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## Effect of Plant Extracts and Boron on Incidence of *Alternaria* Blight, Browning Diseases and Yield of Cauliflower

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### Abstract

Leaf extract of chirata (*Andrographis paniculata*), neem (*Azadirachta indica*), wild tulsi, *Trichoderma viride* (Tv), boron, *Trichoderma viridae* and their combination were evaluated against management of *Alternaria* blight of cauliflower caused by *Alternaria brassicae* an browning diseases of cauliflower. Mean of two years data showed that highest cauliflower yield of 517.7 q ha<sup>-1</sup> was obtained when Seed treatment with Tv plus soil application of boron @ 1kg ha<sup>-1</sup> plus two spray of Chiraita leaf extract (5%) was applied. This treatment also recorded browning disease incidence of 5.4%, *Alternaria* blight disease intensity of 9.5% and increase in yield over control of 84.9%. This treatment was followed by seed treatment with Tv plus soil application of boron @ 1kg ha<sup>-1</sup> plus two spray of leaf extract of wild tulsi (5%) which recorded cauliflower yield of 492.9 q ha<sup>-1</sup>, browning disease incidence of 7.1%, *Alternaria* blight disease intensity of 12.9% and increase in yield over control of 76.0%, whereas, the control plots recorded cauliflower yield of 280.3 q ha<sup>-1</sup>, browning disease incidence of 63.5%, *Alternaria* blight disease intensity of 22.4%.

**Keywords:** *Alternaria* blight, *Alternaria brassicae*, browning, boron, cauliflower, plant extracts, *Trichoderma viridae*, management

### Introduction

Cauliflower is an important commercial vegetable crop grown in India. Soil of Jharkhand state is highly deficient to boron causes browning disease in Cauliflower and *Alternaria* blight of cauliflower caused by *Alternaria brassicae* (Berke) Sacc. are economically vital diseases causing serious loss to cauliflower cultivation in India (Kolte, 1985; Verma and Saharan, 1994), particularly in Jharkhand State. Chemical pesticides are most commonly used for controlling *Alternaria* blight of cauliflower in the field. However, their adverse effects on soil beneficial microorganism and the environment cannot be ignored. Continuous use of potentially hazardous chemicals is posing an increased threat to environment. The danger inherent in these chemicals has brought forth an awareness to find out other alternatives like biopesticides or biocontrol agents to control the diseases. Exploratory studies on finding bioprotecting agents from various plants are going on around the world. Plant extracts as potential antifungal agents are being exploited against several fungal diseases and such extracts contain active compounds that are biodegradable. Therefore, the present investigation was undertaken to evaluate three plant extracts viz., leaf extract of chirata (*Andrographis paniculata*), neem (*Azadirachta indica*), wild tulsi (*Ocimum gratissimum*), *Trichoderma viride* (Tv), boron and their combination for controlling the *Alternaria* blight, browning diseases of cauliflower.

### Materials and Methods

#### Isolation and identification of the pathogen

The pathogen from the cauliflower blighted leaf was isolated on PDA medium at a temperature of 27 ± 2 °C and pure culture was obtained by single spore method. Identification of the pathogen was made on the basis of its morphological characters and growth characteristics. Dimension of the conidia and conidiophores was measured using ocular and stage micrometer.

#### Pathogenicity test

Koch's postulates were followed in controlling the pathogenicity. To harvest conidia and mycelia beats sterile distilled water was added to 10 days old culture growing on PDA slants and a few drops of tween-20 (20 drops/L) was added as wetting agent. The conidial suspension thus obtained by shaking was sprayed on 45 days old plants of the cultivar Pusa Deepali, grown in pot (45 cm x 30 cm) using hand atomizer.

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After inoculum spraying plants were covered with transparent plastic cover and kept in the glass house at a temperature ranging from 15-25 °C. In case of control plants sterile distilled water containing Tween-20 was sprayed.

### Preparation of Plant Extracts

Leaves of Neem (*Azadirachta indica*), Chirata (*Andrographis paniculata*) and Wild tulsi (*Ocimum gratissimum*) were initially washed with tap water followed by sterilized water, air dried and individually crushed in a warring blender using sterile water (1:1 W/V) separately. The extracts was filtered through a double layer muslin cloth and centrifuged at 5000 ppm rpm for 15 min. The clear supernatant was collected which was considered 100% stock solution. Five per cent solution of above was made by diluting 5 ml plant extract in 100 ml of sterilized distilled water.

Field trials were conducted during Rabi, 2015-16, and 2016-17 crop seasons at Darisai Research Farm of Birsa Agricultural University, Jharkhand. The trials were laid out in RBD with three replications. Twenty days old seedlings of highly susceptible cauliflower (Cultivar - Amazing, F1 Hybrid) were transplanted on 2<sup>nd</sup> week of November in 4.5 m X 3.0 m plots with spacing of 60 cm X 45 cm. The seed rate was 300 g ha<sup>-1</sup> and recommended dose fertilizers (N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O - 200: 150: 100 kg ha<sup>-1</sup>) were applied. 100 Kg N, 150 kg P<sub>2</sub>O<sub>5</sub> and 100 kg K<sub>2</sub>O ha<sup>-1</sup> were applied at the time of transplanting, top dressing of 50 Kg N ha<sup>-1</sup> (Urea) was applied at 25 and 55 DAT of the crop. The treatment details were as follows T1. Cauliflower seed treatment with *Trichoderma viride* @ 10 g ha<sup>-1</sup> T2. Soil application of boron @ 1.0 Kg ha<sup>-1</sup> T3. T1 + Two sprays of chiraita (*Andro graphis paniculata*)

leaf extract (5%) T4. T1 + Two sprays of neem (*Azadirachta indica*) leaf extract (5%) T5. T1 + Two sprays of wild tulsi (*Ocimum gratissimum*) leaf extract (5%) T6. T2 + Two sprays of Chirata (*Andrographis paniculata*) leaf extract (5%) T7. T2 + Two sprays of Neem (*Azadirachta indica*) leaf extract (5%) T8. T2 + Two sprays of wild tulsi leaf extract (5%) T9. Control (water spray). Boron was applied at the time of transplanting as per treatment. Plots were inoculated with pathogen (eight days old culture) suspended in water (1 x10<sup>6</sup> spore ml<sup>-1</sup> of water) and applied to plots during the 60 DAS of the crop when the environmental conditions were favourable for development of the disease during above two years (Deep and Sharma, 2012). Three plant products of two foliar sprays as per above treatments were applied. First spray was applied three days after artificial inoculation of the pathogen *i.e.*, pre flowering stage and second spray was given 10 days after first spray. The control plots were sprayed with water only. All possible care was taken to prevent pest attack by spraying insecticide according to the necessity. The disease observation was recorded ten days after second spray. Disease scores on individual leaves were calculated by using a 1-9 rating scale given by Sharma *et al.* (2004) where, 1= No infection, 9= 81- 100% infection, Disease severity value as per cent disease index (PDI) was calculated as PDI= [  $\sum(\text{severity grade} \times \text{number of leaves/plant}) / \text{Maximum grade} \times \text{total number of leaves/plant scored}$ ] X 100. Flower yield was also recorded for each plot after harvesting. Increase in yield over control was also worked out. All the data of field trials (RBD) were subjected to standard statistical analysis as per Gomez and Gomez (1984).

**Table 1:** Evaluation of biocontrol agents and boron on incidence of *Alternaria* blight and browning diseases of cauliflower

Treatments	Browning			Alternaria blight (PDI-%)			yield (q/ha)			IYOC (%)		
	*2015	*2016	Mean	*2015	*2016	Mean	*2015	*2016	Mean	*2015	*2016	Mean
T1. Cauliflower Seed treatment with <i>Trichoderma viride</i>	55.0	60.8	57.9	18.8	20.5	19.7	320.4	288.3	304.4	6.5	10.6	8.6
T2. Soil application of boron @ 1.0 Kg ha <sup>-1</sup>	7.5	3.3	5.4	19.8	23.7	21.8	401.9	382.4	392.2	41.2	38.7	40.0
T3. T1 + Two sprays of Chirata ( <i>Andrographis paniculata</i> ) leaf extract (5%)	40.8	50.8	45.8	13.7	9.9	11.8	390.7	362.7	376.7	34	34.8	34.4
T4. T1 + Two sprays of Neem ( <i>Azadirachta indica</i> ) leaf extract (5%)	43.3	57.5	50.4	16.2	18.9	17.6	339.8	326.9	333.4	20.8	17.3	19.1
T5. T1 + Two spray of wild Tulsi ( <i>Ocimum gratissimum</i> ) leaf extract (5%)	38.3	42.5	40.4	14.6	14.9	14.8	369.4	354.6	362.0	31.0	27.5	29.3
T6. T1+ T2 + Two sprays of Chiraita leaf extract (5%)	5.8	5.0	5.4	10.6	8.4	9.5	520.4	514.9	517.7	90.2	79.6	84.9
T7. T1 + T2+ Two sprays of Neem leaf extract (5%)	5.8	7.5	6.7	15.2	16.2	15.7	450.0	459.0	454.5	69.6	55.3	62.5
T8. T1 + T2+ Two spray of wild Tulsi leaf extract (5%)	4.2	10.0	7.1	14.4	11.3	12.9	500	485.7	492.9	79.4	72.5	76.0
T9. Control (Only water)	57.5	69.5	63.5	20.6	24.2	22.4	289.8	270.7	280.3			
CD at 5%	10.9	6.5	8.8	3.4	7.8	5.1	56.3	38.2	44.2			
CV (%)	16.6	12.6	13.4	14.4	17.3	15.2	8.1	16.4	13.4			

\*Mean of three replication Figures in percentage were transformed in arc sine values before analysis

### Results and Discussion

All treatments showed significant disease control in comparison to control. *Alternaria* blight disease was adequately managed by the leaves extract of Neem (*Azadirachta indica*), Chirata (*Andrographis paniculata*) and Wild tulsi (*Ocimum gratissimum*). Mean of two years data showed that yield of cauliflower was significant highest (517.7 q ha<sup>-1</sup>) in treatment *i.e.*, when Seed treatment with TV plus soil application of Boron @ 1kg ha<sup>-1</sup> plus two spray of Chiraita leaf extract (5%) was applied. This treatment also recorded browning disease incidence of 5.4 %, *Alternaria* blight disease intensity of 9.5 % and increase in yield over control of 84.9%. This treatment was followed by seed treatment with Tv plus soil application of boron @ 1kg ha<sup>-1</sup>

plus two spray of leaf extract of wild tulsi (5%) which recorded cauliflower yield of 492.9 q ha<sup>-1</sup>, browning disease incidence of 7.1 %, *Alternaria* blight disease intensity of 12.9% and increase in yield over control of 76.0%, The next best treatment in order to superiority was T7 *i.e.*, Seed treatment with Tv plus soil application of boron @ 1kg ha<sup>-1</sup> plus two spray of leaf extract of neem (5%) which recorded cauliflower yield of 454.5 q ha<sup>-1</sup>, browning disease incidence of 6.7 %, *Alternaria* blight disease intensity of 15.7% and increase in yield over control of 62.5%. whereas, the control plots recorded cauliflower yield of 280.3 q ha<sup>-1</sup>, browning disease incidence of 63.5%, *Alternaria* blight disease intensity of 22.4%.

Patni *et al* (2005) reported that *Alternaria* blight of mustard

caused by *A. brassicae* can be adequately managed by spraying of leaf extract of Eucalyptus (5%) and gave highest yield of mustard.

Seed treatment with carbendazim @ 2g/kg seed plus two sprays of chiraita leaf extract(5%) recorded lowest disease intensity of *Alternaria* blight of mustard (11.1%) and highest mustard yield of 7.31 q/ha and increase in grain yield over control of 28.6%. (Barnwal, 2016).

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