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Bio-efficacy of plants extracts against *Alternaria carthmi* caused *Alternaria* Leaf spot of safflower

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Abstract

Safflower (*Carthamus tinctorius* L) is most important oilseed crop and several bacteria, fungi and virus infect it and cause diseases. *Alternaria* Leaf spot of Safflower is very worst disease and distributed worldwide in all safflower growing countries. This disease is caused by *Alternaria carthmi* and pathogen affect the oil content of safflower and yield. Experiment carried out on Bio-efficacy of plant extracts against *Alternaria carthmi* caused *Alternaria* Leaf spot of Safflower. Five plant extracts viz, *Azadirachta indica*, *Capsicum annum*, *Allium sativum* (bulbs), *Eucalyptus globulus*, *Mentha arvensis* and mixture of all plant extract each of them at two concentration 15% and 25% were evaluated against *Alternaria carthmi*. Mixture of all plant extracts and garlic (bulbs) extracts were found highly effective against pathogen at both 15% and 25% concentration and mycelial inhibition was recorded 62.16% at 25% concentration. Another two plant extracts Neem and chilli was also found to be effective against pathogen and both showed 52.15% inhibition at 25% concentration. There are different plant extracts are available in nature. However, some plant extracts are highly effective and some plant extracts are not effective against pathogen. Therefore, this investigation will be helpful to the farmers for selection of suitable plant extracts, used as a control of *Alternaria* Leaf spot of Safflower.

Keywords: Safflower, *Alternaria carthmi*, radial growth, plant extracts, poisoned food technique, toxicity

Introduction

Safflower (*Carthamus tinctorius* L.) is one of the important *Rabi* oilseed crops which belongs to family Asteraceae or Compositae with the chromosome number of $2n=24$. Survey on intensity of *Alternaria* leaf spot safflower in northern India recorded 27-90 per cent yield loss (Krishna Prasad, 1988) [4]. The pathogen survives in seed and infected plant debris. Primary infection develops from infected seed and secondary infection takes place through airborne conidia. Symptoms characterized by Dark necrotic lesions 2-5 mm in diameter are formed first on hypocotyls and cotyledons. In mature plants, small brown to dark brown concentric spots of 1-2 mm appear on leaves. Symptoms also appear on stem and severely infected plant gets blighted. Brown discolouration appear on the stem, dark brown spot with concentric ring up to 1 cm in diameter appear on the leaves which later develop into large lesions. Amaresh *et al.* (2002) [2] tested three plant extracts against *Alternaria carthmi* in vitro condition. Among these neem seed kernel extract was better compared to *Ocimum cannum* and *Tridax procumbense*. Rao (2006) found neem leaf extract, neem kernel extract and *Allium sativum* bulb extract as effective botanicals against *Alternaria carthmi*. Chattopadhyay (1999) [3] reported the 'eco-friendly' and cost-effective management of the disease through spray of botanicals such as *A. sativum* bulb extracts (1% w/v) or leaf extracts (1% w/v) combined with the recommended fertilizer doses for sustainable safflower culture. *Alternaria* earlier several studies have been conducted for management of *Alternaria* blight of safflower in which several plant extract have been used against *Alternaria carthmi* and few plant extract are found single effective. Keeping in view the present investigation was undertaken for "Bio-efficacy of plants extracts against *Alternaria carthmi* caused *Alternaria* blight of Safflower".

Materials and Methods

In the experiment the Poisoned Food Technique was adopted for evaluation of plant extract against pathogen. Fresh samples of six plant species, viz. bulbs of Garlic (*Allium sativum*) and leaves of Neem (*Azadirachta indica*), Eucalyptus (*Eucalyptus globulus*), Menthol (*Mentha arvensis*), Chilli (*Capsicum annum*) and mixture of all plant extracts were used for the experiment. Two concentration 15% and 25% were tested for each plant extracts.

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Preparation of Plant Extracts Stock Solution

Fifty grams of dried, powdered form of each plant sample were weighed and placed into 1000 ml flasks. To this flask 500 ml of methanol was added. The flask mouth was covered with cotton balls and covered with aluminum foil and then were placed over horizontal shaker and then shaken at 120 rpm for 24 hours in the dark condition. On the next day the suspension was filtered through two layers of muslin cloth into five different 250 ml evaporating flasks and the excess alcohol was allowed to evaporate till dryness using a rotator evaporator at 32 ± 2 °C. Then the remaining residue was diluted by addition of sufficient amount of sterilized distilled water containing 10% acetone to prepare stock solution of two different concentrations. These prepared different stock solutions were used for in vitro evaluation against *Alternaria carthmi* by poison food technique.

Table 1: Collection of plants Parts

Common name	Botanical name	Plant part used
Neem	<i>Azadirachta indica</i>	Leaf
Chilli	<i>Capsicum annum</i>	Fruits
Garlic	<i>Allium sativum</i>	Bulbs
Menthol	<i>Mentha arvensis</i>	Leaf
Eucalyptus	<i>Eucalyptus globulus</i>	Leaf

The prepared PDA medium was separated in 11 different 500 ml conical flasks in which ten flasks containing PDA along with

stock solution of different leaf extracts and two flasks with a mixture of all plant extracts of different concentrations and one flask without any solution containing only PDA medium which we treated as control. Two concentrations viz. 15% and 25% were used for each plant extract. These replications were maintained for each treatment. After the solidification of medium in petri plates, each plate was inoculated with a 5 mm disc of freshly grown culture of *Alternaria carthmi* that was cut with the help of a sterilized cork borer. The control plates were maintained and it contains only the PDA medium inoculated with a 5 mm disc of pathogen devoid of plant extracts. Inoculated petri plates were incubated in the B.O.D. incubator at 28 ± 30 °C temperature for mycelial growth of pathogen in the presence of plant extracts among treated petri plates. Radial growth of fungus was measured from the day of inoculation and percent inhibition of growth of the pathogen was calculated using the formula-

$$I = \frac{C - T}{C} \times 100$$

Where,

I= Percent inhibition of mycelium

C= Growth of mycelium in control

T= Growth of mycelium in treatment



Fig 1: Collected Sample of plants used as extracts

Results and Discussion

The efficacy of five plant extracts viz. *Azadirachta indica*, *Capsicum annum*, *Allium sativum*, *Eucalyptus globulus*, *Mentha arvensis* and mixture of all plant extracts were evaluated at concentrations of 15% and 25% for inhibition of mycelial growth of *Alternaria carthmi*. Data pertaining to the effect of plant extracts on radial growth of *Alternaria carthmi* is given in table no. 2 and figure no 2

The plant extracts were found to inhibit growth of fungus with increasing concentration in the medium. Higher inhibitions of the mycelial growth of *Alternaria carthmi* were recorded at 25% and found to be superior over the lower concentration (15%). The result showed that significant differences between treatments.

Mixture of extracts (Neem, Chilli, Garlic, Eucalyptus and Menthol) leaf extracts and Garlic (*Allium sativum*) among the five plant extracts were found highly effective against

pathogen at 25 percent concentration and mycelial inhibition was recorded 62.16%. Another two plant extracts Neem (*Azadirachta indica*) as well as chilli (*Capsicum annuum*) were also effective against pathogen and both showed 52.15% inhibition against *A. carthmi*. Minimum inhibition was recorded in Eucalyptus (*Eucalyptus globulus*) with 45. 51% inhibition.

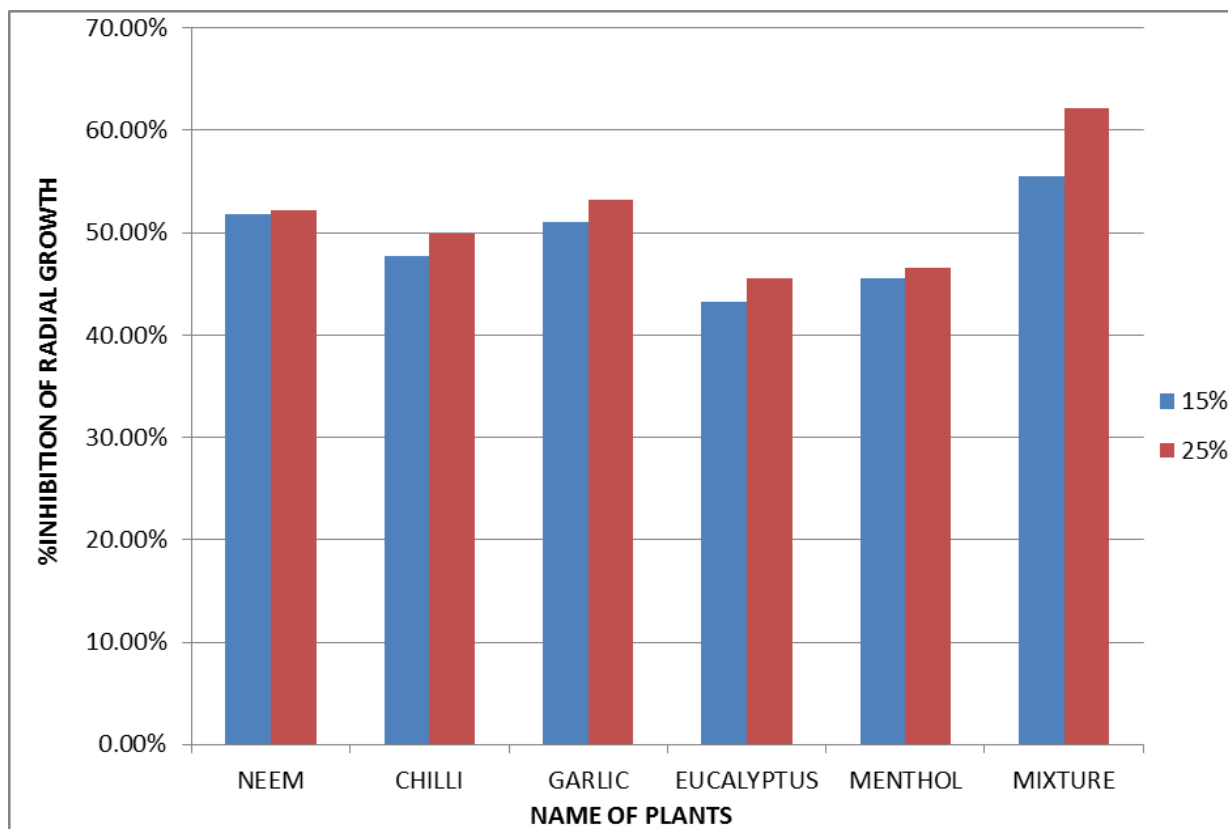
Similarly at 15% concentration maximum percent inhibition was observed in Mixture extracts (55.5%) followed by *Allium sativum* (51.06%), *Azadirachta indica* (51.75%), *Capsicum annuum* (47.73%), *Mentha arvensis* (45.51%) and *Eucalyptus*

globulus was found to last effective with percent inhibition of 43.29%.

The result was found to be confirmative with the finding of Taware *et al.* (2014) [6]. They reported that there is a positive correlation between concentration and growth inhibition percentage that means plant extract at lower concentration will show less effectiveness as compared to plant extract at higher concentration. Similar finding were also found to be confirmative with the result of Ranaware *et al.* (2010) [1], and Kumar *et al.* (2017) [5].

Table 2: Effect of plant extracts on mycelial growth of *Alternaria carthmi*

Botanical extracts	Radial growth (cm)		Percent inhibition (%)	
	15%	25%	15%	25%
Neem (<i>Azadirachta indica</i>)	4.5	4.3	51.75%	52.15%
Chilli (<i>Capsicum annuum</i>)	4.7	4.5	47.73%	49.95%
Garlic (<i>Allium sativum</i>)	4.4	4.2	51.06%	53.28%
Eucalyptus (<i>Eucalyptus globulus</i>)	5.1	4.9	43.29%	45.51%
Menthol (<i>Mentha arvensis</i>)	4.9	4.8	45.51%	46.62%
Mix (Neem, Chili, Garlic, Eucalyptus and Menthol)	4.0	3.4	55.5%	62.16%
Control	9.0	9.0	—	—
Critical Differences (CD) (0.05)	0.105	0.119		
Coefficient of variation (CV)	1.126	1.323		



Graph 1: Effect of plant extracts on mycelial growth of *Alternaria carthmi*

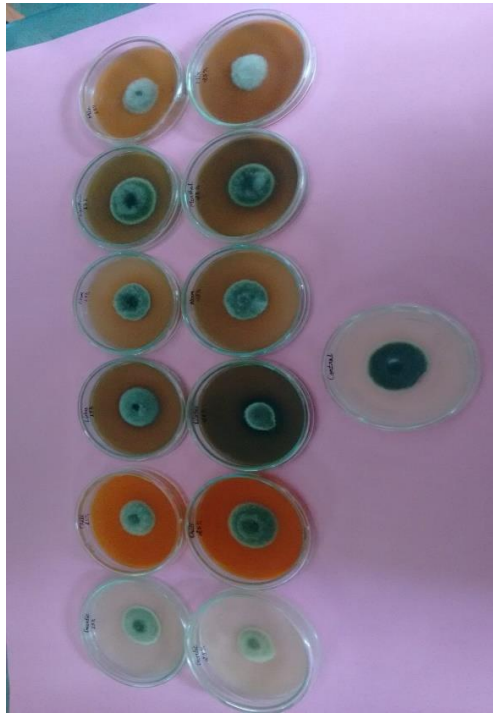


Fig 2: Effect of Plant extracts on Radial growth of *Alternaria carthami*

Summery and Conclusion

Safflower (*Carthamus tinctorius*) is most important oilseed crop and several bacteria, fungi and virus infect it and cause diseases. *Alternaria* leaf spot of safflower is very worst disease and distributed worldwide in all safflower growing countries. This disease is caused by *Alternaria carthami* and pathogen affect the oil content of safflower and yield. Presently many farmers are using chemicals for control of *Alternaria* leaf spot of safflower however; they cause health hazards and affect the environment. Therefore present investigation was conducted on Bio-efficacy of plant extracts against *Alternaria carthami* caused *Alternaria* leaf spot of safflower. In view of the summarized experimental findings it may be concluded that antifungal properties are present in plant extracts. Suitable plant extracts can be used as biopesticides for control of *Alternaria* leaf spot disease. There are different plant extracts are available in nature. However, some plant extracts are highly effective and some plant extracts are not effective against pathogen. Therefore, this investigation will be helpful to the farmers for selection of suitable plant extracts, used as a control of *Alternaria* Leaf spot of Safflower.

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