Efficacy of different plant extracts against bacterial leaf blight of carrot (*Daucus carota* L.)

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Abstract: The present study was conducted to check the efficacy of different plant extract against Alternaria leaf blight of carrot. For this purpose, five carrot varieties named as Gold Mines, Red Core, Deep Red, Mah Rani and Long Red were sown under Randomized Complete Block Design (RCBD) with P×P separate 15cm and R×R remove 45cm with three replications of every assortment. Every single social practice was performed to keep the product in sound condition. Diseased samples were taken from infected field and brought to Plant Pathology lab for isolation of fungus. PDA media was used for the isolation of *Alternaria dauci*,. After isolation, culture was purified and multiplied to prepare inoculum for further processes. The disease was established in healthy carrot crop after inoculation. Extract of three plants viz. Neem (*Azadirachta indica*), Onion (*Allium cepa*) and Eucalyptus (*Eucalytpus* spp.) were prepared at three concentrations i.e. 100ppm, 150ppm and 200ppm, respectively. These extracts at each concentration were sprayed thrice at an interval of 7 days. The neem extract at concentration of 200ppm was much effective in reducing the incidence of *A. dauci* while eucalyptus extract at 100ppm was least effective in reducing the disease incidence as compared to control after 1st, 2nd and 3rd spray.
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Key words: Alternaria leaf blight (ALB), Potato dextrose agar (PDA), Neem (*Azadirachta indica*).

1. Introduction

Carrot (Daucus carota L.) is an essential vegetable crop in Pakistan and in the world. The carrot has been known since long time prior in this century, so it is trusted that this crop was begun from the Afghanistan and its neighboring ranges before 900s (Gugino *et al*., 2004). Carrot is a standout amongst the most vital vegetable product that gives great dietary incentive in everywhere throughout the world (Rubatzky, 2002). The cultivated area of carrot is one million hectares on the earth with the yearly production of 27 million tons yet in Pakistan it is grown on 13.9 thousand hectares with the yearly production of 242.3 thousand tones (FAO, 2008). The national normal yield of this harvest is sensibly low when contrasted with other dynamic nations, for example, Belgium (47.64 tons ha-1), Denmark (44.29 tons ha-1) and the United Kingdom (44.28 tons ha-1). In Africa and South America carrot production expanded gradually when however, in Asia (basically china) it expanded at extremely fast rate particularly in 1997 to declare Europe as a main creation region (FAO, 2008).

Carrot is a cool season crop and grown under the temperature scope of 10-25˚C because it gives better production under this temperature. It is demonstrated that the ideal temperature of day and night for plant development is 25°C and 20°C, separately (Alam *et al*., 2004). The seedlings of carrot bear ice and the temperature of - 7˚C however the top development is influenced by underneath 4˚C, and this serious condition will cause the death of plant. Carrot is the piece of human eating routine. It contains carotene and a forerunner of Vitamin A (Zeb and Mahmood, 2004).

Carrot crop is influenced by bacterial, viral and parasitic illnesses yet among contagious ailments Alternaria leaf blight (*Alternaria dauci*) is real constraining development consider that causes substantial financial misfortune (Koike *et al*., 2009). This infection happens toward the finish of January when temperature is 24˚C (Farrar *et al*., 2004). Alternaria leaf blight is disastrous foliar diseases of carrot (Souza *et al*., 2001). Alternaria dauci is the significant reason for this ailment which is a seed born parasite and is a genuine risk to production of carrot yield (Rogers *et al*., 2011). The characteristic symptoms of this disease is the production of lesions which are green to darker in color that at long last wind up plainly necrotic following 8-10 days of contamination. Injuries show up on the leaflets and petioles of carrot plant as lesions with a yellow hallo. Leaves end up plainly yellow, crumple and become dead when 40% leaf region ends up noticeably contaminated by this pathogen. Because of these

indications, rate of photosynthesis decreased which diminishes the root measure (Pryor *et al*, 2002). The injuries created by *Alternaria dauci* are unpredictable fit as a fiddle having dark colored to dark shading and generally shows up on the edges and tips of the develop leaves of the carrot plant (Farrar *et al*., 2004; Hooker, 1944; Strandberg, 1992).

Seed treatment is not the full destruction of applicable pathogen (Farrar *et al*., 2004). Soteros (1979) reported that *Alternaria dauci* and *Alternaria radiana* are threateing pathogens of carrot causing severe foliage infection to carrot plant by attacking all the plant parts including flowers, leaves, stem and seedling. By using fungicide attack of ALB can be controlled. But this approach is costly and may have pesticide residues accumulating in roots and soil (Pryor *et al*., 2002). Essential oils and plant extracts are effective because of their antimicrobial activity to control seed-associated pathogens (SCHWAN-ESTRADA *et al*., 2003). BAKKALI (2008) and KUMAR et al. (2008) the cytotoxic properties of essential oils are due their lipophilic nature.

2. Material and method

Five carrot assortments named as Gold Mines, Red Core, Deep Red, Mah Rani and Long Red were taken from Vegetable Research Institute of Ayub Agricultural Research Institute, Faisalabad. The experiment was conducted in research area of Department of Plant Pathology, University of Agriculture, Faisalabad under Randomized Complete Block Design (RCBD) with P×P separate 15cm and R×R remove 45cm with three replications of every assortment. Every single social practice was performed to keep the product in sound condition.

2.1 Accumulation of Diseased Samples

Solid and diseased examples were gathered from various fields in partitioned dark colored sacks, named with perpetual dark marker and put in polyethene packs to store in frosty temperature in icebox in research center.

2.2 Isolation and Multiplication of Fungus

Diseased samples were taken from infected field and brought to Plant Pathology lab for isolation of fungus. For isolation of *Alternaria dauci*, PDA media was used. After isolation, culture was purified and multiplied to prepare inoculum for further processes. Pathogenicity test of diseased plants was performed to check whether relevant pathogen is present or not.

2.3 Efficacy of plant extracts against *Alternaria dauci*

The disease was established in healthy carrot crop after inoculation. Three types of plant extracts (Neem, Onion and Eucalyptus extracts) were used at three concentrations viz. 100ppm, 150ppm and 200ppm, respectively against spore germination of relevant fungus.

Disease Incidence (%)= (Number of contaminated plants watched) / (Total number of plants watched) ×100. The appraisal of illness was done considering the ailment rating scale created by Gugino *et al.* (2007).

3. Result and discussion

3.1 Evaluation of plant extracts against *Alternaria dauci* under field conditions

Extract of three plants viz. Neem (*Azadirachta indica*), Onion (*Allium cepa*) and Eucalyptus (*Eucalytpus* spp.) were prepared at three concentrations i.e. 100ppm, 150ppm and 200ppm, respectively. These extracts at each concentration were sprayed thrice at an interval of 7 days.

The results concluded that neem extract at concentration of 200ppm was very much effective in reducing the incidence of *A. dauci* while eucalyptus extract at 100ppm was least effective in reducing the disease incidence as compared to control after 1st, 2nd and 3rd spray.

The analysis of variance at all three sprays also showed significant impact as plant extracts showed significant response in reducing the disease incidence as compared to control after three sprays at 5% significance level.

Table 1: Analysis of variance for evaluation of plant extracts against *Alternaria dauci* under field conditions after 1st spray.

Source of Variation	Degree of Freedom	Sum of Squares	Mean Sum of Squares	F-value	P-value
Replication	2	6.92	3.46		
Concentrations	2	61.14	30.57	142.90*	0.0000
Plant Extracts	3	6495.90	2165.30	10122.3*	0.0000
Concentrations × Plant Extracts	6	21.06	3.51	16.41*	0.0000
Error	22	4.71	0.21		
Total	35	6589.73			

***: Significant**
Grand Mean: 24.847
CV: 1.86%

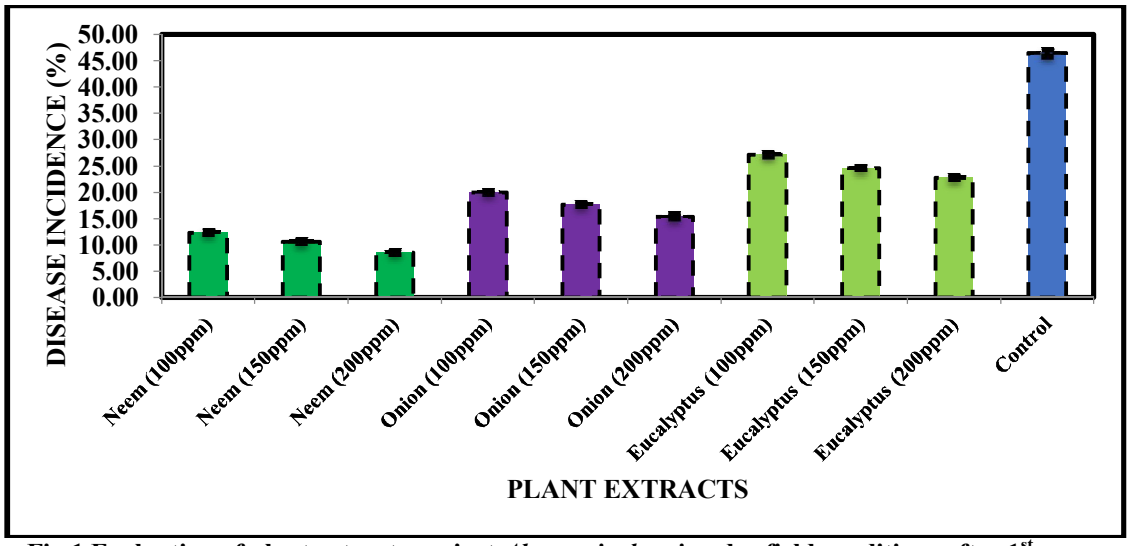

Fig.1 Evaluation of plant extracts against *Alternaria dauci* under field conditions after 1st spray

After 1st spray, neem extract at 100ppm, 150ppm and 200ppm showed mean incidence of 12.37%, 10.63% and 8.53%, respectively. Onion extract at 100ppm, 150ppm and 200ppm showed mean incidence of 19.93%, 17.63% and 15.4%, respectively. Eucalyptus extract showed mean incidence of 27.13%, 24.6% and 22.73% at 100ppm, 200ppm and 300ppm, respectively.

Table 2: Analysis of variance for evaluation of plant extracts against *Alternaria dauci* under field conditions after 2nd spray

Source of Variation	Degree of Freedom	Sum of Squares	Mean Sum of Squares	F-value	P-value
Replication	2	25.1	12.57		
Concentrations	2	79.9	39.95	61.25*	0.0000
Plant Extracts	3	11540.2	3846.74	5897.67*	0.0000
Concentrations × Plant Extracts	6	35.1	5.85	8.98*	0.0001
Error	22	14.3	0.65		
Total	35	11694.8			

***: Significant**
Grand Mean: 28.428
CV: 2.84%

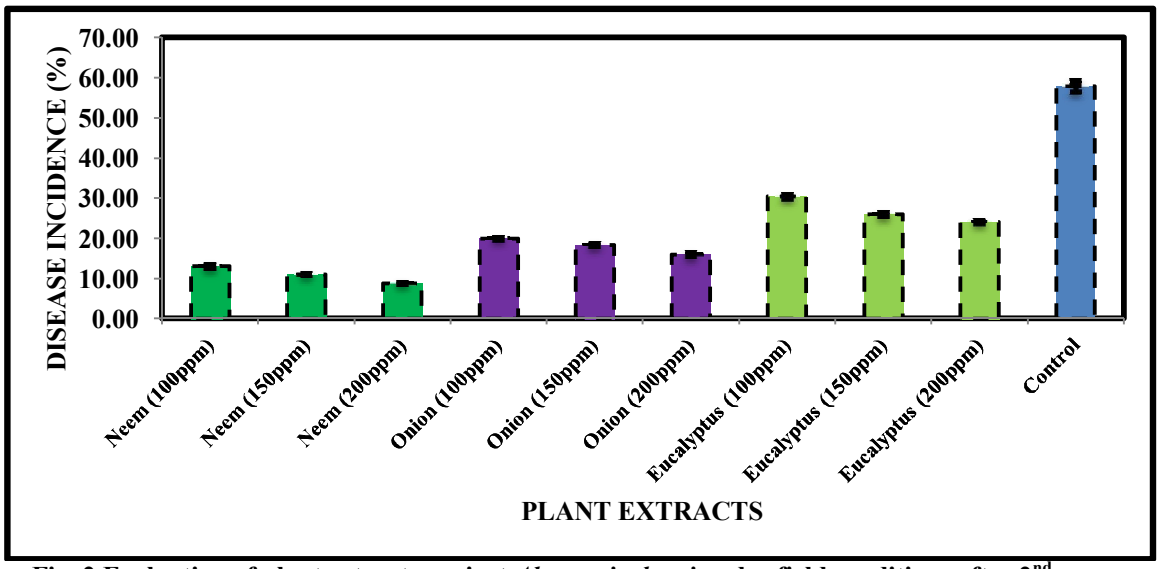

Fig. 2 Evaluation of plant extracts against *Alternaria dauci* under field conditions after 2nd spray

After 2nd spray, neem extract at 100ppm, 150ppm and 200ppm showed mean incidence of 13%, 11.03% and 8.83%, respectively. Onion extract at 100ppm, 150ppm and 200ppm reduced the incidence of the disease up to 19.93%, 18.3% and 15.9%. Eucalyptus extract reduced the incidence of disease up to 30.47%, 25.97% and 24.1% at 100ppm, 150ppm and 200ppm, respectively.

Table 3: Analysis of variance of all plant extracts at their respective concentrations at three applications

Source of Variation	Degree of Freedom	Sum of Squares	Mean Sum of Squares	F-Value	P-Value
Replication	2	105.8	52.9		
Spray	2	1092.8	546.4	192.31*	0.0000
Treatments	3	37003.2	12334.4	4341.43*	0.0000
Concentration	2	211.6	105.8	37.23*	0.0000
Spray × Treatments	6	2277.6	379.6	133.61*	0.0000
Spray × Concentration	4	0.7	0.2	0.06^{ns}	0.9926
Treatments × Concentration	6	86.0	14.3	5.04*	0.0002
Spray × Treatments × Concentration	12	5.7	0.5	0.17^{ns}	0.9992
Error	70	198.9	2.8		
Total	107	40982.2			

***: Significant**
ns: Non-significant
Grand Mean: 28.635
CV: 5.89%

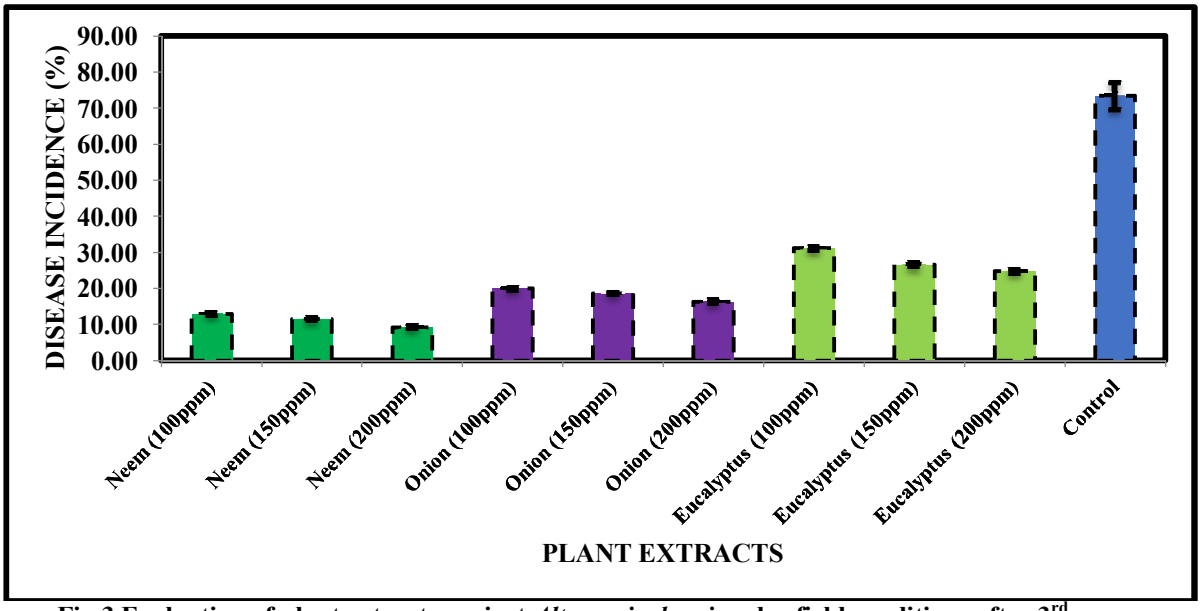

Fig.3 Evaluation of plant extracts against *Alternaria dauci* under field conditions after 3rd spray

Table 4: Effect of plant extracts at different concentration against *Alternaria dauci* after three sprays under field conditions

Plant Extract	Spray 1			Spray 2			Spray 3		
	100ppm	**150ppm**	**200ppm**	**100ppm**	**150ppm**	**200ppm**	**100ppm**	**150ppm**	**200ppm**
Neem	12.37klmn	10.63mn	8.53mn	13jklmn	11.02lmn	8.83n	13jklmn	11.43lmn	9.23n
Eucalyptus	19.93fghi	17.63hijk	15.4ijklm	19.93fghi	18.3hij	15.9ijklm	19.93fghi	18.67ghi	16.27ijkl
Parthenium	27.13de	24.6ef	22.73efgh	30.47d	25.97de	24.1efg	31.17d	26.53de	24.83ef

Level of Significance: 5%
LSD for Spray × Treatment: 1.5847
LSD for Spray: 0.7924
LSD for Treatment: 0.9149
LSD for Concentration: 0.7924
LSD for Spray × Concentration: 1.3724
LSD for Treatment × Concentration: 1.5847
LSD for Spray × Treatment × Concentration: 2.7448 **s**

After 3rd spray, mean disease incidence was 13%, 11.43% and 9.23% in those plants where neem extract was applied at 100ppm, 150ppm and 200ppm, respectively. Onion extract treated plants showed mean disease incidence of 19.93%, 18.67% and 16.27% at 100ppm, 150ppm and 200ppm, respectively. Eucalyptus extract sprayed plants showed mean disease incidence of 31.17%, 26.53% and 24.83% at 100ppm, 150ppm and 200ppm concentrations, respectively.

These results show some resemblance with Jensen *et al.* (2004) in which it was investigated the role of bio agents in managing *Alternaria* blight of carrot is significant. Highly infected carrot seed with *A. dauci* / *A. radicina when* bioprimed with *Clonostachys rosea* strain IK 726, reduced the incidence of the pathogen to 4.8 per cent with a lower infection rate. For the botanical management of *Alternaria* blight, plant extracts were used. Extract of three plants viz. Neem (*Azadirachta indica*), Onion (*Allium cepa*) and Eucalyptus (*Eucalytpus* spp.) were prepared at three concentrations i.e. 10ppm, 15ppm and 20ppm, respectively. These extracts at each concentration were sprayed thrice at an interval of 7 days.

The results concluded that neem extract at concentration of 200ppm was very much effective in reducing the incidence of *A. dauci* while eucalyptus extract at 100ppm was least effective in reducing the disease incidence as compared to control after 1st, 2nd and 3rd spray. The analysis of variance at all three sprays also showed significant impact as plant extracts showed significant response in reducing the disease incidence as compared to control after three sprays at 5% significance level.

4. Conclusion

Proper forecasting of disease along with the use of resistant varieties and post-infection treatment of plant extracts is favorable for the proper management of *Alternaria* blight of carrot.

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