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Sudan University of Science and Technology

College of Agricultural Studies

Plant Protection Department

Evaluation of the efficacy of Coriander Extracts against wilt disease caused by*Alternariasolani*in tomto plant

تقيم فعالية مستخلص الكسبره ضد مرض اللفحه المبكره فى نبات الطماطم الذى يسببه فطر الترناريا سولانى

By

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الآية

قال تعالى:

(وَهُوَ الَّذِي أَنْزَلَ مِنَ السَّمَاءِ مَاءً فَأَخْرَجْنَا بِهِ نَبَاتَ كُلِّ شَيْءٍ فَأَخْرَجْنَا مِنْهُ خَضِرًا نُخْرِجُ مِنْهُ حَبًّا مُتَرَاكِبًا وَمِنَ النَّخْلِ مِنْ طَلْعِهَا قِنْوَانٌ دَانِيَةٌ وَجَنَّاتٍ مِنْ أَعْنَابٍ وَالزَّيْتُونَ وَالرُّمَّانَ مُشْتَبِهًا وَغَيْرَ مُتَشَابِهٍ ۗ انْظُرُوا إِلَىٰ ثَمَرِهِ إِذَا أَثْمَرَ وَيَنْعِهِ ۚ إِنَّ فِي ذَٰلِكُمْ لَآيَاتٍ لِقَوْمٍ يُؤْمِنُونَ ﴿٩٩﴾)

صدق الله العظيم

سورة (الأنعام 99)

Dedication

To my parents

To my friends and to everyone who helped me in this research

With Love

ACKNOWLEDGEMENTS

I would like very much to render His Almighty Allah who gives me the power and health to complete this work.

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Special thanks My companion**YousifDafaallaALjilane**

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ملخص الاطروحة

اجريت هذه التجربة تحت ظروف المختبر بقسم وقاية النبات ,(بمعمل امراض النبات) كلية الدراسات الزراعية , جامعه السودان للعلوم و التكنولوجيا (شمبات) لدراسه تاثير المستخلص الكحولى لثمار الكسبرة و المبيد الفطرى سكورعلى نمو فطر الالترناريا سولاني المسبب لمرض اللفحة المبكرة في الطماطم.استخدمت ثلاث تراكيز من المستخلص الكحولى من بذور الكسبره (50%_25%_12,5%)والمبيد الفطرى سكوراضافه الى الشاهد. تم تقيم الاثر التثبيطى الى هذه التراكيز بتسجيل نسبه تثبيط نمو الفطر. اوضحت النتائج ان كل تراكيز المستخلص الكحولى لثمار الكسبرة المختبرة و المبيد الفطرى قد اظهرت تاثيرمعنوى ضد الفطر المختبر مقارنه بالشاهد. تراكيز المستخلص الكحولى و المبيد الفطرى قد تفاعلت كل على حدة ضد الفطر المختبر مع تاثير واضح للمستخلصات من المبيد الفطرى . التراكيز الاقل(12,5%) في المستخلص الكحولى اعطت اعلى نسبة تثبيط مقارنه بالشاهد. وتخلص هذه الدراسة الى ان الكسبرة تحتوي علي بعض المكونات التي لها المقدرة علي تثبيط الفطر الامر الذي يمكن اعتباره ذو فائدة لاستمرار هذا النوع من البحوث لتحديد المواد الطبيعية التي تتضمنتها الكسبرة.

ABSTRACT

This experiment was conducted under laboratory and the Department of Plant Protection, (in Plant Pathology Lab) College of Agricultural Studies , Sudan University of **Science** and Technology (shambat) to study the effect of alcoholic extract of the fruits of coriander and fungicide **score**^{250EC} the fungus*Aternariasolani* growth that causes early blight on Tomatoes.Used three concentrations of the alcoholic extract of coriander seeds (50%, 25 % and12,5 %) and the fungicide score^{250EC} addition to the witness has been assessed to the inhibitory effect of these concentrations logged percentage inhibition of the growth of fungus . The results showed that the concentration of all the alcoholic extract of the fruits of coriander and tested the fungicide has shown a significant effect on the laboratory compared to the control (test fungus). Concentrations of aqueous extrac may have interacted individually against the fungus with the effect is obvious to extracts of the fungicid

Concentrations least (12.5 %) in each of the extracts alcoholic gave the highest percentage of inhibition compared to the control .This study concludes that coriander contains some ingredients that have the ability to inhibition , which can be regarded as a benefit for the continuation of this type of research to identify natural substances that Taatdmentha coriander.

CHAPTER ONE

INTRODUCTION

Tomato *Solanumlycopersicum* is the edible, often red fruit of the plant, commonly known as Tomato. Both the species and its use as food originated in Mexico, and spread around the world following the Spanish colonization of the Americas. Its many varieties are now widely grown, sometimes in greenhouses in cooler climates (Warnock, 1991; Heuvelink, 2005). In the Sudan, Tomato is second to onion among the most important vegetable crops grown, producing about 294 thousand tons of fruits annually representing about 27% of the country's total vegetable production (Ahmed, 1994)

The tomato is consumed in diverse ways, including raw, as an ingredient in many dishes, sauces, salads, and drinks. While it is botanically a fruit, that is considered a vegetable for culinary purposes. The fruit is rich in lycopene, which may have beneficial health effects (Heuvelink, 2005).

Tomato belongs to the nightshade family. The plants typically grow to 1–3 meters (3–10 ft) in height and have a weak stem that often sprawls over the ground and vines over other plants. It is a perennial in its native habitat, although often grown outdoors in temperate climates as an annual. An average common Tomato weighs approximately 100 grams (Warnock, 1991).

Tomato is subjected to a variety of diseases and disorders affecting its yield. One of the most important diseases is the "Early Blight" caused by the imperfect fungus *Alternariasolani* (Awad, 1990; Stone *et. al.*, 2000).

Pesticides are considered indispensable for sustainable agriculture production, in addition to their role in the protection of human health especially in the tropics (Karan, *etal*2006).

Mean while, the increasing and irrational use of synthetic pesticides has become a source of great concern because of their possible effect on human health and non-target components of the environment (Akimbo, and Carvel, 2004). This concern is heightened by the non-specificity and high toxicity of some pesticides and development of resistant strains of microorganisms against other ones. The foregoing has initiated the exploration of safe alternate antimicrobial agents (Research Council Board of Agriculture, 1987). Accordingly, increasing effects have been primary directed towards minimizing pesticides risks in the environment through ecologically sound innovative measures of diseases control (Guideword, *et al* 1990).

Recently, the uses of natural products for crop protection were greatly emphasized by scientists in everywhere (Guideword,. *et al* 1990).

Medicinal plants have become the focus of intense study in terms of validation of their traditional uses ,and then it can be used as a natural pesticides. These pesticides are generally more selective in their action, economically feasible and less harmful to the environment than synthetic chemicals (Songhua and Michailides, 2005).

Currently, control of plant pathogens requires employment of alternative techniques because traditional handling with synthetic chemicals has caused various problems such as toxicity to users and impairment of beneficial organisms (Anderson,. *et al*.2003). Another important aspect is that pathogenic organisms have generated resistance to the active ingredient of some synthetic fungicides in response to selection pressure due to high dose and continuous applications, causing to great economic losses.

Objectives:

The aim of this work is to find an alternative to chemical fungicides currently used in the control of plant pathogenic fungus *A. solani*.

In this work we intended to:

1- Isolate the fungus *A. solani* from infected Tomato plant.

2. Investigate the efficacy of alternative control measures involving the Coriander ethanolextracts against the growth of *A. solaniin vitro*.

CHAPTER TWO

LITERATURE REVIEW

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2.1 Tomato plant

Tomato, (*Lycopersiconesculentum* Mill.), which belongs to the family Solanaceae is one of the most popular and widely consumed vegetable grown worldwide. The tomato crop (*Lycopersiconesculentum*) originated in tropical central South America it was domesticated in Mexico and later taken to Europe (Rick, 1978). In many countries the tomato is very popular vegetable. This is because of it acceptable flavor nutritive, to fruit in a wide range of environments and the relative ease with which it can be cultivated. The production of tomato developed rapidly 19^{th} century (Rick, 1978). The means and method of tomato production have largely changed from a hand –cultivated crop to one, which can be full mechanized.

The popularity of the crop stems from its acceptable flavors, nutritive value (high vitamin C and A), the short cycle life and high productivity (Abdelmageed *et al.*, 2003). Tomato is the major vegetable crop grown worldwide, with a production estimate of 95 million Mt *(*Faostat, 2002*)* and its production is concentrated in semi-arid regions (Santa-Curz*et al*., 2002). Presently, Tomato is becoming increasingly important in Sudan, for local consumption as well as for export. It is cultivated throughout the year under irrigation in an area that exceeds 36540 hectares with an average yield of 17.57 tons per hectare (Aoad, 2007). The most important grown cultivars are the canning types such as Strain B, Strain C, Peto86, Peto111 and Castle Rock in addition to few local varieties.

In the Sudan, Tomato ranks second to onion among vegetable crops based on cultivated area. It is grown by holders who employ relatively poor management practices (Abdelmageed*et al.*, 2003). Tomato combined with peanut butter dominating the food table of most of the poor families in Sudan.

Relative to phytonutrient, the most abundant in tomatoes are the carotenoids. The antioxidant activity of Lycopene as well as several other carotenoids and their abundance in tomatoes make the crop source of antioxidant activity (Beecher, 1998).

2.1.1 Classification

Kingdom	plant
Sub kingdom	Tracheobionia
Division	Magnoliopida
Sub class	Asterielae
Order	Solanaceae
Genus	Lycopersicon
Species	*esculentum* (Mill)

2:1:2 Economic Importance of Tomato

The importance of tomato, both as vegetable food and cash crop cannot be over-emphasized. It is a vegetable crop of considerable economic importance in tropical and subtropical countries where high yields of tomato result in high incomes to farmers when it is cultivated on large scale (Thompson and Kelly, 1957). For its nutritional values, analysis shows that fresh (ripe) tomato contains; 13mg Ca; 27mg P; 0.5mg Fe; 3mg Na; 244mg K; 900 (I.U) of Vitamin A; 0.6mg Thiamine; 0.4mg Riboflavin; 0.7mg Niacin; and 233mg Ascorbic acid (Nonnecke, 1989).The tomato plant is versatile and the crop can be divided in to two categories ;(1) fresh market tomato (2) processing tomatoes. Tomatoes are good sourcing of vitamins (A and C) a fact that is becoming more important in modern diets.

2.1.3 Fungal diseases of tomatoes

Plant diseases constitute a major constraint to crop production often resulting in a great degree of crop losses which may range from slight to 100% (Agrios, 2005).In Sudan, cultivated tomatoes suffer from many fungal diseases such as are Fusarium wilt (*Fusariumoxysporum f. sp. lycopersicum*), Verticillium wilts (*Verticilliumdahliae*), powdery mildews (*Leveilulataurica*) and early and late blights, which are caused by *Alternariasolani - A. alternata* and *Phytophthorainfestans*, respectively. In fact, Fusarium wilt disease is considered as one of the major agents of yield reduction of the crop (Awad, 1990 and Stone *et al.*, 2000).

2.2.1 Early Blight of Tomato

Alternariasolani	
Scientific classification	
Kingdom:	Fungi
Phylum:	Ascomycota
Class:	Dothideomycetes
Subclass:	Pleosporomycetidae
Order:	Pleosporales
Family:	Pleosporaceae
Genus:	*Alternaria*
Species:	***Solani***

Binomial name:*Alternariasolani*(Sorauer, 1896)

Alternariasolani is afungal pathogen, causes diseases in tomato and potato plants called early blight. The pathogen produces distinctive "bulls eye" patterned leaf spots and can also cause stem lesions and fruit rot on tomato and tuber blight on potato. Despite the name "early," foliar symptoms usually occur on older leaves. If uncontrolled, early blight can cause significant yield reductions. Primary methods of controlling this disease include preventing long periods of wetness on leaf surfaces and applying fungicides (Madden *et. al.*, 1978; Jones *et. al.*, 1991).

Geographically, *A. solani* is problematic in tomato production areas east of the Rocky Mountains and is generally not an issue in the less humid Pacific or inter-mountain regions. *A. solani* is also present in most potato production regions every year but has a significant effect on yield only when frequent wetting of foliage favors symptom development (Ahmed, 1994).

2.2.2Hosts and symptoms

Alternariasolani infects stems, leaves and fruits of tomato (*Solanumlycopersicum* L.), potato (*S. tuberosum*), eggplant (*S. melongena* L.), bell pepper and hot pepper (*Capsicum* spp.), and other members of the *Solanum* family. Distinguishing symptoms of *A. solani* include leaf spot and defoliation, which are most pronounced in the lower canopy. In some cases, *A. solani* may also cause damping off (Madden *et. al.*, 1978; Jones *et. al.*, 1991).

2.2.3 Symptoms on Tomatoes

On tomato, foliar symptoms of *A. solani* generally occur on the oldest leaves and start as small lesions that are brown to black in color. These leaf spots resemble concentric rings - a distinguishing characteristic of the pathogen - and measure up to 1.3 cm (0.51 inches) in diameter (Jones *et al*, 1991). Both the area around the leaf spot and the entire leaf may become yellow or chlorotic. Under favorable conditions (e.g., warm weather with short or abundant dews), significant defoliation of lower leaves may occur, leading to sunscald of the fruit (Jones *et al*, 1991). As the disease progresses, symptoms may migrate to the plant stem and fruit. Stem lesions are dark, slightly sunken and concentric in shape. Basal girdling and death of seedlings may occur, a symptom known as collar rot (Jones *et al*, 1991). In fruit, *A. solani* invades at the point of attachment to the stem as well as through growth cracks and wounds made by insects; infecting large areas of the fruit (Jones *et al*, 1991). Fruit spots are similar in appearance to those on leaves – brown with dark concentric circles.

Mature lesions are typically covered by a black, velvety mass of fungal spores that may be visible under proper light conditions (Jones *et al*, 1991).

2.2.4 Economic Important

Early blight caused by *A. solani* is the most destructive disease of tomatoes in the tropical and subtropical regions. Each 1% increase in intensity can reduce yield by 1.36%, and complete crop failure can occur when the disease is most severe (Jones *et al*, 1991). Yield losses of up to 79% have been reported in the U.S., of which 20-40% is due to seedling losses (i.e., collar rot) in the field (Jones *et al*, 1991).

A. solani is also one of the most important foliar pathogens of potato. In the U.S., yield loss estimates attributed to foliar damage, which results in decreased tuber quality and yield reduction, can reach 20-30% (Ahmed, 1994). In storage, *A. solani* can cause dry rot of tubers and may also reduce storage length, which both of which diminish the quantity and quality of marketable tubers (Ahmed, 1994).

2.2.5 Management

2.2.5.1Cultural control

- Clear infected debris from field to reduce inoculums for the next year.
- Water plants in the morning so plants are wet for the shortest amount of time.
- Use a drip irrigation system to minimize leaf wetness which provides optimal conditions for fungal growth.
- Use mulch so spores in soil cannot splash onto leaves from the soil.

- Rotate to a non-Solanaceae crop for at least three years.
- If possible control wild population of *Solanaceae*. This will decrease the amount of inoculums to infect your plants.
- Closely monitor field, especially in warm damp weather when it grows fastest, to reduce loss of crop and spray fungicide in time.
- Plant resistant cultivars.
- Increase air circulation in rows. Damp conditions allow for optimal growth of *A. Solani* and the disease spreads more rapidly. This can be achieved by planting farther apart or by trimming leaves.

2.2.5.2Chemical control

There are numerous fungicides on the market for controlling early blight. Some of the fungicides on the market are azoxystrobin, pyraclostrobin, Bacillus subtilis, chlorothalonil, copper products, hydrogen dioxide, mancozeb, potassium bicarbonate, and ziram. Specific spraying regiments are found on the label.

2.3 Coriander plant

There exist very different uses of coriander and these are based on different parts of the plant. The traditional uses of the plant, which are based on the primary products, i.e. the fruits and the green herb, are two-fold: medicinal and culinary. During industrialization, the specific chemical compounds of coriander were recognized and identified, and these became important as raw materials for industrial use and further processing. The essential and fatty oils of the fruits are both used in industry, either separately or combined. After extraction of the essential oil, the fatty oil is obtained from the extraction residues either by pressing or by extraction.

A further benefit of coriander derives from the reproductive biology of this plant. Coriander produces a considerable quantity of nectar and thereby attracts many different insects for pollination, an external effect which is of both ecological and economic value. Coriander is also a good melliferous plant (Luk'janov and Reznikov,1976) state that one hectare of coriander allows honey bees to collect about 500 kg of honey.

Scientific classification2.3.1

Kingdom: Planate

Order: Apiales

Family: Apiaceae •

Genus:*Coriandrum*

Species: ***C. sativum***

Binomial name: *Coriandrumsativum*

2.3.2 Distribution

A native of the Mediterranean region there for several thousand years, now cultivated in tropical Asia (India, Malaysia, Thailand, and china), the Middle East and Brazil. Coriander was brought to the British colonies in North America in 1670, and was one of the first spices cultivated by early settlers (Aggarwal, and Kunnumakkara, 2009) and (Platte, 1962).

Chemical composition of the fruits

The essential oil content is of greatest importance, and accessions that have almost no essential oil and others with up to 2.60% of essential oil in the air-dried fruits. The extremely leafy types from Syria have very low essential oil content in the fruits. Despite this, the essential oil content is positively correlated with the foliation of the plant. High essential oil content of was found in all accessions from the Caucasus.

The taste of the green leaves of the plant was more aromatic in the accessions that had high essential oil content in the fruits. The Georgian types had leaves with a very spicy taste. The Syrian types must have been subject to a selection towards plants with a mild taste more suited to use in salads than as a spice. The Ethiopian accessions show the same tendency as the Syrian, but their flavor is more aromatic.

Usually, the plants with low foliation and large fruits have allowed essential oil content. The Indian group with the lengthened fruits also belongs in this category.

This fact has been known and described in literature for a long time (e.g. Luzina and Michelsson 1937). But the chemical composition of the essential oil of the plant is also important, as it affects its flavor.

The organoleptic differences between coriander plants of different origin have been described by (Purseglove*et al.* 1981). The weather during the vegetation period in the experimental year 1995 started with a relatively cold April (mean temperature: 8.6°C), May (11.9°C) and June (14.8°C), while July (20.2°C) and August (18.8°C) were hot months. The sum of average temperatures higher than 4°C of the days from sowing (7 April) to harvesting of the latest accessions (22 August) was 2143°C. The rainfall of 211 mm was evenly spread over the months of the vegetation period, but was concentrated in a few rainy days. The climatic conditions during the growing season of 1995 in Germany were extremely favorable for the cultivation of coriander, and the trials there-fore produced exceptionally high essential oil yields.

CHAPTER THREE

MATERIAL AND METHODS

This study which conducted under laboratory condition of Plant Pathology, College of Agricultural Studies, Sudan University of science and Technology during the period November to December 2015 to investigate the inhibitory effect of ethanolic extracts of coriander and standard fungicide, **score** $^{\mathbf{250EC}}$ against the fungus *Aternariasolani.*

3.1 Isolation and Identification of *Aternariasolani*(the causal agent of early blight of Tomato crop)

Fungal isolate was isolated from naturally diseased Tomato leaves showing blight symptoms and Identification of the causal pathogen. Isolate was conducted under laboratory conditions at Plant pathology.

3.2 Plants Material

Freshly collected plant parts (Coriander) were shade-dried at room temperature for 10 – 15days. Dried bark and leaf samples were separately crushed and ground into fine powder with mortar and pestle.

3.4. Preparation of extracts

Extracts from seeds of Coriander (*Coriandrumsativum)* were obtained or collected from local market in Khartoum “Shambat” , Sudan and tested for their efficacy in reducing the mycelial growth of *A. solani****in vitro*** using the poisoned food technique (Schmitz, 1930).

Powdered plant materials were sequentially extracted with different solvents in a**Soxhlet**apparatus for 8h according to the method described lsewhere(Pandey., 2007).The solvents used for extraction included petroleum ether(PE), ethanol(ET).The respective extracts were filtered and dried under reduced pressure using rotary evaporator to yield solid/semi solid residues.The residues were lyophilized to get dry solid mass.

The PDA media amended with five milliliters of ethanolextract, 1 and 5%, of each plant extracts individually were inoculated with mycelial discs (9 mm diameter) taken from the advancing edges of 7 day-old pure cultures of *A. solani.* The control experiments had distilled water instead of plant extracts. The inoculated media were incubated at temperature 27±1°C. Four plates were each treatment was used as a replicates. The diameter of the fungal colony was measured using a meter rule along two diagonal lines drawn on the reverse side of each Petri plate 7 days after inoculation. Each treatment was replicated three times with four plates per replication (*Pandey.*, 2007).

3.5 Preparation of fungicide concentrations

One mL of the **score** **250EC** (Difenoconazole 25%), fungicide was dissolved in 90 ml of sterilized distilled water of 2500 ppm was prepared.

Five mL of recommended fungicide doses **(score** **250EC)** and nine mL of molten PDA medium was poured into sterilizedglass Petri dishes 2500 ppm fungicide concentrations.

3.6 Test procedure

The antifungal *in vitro* assays were carried out following the modified method of (Okigbo *et al*. 2005) and (Chohan., and Perveen.,2006). Inhibition zone technique was used in this study to evaluate the effect of each concentration on mycelia linear growth of the fungus. Initially, fresh fungal growth was prepared from previously maintained culture of

Alternariasolani. Prepared PDA media was amended with the required concentration from Coriander and fungicide before being solidified in a conical flask of 250 ml, agitated and poured into sterilized glass Petri dishes. Three plates, containing 25 ml of PDA, were assigned for each concentration and left to solidify. The other three plates with PDA medium were served as control.

One mycelia disc of the fungus was placed in the centre of PDA plates where opposite poles were marked at the back of the plate and incubated at 27±1°C in incubator and radial growth of pathogen was measured at 24 h intervals.

The Petri dishes of each concentration were arranged in a complete block design in incubator and incubated at 27±1°C for 3 days. The growth of the fungus was measured and calculated successively after 3, days after inoculation. The effect of each extract concentration on linear fungal growth was calculated as percentage of reduction in diameter of fungal growth.The formula suggested by Vincent (1947).The formula (1) Where

$$R = \frac{dc - dt}{dc} \times 100 \qquad \ldots\ldots\ldots (1)$$

R = Percentage reduction of the growth, dc= diameter of controlled growth and dt= diameter of treated growth.

3.7. Experimental design

The experiment was arranged in a Complete Randomized block Design.

3.8. Statistical analyses

The obtained data was statistically analyzed according to analysis of variance (ANOVA) Duncan's Multiple Range Test (DMRT) was used for means separation using Mstat-C statistical package.

CHAPTER FOUR

RESULTS AND DISCUSSION

Fungal isolate was isolated from naturally diseased tomato leaves showing blight symptoms and Identification of the causal pathogen. Isolation of *Alternariasolani* was carried out from naturally infected tomato plants and identified on basis of cultural and morphological characteristics as *A.solani*.

Selected and evaluated for the antifungal activity against *A. solani in vitro.* Tested concentrations of species ethanolic extracts of fruits coriander leaves exhibited different degrees of antifungal activity against *A. solani*. Two days after treatment all tested concentrations of ethanolic extracts of coriander leaves in addition to standard fungicide resulted in similar higher non significant inhibition percentage compared to the control treatment (Table 1, Fig. 1and appendixes A). The same trend of inhibition percentage was noticed four days after treatment. The extract coriander at 12.5% (89%) and 50% **(**87.6%), the standard fungicide and coriander leaves at 25% (88% and 83.3%). The mycelia of the control treatment grew naturally. After eight days of treatment all tested concentrations of ethanolic extracts, coriander leaves and standard fungicide recorded higher similar non significant inhibition percentage compared to the control treatment (Table 1). At the end of the experiment after eleven day the same trend was observed as in previous count (8^{th} days after treatment) (Table 1).

Table 1Effect of Ethanolic Extract of Coriander on The leaner Growth of *Alternariasolani in vitro*

Treatments	Con. %	Inhibition zone % 2nd day	4th day	6th day	8th day	
Coriander	12.5	89.3(9.5) a	89(9.4) ab	94.6(9.7)a	94(9.7) a	
	25	85.6(9.3) a	83.3(9.1) b	84.6(9.2)a	88.3(9.4)a	
	50	84.3(9.2) a	87.6(9.4)ab	88.6(9.4)a	92 (9.6) a	
Fungicide		91(9.6) a	88(9.4) ab	87.3(9.3)a	100 (10)a	
Control		0(0.7) b	0(0.7) c	0(0.7) b	0 (0.7) b	
CV%		4.1	4.0	3.7	15.3	4.1
SE±		0.212	0.191	0.175	0.769	0.212

Means with the same letter in the same column are not significantly different ($P < 0.05$)

Means in the parenthesis are transformed by square root transformation($\sqrt{X + 0.5}$) before analysis.

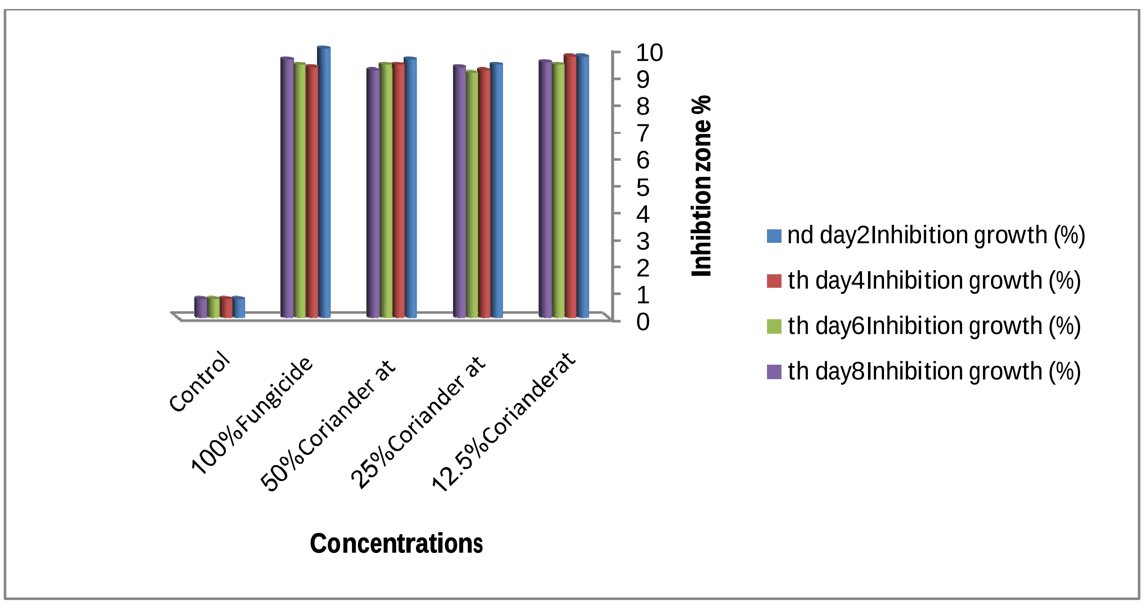

Figure1 Effect of Ethanolic Extract of Coriander on The leaner Growth of

Alternariasolani in vitro.

DISCUSSION

The possibility of controlling Tomato fungal diseases with plant products has an unusual significance in the context of environmental pollution, toxicity of the produce and development of resistance by plant pathogens. Preliminary assessment of the antifungal potential of different plant extracts, under controlled conditions established significant antimicrobial activity on fungal diseases of tomato plants. The results of these present study indicated that all tested ethanolic extracts of coriander seeds, caused a significant reduction in the linear growth of *A. solani*.

Coriander showed moderate activity cambered by control.For instance, higher plants are large reservoirs of antifungal compounds, being biodegradable, are considered valuable in disease resistance (Okigbo and Ajalie, 2005; Siva *etal*., 2008). Therefore, they have been implicated in pathogenesis of many plant diseases. Flavonoids, isoflavonoids, glycosides, tanins, coumarins, terpenes, alkaloids and phenolic compounds are secondary metabolites synthesized by plants (Simões*etal*., 1999).

The inhibitory effects of tested plant extract may be due to their direct toxic effect on the pathogen as reported by (Vijayan, 1989). Investigations on the mechanisms of disease suppression by plant products have suggested that the active principles present in plant extracts may either act on the pathogen directly or induce systemic resistance in host plants resulting in a reduction of the disease development (Kagale*et al.*, 2004).

Several authors including (Curtis *et al.*, 2004), (Krebs *etal*., 2006), and (Latha*et al*., 2009) reported that plant extracts 20 non-host plant species caused a reduction of the early blight disease and suppressed the mycelia growth of *A. solani*. In conclusion, the study demonstrated that many plant extracts, *e.g*. from coriander seeds, can be used for the biocontrol of the early blight disease. Thus, this method of control can contribute to minimizing the risks and hazards of toxic fungicides, especially on vegetables produced for fresh consumption. Further research into these extracts will identify the active compounds responsible for their fungicidal activity (Nashwa., Abo-Elyousr., 2012).

CONCLUSION

The results indicated that the effects of the ethanolic extract of coriander seeds in inhibition the growth of the fungus *Alternariasolani* the causal agent of early blight. Thechemicalfungicidesarecost effectiveandoutofreachofthe smalllandholders.Alsothe consumersarequite doubtfulontheproductionofsynthetic chemicals andtherehasalwaysbeenagoodacceptance when it comes to natural antioxidants. This supplied a rationaleforexploitation ofplantproductsindisease management programs.Itisenvisagedthat,application of plantextracts asanaturalfungicides totreatdifferent pathogenswill beusefulforsmall-scalefarmersthat arenot abletoaffordcostlyfungicides.

- ❖ The results of these present study indicated that all tested ethanolic extracts coriander fruits, caused a significant reduction in the linear growth of *A. solani* by extract of coriander this reduction was increased by decreasing the concentration.

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Appendecies