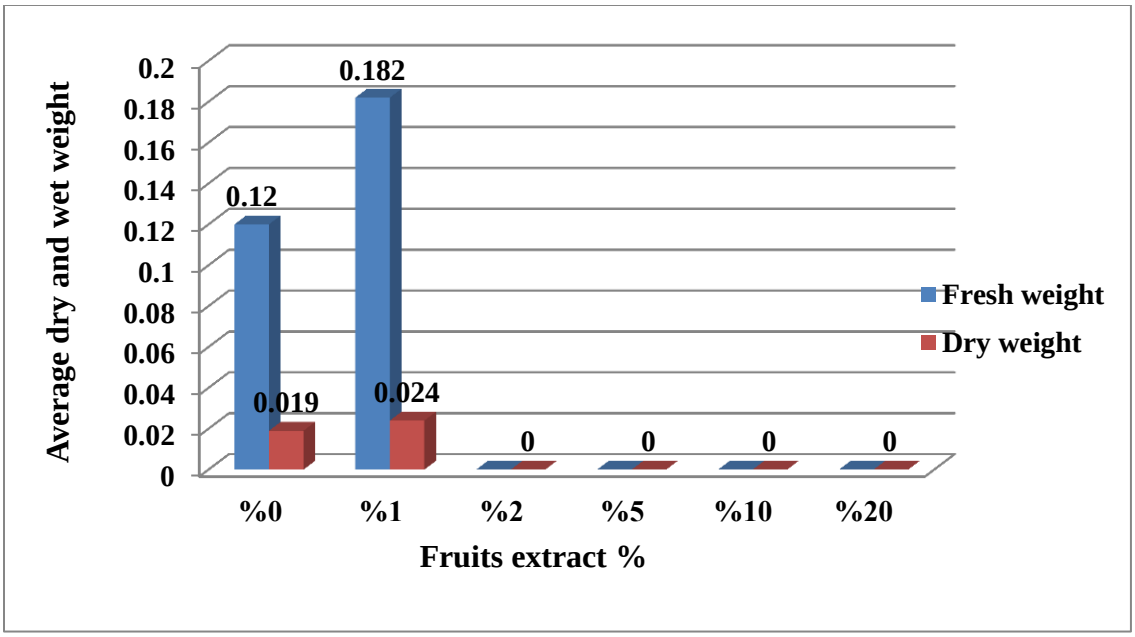

Fig. (4-40) The effect of *S. elaeagnifolium* fruits extract on tomato seeds fresh and dry weight.

4.3. Allelopathic effect of *S. elaeagnifolium* parts on wheat:

4.3.1. Allelopathic effect of *S. elaeagnifolium* root extract on wheat germination:

A. Effect of *S. elaeagnifolium* root extract on wheat seed germination percentage:

The effect of *S. elaeagnifolium* roots extract on wheat germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in wheat at concentration of 5 and 20%% as it is shown in the table (4-31) and figure (4-41).

Table (4-31) wheat germination percentage at different concentrations of solanum roots extract.

Solanum extract conc.	wheat seeds germination %
0%	90%
1%	30%
2%	10%
5%	No germination
10%	10%
20%	No germination

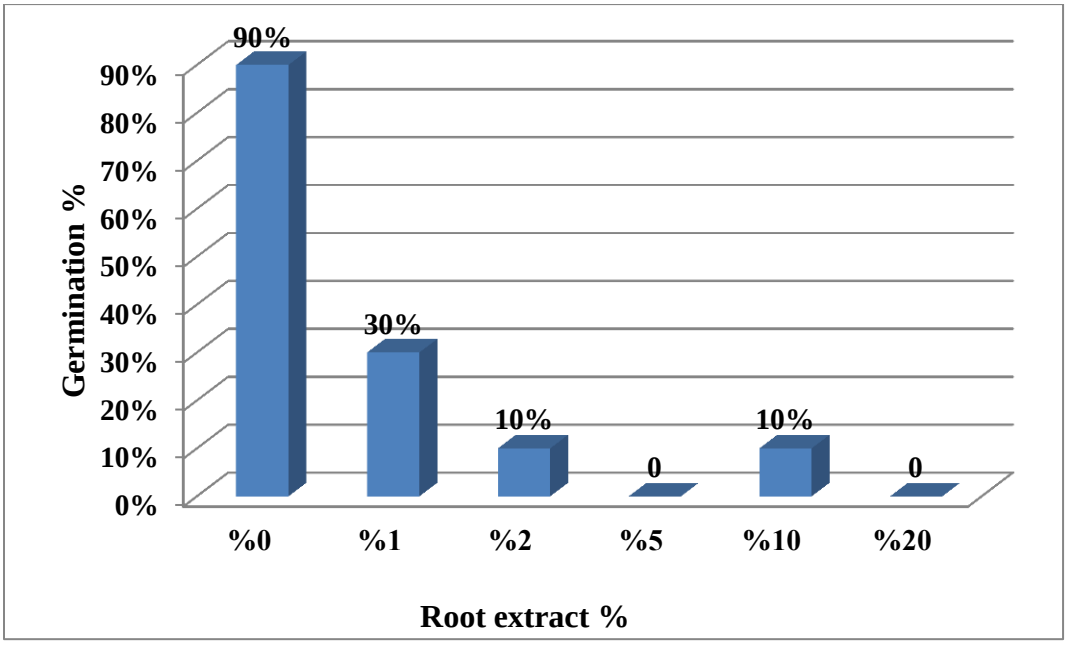

Fig. (4-41) wheat seeds germination percentage at different concentrations of solanum roots extract.

B. Effect of *S. elaeagnifolium* roots extract on wheat root and shoot elongation:

Allelopathiy of solanum roots extracts concentration on wheat root and shoot elongation were examined by Anova statistical test, which showed no significant effect of solanum root extract on root length (p-value 0.72 > 0.05), but a significant effect was observed on shoot length (0.043 < 0.05) as shown in table (4-32), figures (4-42) and (4-43).

Table (4-32) The effect of *S. elaeagnifolium* roots extract on wheat root and shoot length.

Plant part	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.74	0.128	0.455	0.720
	1%	0.513	0.19		
	2%	0.36	-		
	5%	-	-		
	10%	0.55	-		
	20%	-	-		
Shoot	0%	0.37	0.187	4.308	0.043
	1%	0.63	0.036		
	2%	0.49	-		
	5%	-	-		
	10%	0.32	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

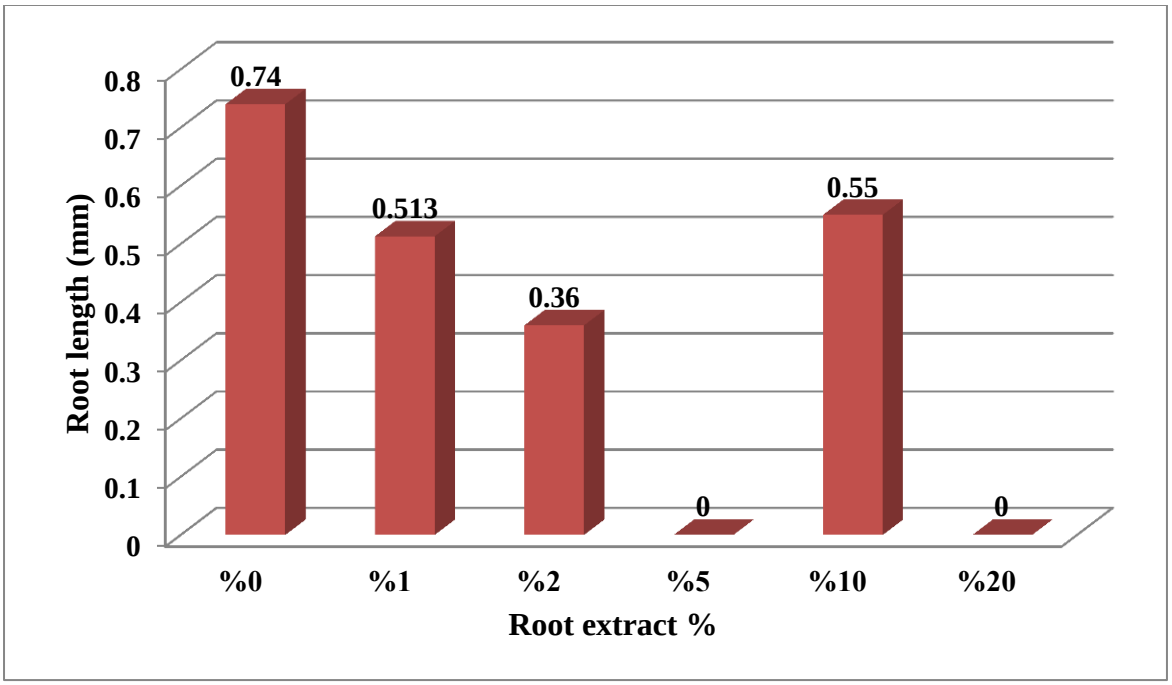

Fig. (4-42) The effect of solanum roots extract on wheat roots elongation.

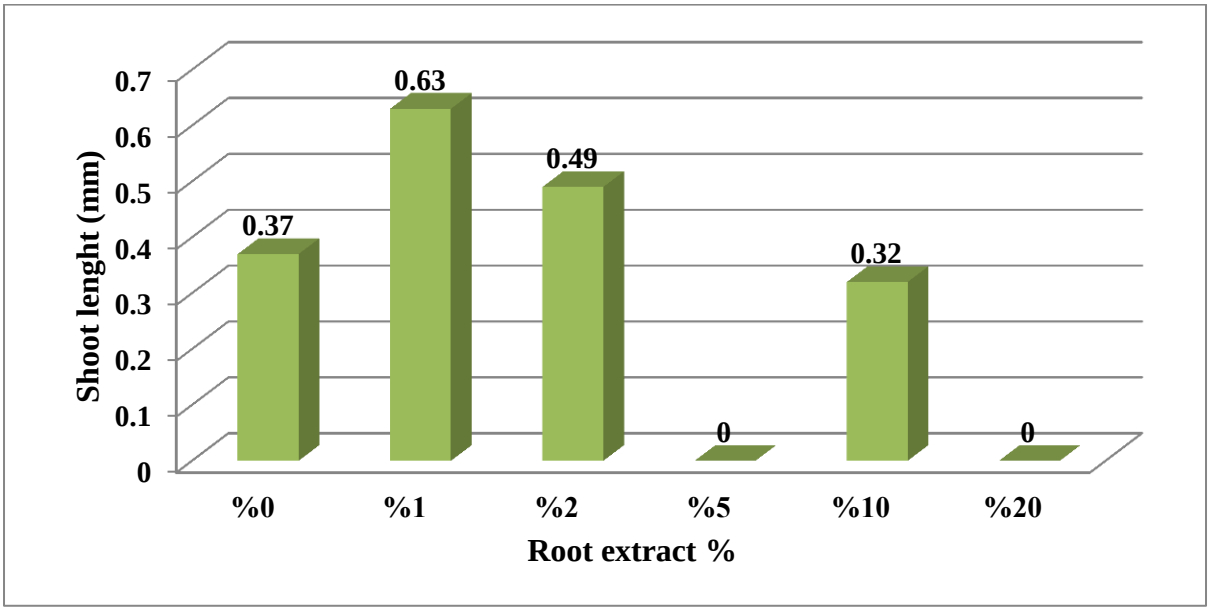

Fig. (4-43) The effect of solanum roots extract on wheat shoots elongation.

C. Effect of *S. elaeagnifolium* roots extract on wheat seeds dry and fresh weight:

The effect of different concentrations of *S. elaeagnifolium* roots extract on wheat fresh and dry weight showed increased weight at 1%concentration compared with the control . Anova test was performed to explore the significance of this effect, there was no significant effect on fresh weight (p- value 0.285 >0.05), but a significant effect was observed on dry weight (p- value 0.00< 0.05) as it is shown in table (4-33) and figure (4-44).

Table (4-33) The effect of *S. elaeagnifolium* roots extract on wheat seeds fresh and dry weight.

Weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.1189	0.0284		0.285
	1%	0.387	0.445		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.0354	0.0137		0.00
	1%	0.039	0.005		
	2%	-	-		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

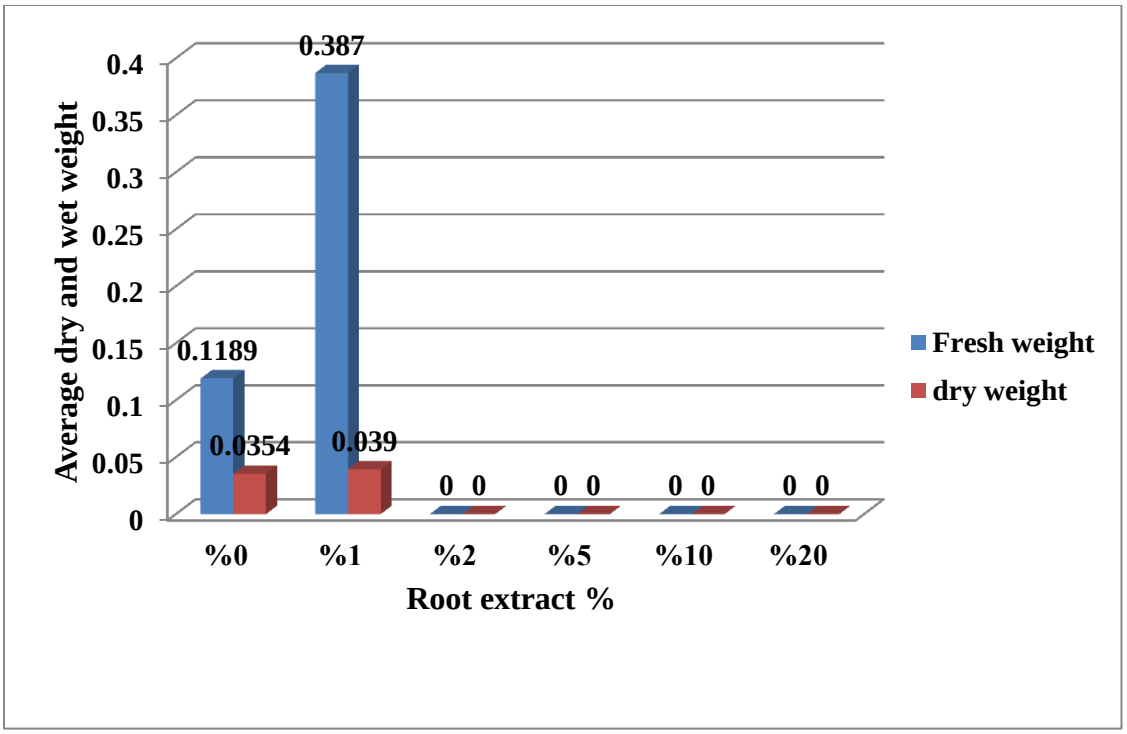

Fig. (4-44) The effect of *S. elaeagnifolium* roots extract on wheat fresh and dry weight.

4.3.2. Allelopathic effect of *S. elaeagnifolium* stem extract on wheat:

A. Effect of *S. elaeagnifolium* stem extract on wheat germination percentage:

The effect of *S. elaeagnifolium* stem extract on wheat germination percentage showed that germination percentage decrease with increase treatment concentration, no germination in wheat at concentration of 5%, 10% and 20%% as it is shown in the table (4-34) and figure (4-45).

Table (4-34) Wheat germination percentage at different concentrations of solanum stems extract.

Solanum extract conc.	wheat seeds germination %
0%	80%
1%	30%
2%	30%
5%	No germination
10%	No germination
20%	No germination

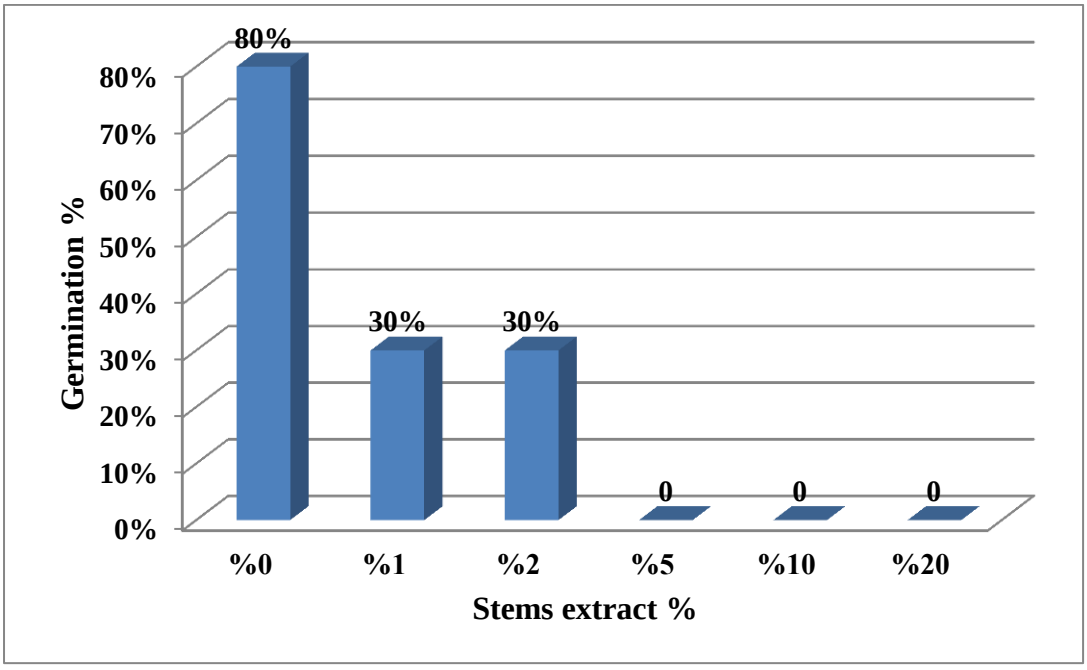

Fig. (4-45) Wheat seeds germination percentage at different concentrations of solanum stems extract.

B. Effect of *S. elaeagnifolium* stems extract on wheat root and shoot elongation:

Allelopathiy of solanum stems extracts concentration on wheat root and shoot elongation were examined by Anova statistical test, which showed no significant effect of solanum stems extract on root length (p-value 0.083 > 0.05), but a significant effect was observed on shoot length (0.002 < 0.05) as shown in table (4-35), figures (4-46) and (4-47).

Table (4-35) The effect of *S. elaeagnifolium* stems extract on wheat root and shoot length.

Plant part	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Roots	0%	0.695	0.076	0.455	0.083
	1%	0.496	0.309		
	2%	0.800	0.100		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Shoot	0%	0.356	0.049	4.308	0.002
	1%	0.633	0.275		
	2%	0.750	0.132		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

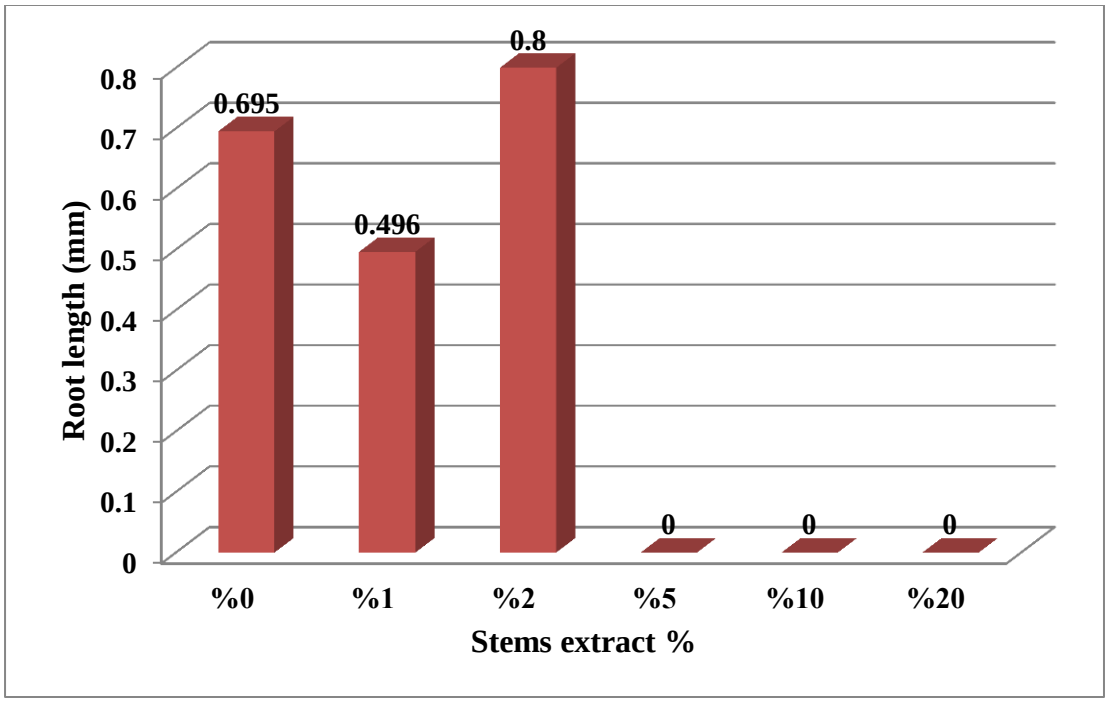

Fig. (4-46) The effect of solanum stems extract on wheat roots elongation.

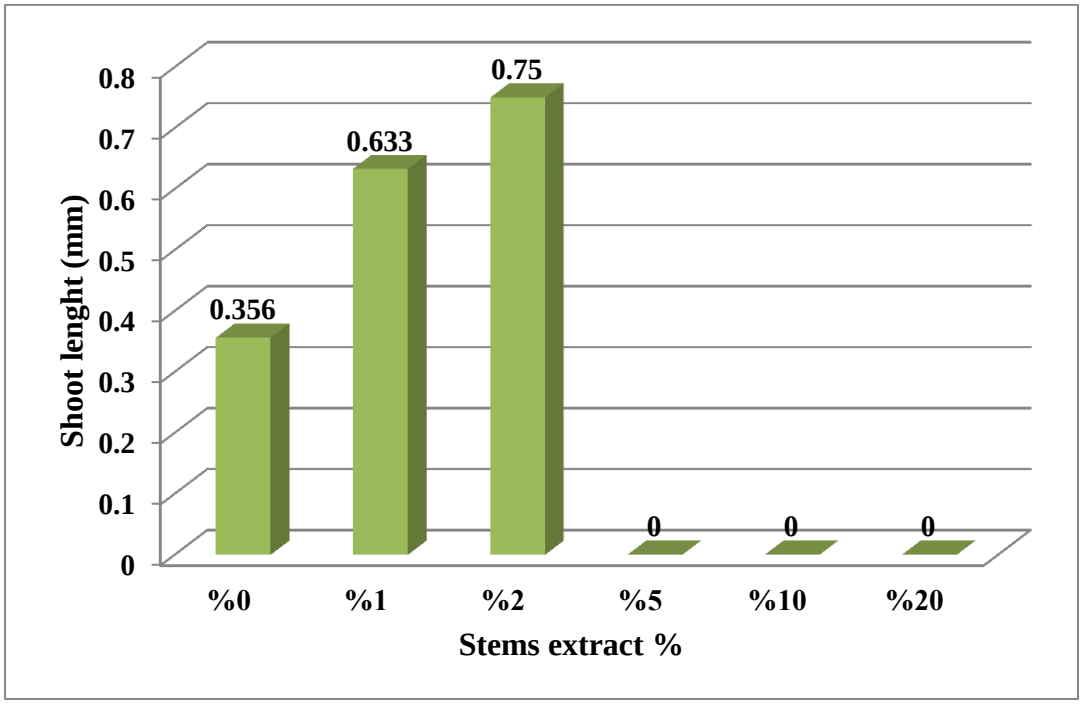

Fig. (4-47) The effect of solanum stems extract on wheat shoots elongation.

C. Effect of stems extract on wheat dry and fresh weight:

The effect of different concentrations of *S. elaeagnifolium* stems extract on wheat fresh and dry weight showed increased weight at 1% concentration compared with the control . Anova test was performed to explore the significance of this effect, there was no significant effect on dry weight (p- value 0.708 > 0.05), but a significant effect was observed on fresh weight (p- value 0.005 < 0.05) as it is shown in table (4-36) and figure (4-48).

Table (4-36) The effect of *S. elaeagnifolium* stems extract on wheat fresh and dry weight.

Weight	Descriptive			ANOVA	
	Concentration	Mean	S.D (±)	F	p- values
Fresh weight	0%	0.155	0.028		0.005
	1%	0.193	0.100		
	2%	0.316	0.066		
	5%	-	-		
	10%	-	-		
	20%	-	-		
Dry Weight	0%	0.034	0.007		0.708
	1%	0.0298	0.011		
	2%	0.029	0.017		
	5%	-	-		
	10%	-	-		
	20%	-	-		
*The mean difference is significant at the 0.05 level.					

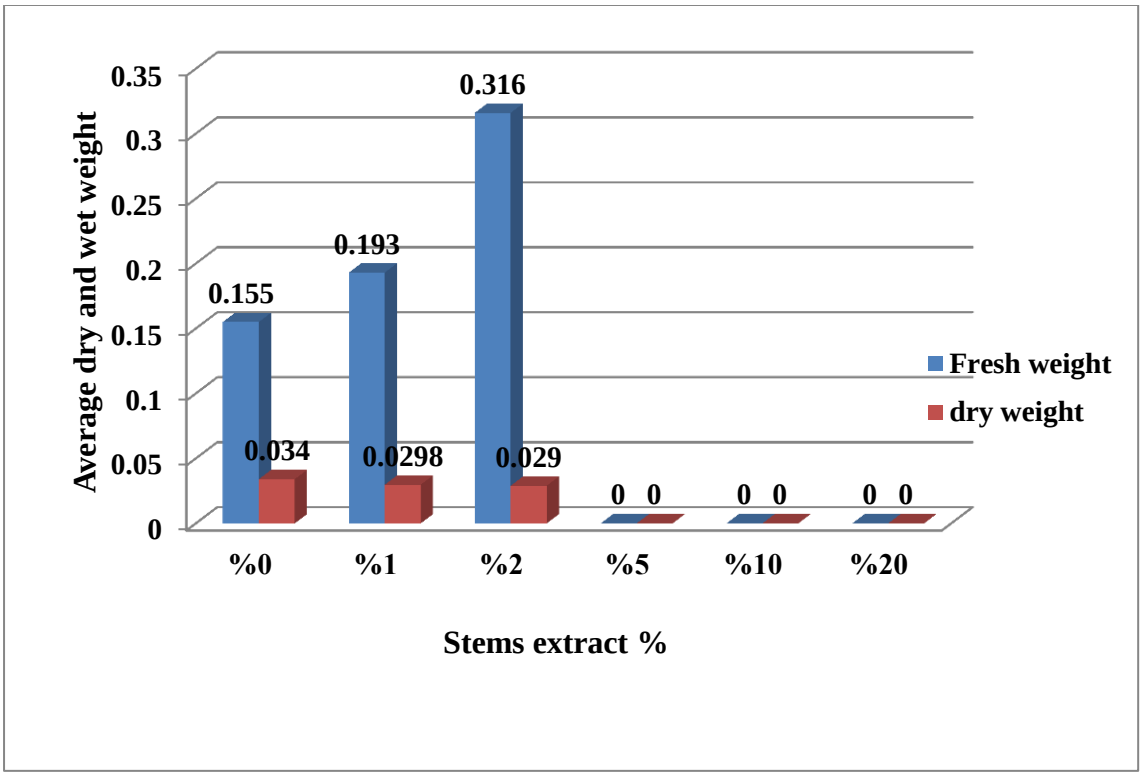

Fig. (4-48) The effect of *S. elaeagnifolium* roots extract on wheat fresh and dry weight.

4.3.3. Allelopathic effect of *S. elaeagnifolium* leaves, flowers, and fruits extracts on wheat germination:

No germination were occurred at all concentrations of leaves, flowers and fruits extracts of *S. elaeagnifolium*, only the control plates showed 80% germination.

Table (4-37) Wheat germination percentage at different concentrations of solanum leaves, flowers and fruits extracts.

Solanum extract conc.	Wheat seeds germination %
Control 0%	80%
Leaves extract 1%	No germination
Leaves extract 2%	No germination
Leaves extract 5%	No germination
Leaves extract 10%	No germination
Leaves extract 20%	No germination
Flower extract 1%	No germination
Flower extract 2%	No germination
Flower extract 5%	No germination
Flower extract 10%	No germination
Flower extract 20%	No germination
Fruit extract 1%	No germination
Fruit extract 2%	No germination
Fruit extract 5%	No germination
Fruit extract 10%	No germination
Fruit extract 20%	No germination

4.4. Allelopathic effect of different concentration of *S. elaeagnifolium* parts on lettuce seeds:

Only control plates were germinated, no germination occurred at all concentrations of all *S. elaeagnifolium parts.*

Table (4-38) Lettuce germination percentage at different concentrations of solanum roots, stems leaves, flowers and fruits extracts.

Solanum extract conc.	Wheat seeds germination %
Control 0%	70%
Root extract 1%	No germination
Root extract 2%	No germination
Root extract 5%	No germination
Root extract 10%	No germination
Root extract 20%	No germination
Stem extract 1%	No germination
Stem extract 2%	No germination
Stem extract 5%	No germination
Stem extract 10%	No germination
Stem extract 20%	No germination
Leaves extract 1%	No germination
Leaves extract 2%	No germination
Leaves extract 5%	No germination
Leaves extract 10%	No germination
Leaves extract 20%	No germination
Flower extract 1%	No germination
Flower extract 2%	No germination
Flower extract 5%	No germination
Flower extract 10%	No germination
Flower extract 20%	No germination
Fruit extract 1%	No germination
Fruit extract 2%	No germination
Fruit extract 5%	No germination
Fruit extract 10%	No germination
Fruit extract 20%	No germination

Chapter five

5- Discussion

Silverleafe nightshade is a very competitive and aggressive weed species (Boyd *et al.*, 1984; Trione and Cony, 1990). According to Roe (1971), a single plant can produce thousands of viable seeds. A dense population of silverleaf nightshade is capable of producing millions of viable seed (Cooley and Smith, 1973). The seriousness of silverleaf nightshade as a weed is enhanced by a growth habit where vegetative growth appears early in the spring followed by rapid growth from a well-developed root system (Boyd *et al.*, 1984). This characteristic gives silverleaf nightshade a competitive advantage over many agricultural crops.

Silverleaf nightshade contained the highest amount of the alkaloid solasodine. They reported that the ripe berries contained 3.2 % of their dry weight as solasodine. Kaul and Zutshi (1973) reported 1.8 % solasodine in berries. A concentration of 1.6 % was reported for green berries and 1.7% in ripe berries by Bradley *et al.* (1978). Higher concentrations of allelochemicals have been reported mostly in leaves but also in roots or seeds in some cases (Rice, 1974). Generally, leaves are the common source of allelochemicals and roots usually either contain low amounts of a particular compound, or chemicals of low toxicity (Rice, 1974). High concentrations of the glycoalkaloid solasodine that are extracted from ripe

berries of silverleaf nightshade is used in the manufacture of steroidal drugs (Chiale *et al*., 1991).

This study was conducted to examine the allelopathic effect of *S. elaeagnifolium* plant parts (roots, stems, leaves, flowers and berries) on four receptor seeds (radish, tomato, lettuce and wheat), seed germination, seedling length or seedling fresh mass are the parameters usually tested to quantify the effects of allelochemicals inhibitory effects of *S. elaeagnifolium* (Muller, 1965; Jankay & Muller, 1976; Rice, 1984; Ortega *et al.,* 1988).

5.1. Effect of *S. elaeagnifolium* extracts on the four receptor seeds germination percentages:

The effect of *S. elaeagnifolium* plant parts extract in different concentrations on radish and tomato seeds showed decreased germination percentage with increased concentrations of these extracts, in addition to completely inhibition of radish and tomato growth was observed at high concentrations of these extract, this discuses the fact that, all parts of *S. elaeagnifolium* even the root parts contains some allelochemicals, either low amounts or chemicals of low toxicity (Rice, 1974). *S. elaeagnifolium* leaves, flowers and fruits (berries) inhibit the germination of radish and tomato seeds even in low concentrations, which discuses the fact that leaves, flowers and fruits parts of *S. elaeagnifolium* contain high concentrations of allelochemichals (Rice, 1974). Lettuce seeds germination were completely

inhibited even by low concentration of *S. elaeagnifolium* only control seeds (0%) were germinated, so it was the most sensitive receptor to the allelopathy of *S. elaeagnifolium*, wheat seeds germinated at low concentrations of 1 and 2 % of the *S. elaeagnifolium* roots and stems extracts only, which mean that lettuce followed by wheat are the most receptors inhibited by *S. elaeagnifolium* extracts.

5.2. Effect of *S. elaeagnifolium* extracts on the four receptor seeds root and shoot elongation:

Roots and shoots of germinating receptor seeds were measured with the ruler at the same day, radish seeds showed different responses to different concentration of different *S. elaeagnifolium* plant parts, *S. elaeagnifolium* stem, leaves, and fruits extracts showed significant effects on radish seed germination, these extracts severely inhibit radish and wheat root growth, this can be explained by the fact that higher concentrations of alkaloid solasodine were reported in these parts, there was no significant effects of theses extracts on shoots of radish seeds, Tomato and wheat shoots lengths were affected by different parts of *S. elaeagnifolium* (tomato and wheat shoots decreased with increased *S. elaeagnifolium* concentrations).

Conclusion

1. Radish germination is less likely inhibited by increased concentrations of all parts of *S. elaeagnifolium* plant but this inhibition was more obvious when radish was treated with areal parts of *S. elaeagnifolium* (leaves, flowers and berries).
2. Tomato is also affected by allelopathy of *S. elaeagnifolium* , germination of tomato is inhibited by increased concentration of *S. elaeagnifolium* extracts of leaves, flowers and berries.
3. Wheat growth is very inhibited by *S. elaeagnifolium* even at low concentrations, no growth was occurred when treated by leaves, flowers and berries extracts.
4. Lettuce is more sensitive to allelopathy of *S. elaeagnifolium,* no growth was occurred at all concentrations of all *S. elaeagnifolium* parts extracts
5. Areal parts (leaves, flowers and berries) of *S. elaeagnifolium* contain more allelochemichals that inhibit germination than roots and stems
6. *S. elaeagnifolium* inhibit the root growth of radish and wheat but it doesn't inhibit shoot growth, but it inhibit shoots growth of tomato.

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Appendix

1. Allelopathic effect of *S. elaeagnifolium* on radish:

I. Allelopathic effect of *S. elaeagnifolium* root extract on radish

Effect of root extract on radish root and shoot elongation

Report			
treatment		root	shoot
0%	Mean	0.6733	0.6033
	N	9	9
	Std. Deviation	0.27946	0.19384
1%	Mean	0.4486	0.6729
	N	7	7
	Std. Deviation	0.32921	0.39148
2%	Mean	0.4083	0.5167
	N	6	6
	Std. Deviation	0.24523	0.25897
5%	Mean	0.1000	1.0100
	N	2	2
	Std. Deviation	0.02828	0.15556
20%	Mean	0.1300	0.2000
	N	1	1
	Std. Deviation	.	.
Total	Mean	0.4792	0.6184
	N	25	25
	Std. Deviation	0.31371	0.29905

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
root	Between Groups	0.785	4	0.196	2.491	0.076
	Within Groups	1.577	20	0.079		
	Total	2.362	24			
shoot	Between Groups	0.567	4	0.142	1.794	0.170
	Within Groups	1.580	20	0.079		
	Total	2.146	24			

II. Allelopathic effect of *S. elaeagnifolium* stem extract on radish:

Effect of *S. elaeagnifolium* stem extract on radish root and shoot elongation:

Report			
treatment		radish root length	radish shoot length
0%	Mean	0.6733	0.6033
	N	9	9
	Std. Deviation	0.27946	0.19384
1%	Mean	0.1767	0.6833
	N	6	6
	Std. Deviation	0.07815	0.29480
2%	Mean	0.6867	0.6083
	N	6	6
	Std. Deviation	0.36484	0.26157
5%	Mean	0.5000	0.4520
	N	5	5
	Std. Deviation	0.48384	0.32522
Total	Mean	0.5285	0.5938
	N	26	26
	Std. Deviation	0.36567	0.25698

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
radish root length	Between Groups	1.110	3	0.370	4.616	0.032
	Within Groups	1.763	22	0.080		
	Total	2.873	25			
radish shoot length	Between Groups	1.101	3	0.367	6.578	0.541
	Within Groups	1.228	22	0.056		
	Total	2.329	25			

III. Allelopathic effect of *S. elaeagnifolium* leaves extract on radish:

Effect of *S. elaeagnifolium* leaves extract on radish root and shoot elongation

Report			
extract		root	Shoot
0%	Mean	0.6733	0.6033
	N	9	9
	Std. Deviation	0.27946	0.19384
1%	Mean	0.3400	0.6183
	N	6	6
	Std. Deviation	0.18836	0.23241
2%	Mean	0.3033	0.3267
	N	3	3
	Std. Deviation	0.17214	0.19218
10%	Mean	0.0800	0.2000
	N	1	1
	Std. Deviation	.	.
Total	Mean	0.4784	0.5432
	N	19	19
	Std. Deviation	0.29524	0.23207

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
root	Between Groups	0.090	3	0.030	0.729	0.026
	Within Groups	0.619	15	0.041		
	Total	0.709	18			
shoot	Between Groups	0.266	3	0.089	2.164	0.97
	Within Groups	0.615	15	0.041		
	Total	0.882	18			

IV. Allelopathic effect of *S. elaeagnifolium* flowers extract on radish:

Effect of *S. elaeagnifolium* flowers extract on radish root and shoot elongation:

Report			
extract		root	shoot
0%	Mean	0.6733	0.6033
	N	9	9
	Std. Deviation	0.27946	0.19384
1%	Mean	0.5450	0.5575
	N	4	4
	Std. Deviation	0.37036	0.20597
2%	Mean	0.4233	0.2967
	N	3	3
	Std. Deviation	0.28572	0.13429
Total	Mean	0.5944	0.5344
	N	16	16
	Std. Deviation	0.30035	0.21266

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Root	Between Groups	0.320	2	0.160	2.970	0.457
	Within Groups	0.701	13	0.054		
	Total	1.022	15			
Shoot	Between Groups	0.117	2	0.059	1.231	0.58
	Within Groups	0.619	13	0.048		
	Total	0.736	15			

V. Allelopathic effect of *S. elaeagnifolium* fruits extract on radish

Effect of *S. elaeagnifolium* fruits extract on Radish root and shoot elongation

Report			
Extract		shoot	root
0%	Mean	0.6033	0.6733
	N	9	9
	Std. Deviation	0.19384	0.27946
1%	Mean	0.3957	0.2671
	N	7	7
	Std. Deviation	0.26165	0.21616
2%	Mean	0.1200	0.2000
	N	1	1
	Std. Deviation	.	.
Total	Mean	0.4894	0.4782
	N	17	17
	Std. Deviation	0.25324	0.31987

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
shoot	Between Groups	0.315	2	0.157	3.097	0.077
	Within Groups	0.711	14	0.051		
	Total	1.026	16			
root	Between Groups	0.732	2	0.366	5.660	0.016
	Within Groups	0.905	14	0.065		
	Total	1.637	16			

2. Allelopathic effect of *S. elaeagnifolium* on tomato

I. Allelopathic effect of *S. elaeagnifolium* root extract on tomato

Effect of root extract on tomato root and shoot elongation

Report			
Extract		root	shoot
0%	Mean	0.4120	0.3880
	N	10	10
	Std. Deviation	0.25315	0.25568
1%	Mean	0.3360	0.6160
	N	10	10
	Std. Deviation	0.14253	0.06620
2%	Mean	0.3180	0.5580
	N	5	5
	Std. Deviation	0.11432	0.13255
5%	Mean	0.3350	0.4400
	N	2	2
	Std. Deviation	0.09192	0.05657
20%	Mean	0.3000	0.0600
	N	1	1
	Std. Deviation	.	.
Total	Mean	0.3586	0.4918
	N	28	28
	Std. Deviation	0.17917	0.20879

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
shoot	Between Groups	0.476	4	0.119	3.901	0.015
	Within Groups	0.701	23	0.030		
	Total	1.177	27			
root	Between Groups	0.046	4	0.012	0.325	0.858
	Within Groups	0.820	23	0.036		
	Total	0.867	27			

II. Allelopathic effect of *S. elaeagnifolium* stem extract on tomato:

Effect of *S. elaeagnifolium* stem extract on tomato root and shoot elongation:

Report			
extract		Shoot	root
0%	Mean	0.3880	0.4120
	N	10	10
	Std. Deviation	0.25568	0.25315
1%	Mean	0.2700	0.2500
	N	8	8
	Std. Deviation	0.14010	0.15811
2%	Mean	0.1167	0.1600
	N	6	6
	Std. Deviation	0.04274	0.19667
Total	Mean	0.2808	0.2950
	N	24	24
	Std. Deviation	0.20980	0.22914

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
shoot	Between Groups	0.277	2	0.139	3.965	0.004
	Within Groups	0.735	21	0.035		
	Total	1.012	23			
root	Between Groups	0.262	2	0.131	2.916	0.143
	Within Groups	0.945	21	0.045		
	Total	1.208	23			

III. Allelopathic effect of *S. elaeagnifolium* leaves extract on tomato:

Effect of *S. elaeagnifolium* leaves extract on tomato root and shoot elongation

Report			
Extract		root	shoot
0%	Mean	0.2956	0.4300
	N	9	9
	Std. Deviation	0.19080	0.22411
1%	Mean	0.2500	0.2700
	N	8	8
	Std. Deviation	0.15811	0.14010
2%	Mean	0.1600	0.1167
	N	6	6
	Std. Deviation	0.19667	0.04274
Total	Mean	0.2443	0.2926
	N	23	23
	Std. Deviation	0.18168	0.20316

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
shoot	Between Groups	0.360	2	0.180	6.560	0.035
	Within Groups	0.548	20	0.027		
	Total	0.908	22			
root	Between Groups	0.067	2	0.033	1.009	0.076
	Within Groups	0.660	20	0.033		
	Total	0.726	22			

IV. Allelopathic effect of *S. elaeagnifolium* flowers extract on tomato:

Effect of *S. elaeagnifolium* flowers extract on tomato root and shoot elongation

Report			
extract		root	shoot
0%	Mean	0.4120	0.3880
	N	10	10
	Std. Deviation	0.25315	0.25568
1%	Mean	0.3550	0.6200
	N	4	4
	Std. Deviation	0.12689	0.09798
Total	Mean	0.3957	0.4543
	N	14	14
	Std. Deviation	0.22090	0.24352

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
root	Between Groups	0.009	1	0.009	0.178	0.201
	Within Groups	0.625	12	0.052		
	Total	0.634	13			
shoot	Between Groups	0.154	1	0.154	2.990	0.716
	Within Groups	0.617	12	0.051		
	Total	0.771	13			

V. Allelopathic effect of *S. elaeagnifolium* fruits extract on tomato:

Effect of *S. elaeagnifolium* fruits extract on tomato root and shoot elongation

Report			
extract		root	shoot
0%	Mean	0.4120	0.3880
	N	10	10
	Std. Deviation	0.25315	0.25568
1%	Mean	0.4267	0.7056
	N	9	9
	Std. Deviation	0.11369	0.11844
2%	Mean	0.2500	0.4000
	N	5	5
	Std. Deviation	0.12826	0.15811
20%	Mean	0.0600	0.1500
	N	1	1
	Std. Deviation	.	.
Total	Mean	0.3708	0.4952
	N	25	25
	Std. Deviation	0.20006	0.24818

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
root	Between Groups	0.215	3	0.072	2.014	0.68
	Within Groups	0.746	21	0.036		
	Total	0.961	24			
shoot	Between Groups	0.678	3	0.226	5.925	0.109
	Within Groups	0.801	21	0.038		
	Total	1.478	24			

الملخص

يعتبر نبات السولانيوم (*Solanum elaeagnifolium*) من الاعشاب الضارة المعمرة في العديد من مناطق العالم و الشبه قاحلة و التي تشمل شمال افريقيا حيث يعد نبات السولانيوم من النباتات الغازية لمنطقة حوض البحر المتوسط و التي لها تأثير سلبي على المحاصيل الزراعية و التي تقدر خسائره للمحصول بنسبة 75 % و قد يسبب خسائر بطرق غير مباشرة حيث انه يأوي العديد من الحشرات الضارة و الامراض ، اجريت هذه الدراسة لمعرفة التأثير السمي لهذا النبات على اربعة مستقبلات نباتية من ذوات الفلقة الواحدة و ذوات الفلقتين و هذه النباتات هي (الفجل و الطماطم و القمح و الخس) و لدراسة تأثير هذا النبات على طول الجذر و الساق بالإضافة الى تأثيره على الوزن الجاف و الرطب حيث تم تحضير 5 مستخلصات مائية من الجذر و الساق و الاوراق و الزهور و الثمار كلا على حده بست تراكيز مختلفة (1%، 2% ، 5% ، 10 % و 20 %) حيث تمت دراسة السمية عن طريق زراعة عشر بذور من هذه المستقبلات في اطباق خاصة تحتوي على ورق ترشيح مبللة ب 5 مل من المستخلص المائي المراد دراسته تترك هذه الاطباق لتنمو في درجة حرارة الغرفة حيث يتم المحافظة على رطوبتها بإضافة المستخلص المائي يوم بعد يوم ، يتم حساب كلا من نسبة الانبات ، طول الجذر و الساق و الوزن الرطب و الوزن الجاف ، و قد اثبتت نتائج هذه الدراسة ان انبات بذور الفجل و الطماطم اقل تأثرا بسمية نبات السولانيوم مقارنة بنباتي القمح و الخس حيث انها لم تظهر اي انبات خاصة عند التراكيز العالية ، كما اظهرت الدراسة ان الاجزاء العليا من النبات مثل الازهار و الثمار و الاوراق تحتوي على نسبة عالية من القلويدات السامة اكثر من الجذور و السيقان ، كما اظهرت الدراسة ان مستخلصات نبات السولانيوم تؤثر سلبا على نمو الجذر في نبات الفجل و القمح و لا تؤثر على نمو الساق في هذه النباتات كما انها تؤثر سلبا على نمو الساق في نبات الطماطم و لا تؤثر في نمو الجذر بالإضافة الى ان كل مستخلصات اجزاء نبات السولانيوم بكل تراكيزها منعت نمو نبات الخس و هذا ما يؤكد وجود مواد سامة في جذر النبات .