To Evaluate in vitro Bio-efficiency of Different Plant-Extracts against Colletotrichum gloeosporioides Penz. and Sacc. causing Fruit Rot of Aonla

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Abstract

Colletotrichum gloeosporioides Penz. and Sacc. is associated with aonla, in that fruit rot of aonla is one of the contributing factors for this low productivity. Therefore, the ecofriendly and environmentally safe management of fruit rot disease with the use of plant extracts is necessary. Different plant extracts evaluated under in vitro condition against the mycelial growth of Colletotrichum gloeosporioides. Plant extracts viz., Allium sativum (82.74 %), Azadirachta indica (80.77 %), Ocimum sanctum (77.1 %) mycelial growth inhibition of fungus under laboratory dual culture technique.

Keywords
Aonla (Emblica officinalis Gaertn), Colletotrichum gloeosporioides Penz. and Sacc

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Introduction

Aonla (Emblica officinalis.Gaertn.) is one of the major fruit crop in the State of Maharashtra. The anola is affected by number of fungal pathogens such as Colletotrichum gloeosporioides. Penz. and Sacc. (fruit rot) Ravenelia emblica Styd. (rust), Fusarium spp. (wilt), Penicillium citrinum Thom. (fruit rot or blue mould), Phomopsis phyllanithi Punith (soft rot), Phoma putaminum Speg. (dry fruit rot), Aspergillus terreus (fruit rot) etc. Among them, the fruit rot caused by Colletotrichum gloeosporioides. Penz. and Sacc. is a major disease of aonla fruit and responsible for causing 2- 29 per cent yield loss (Sohi, 1975).

Keeping in view economic importance of aonla and losses incurred due to fruit rot disease, present investigations on the various aspects viz., survey, symptomatology, pathogenicity test, morphological and cultural characteristics, efficacy of different fungicides, bio-agents, plant extracts were undertaken during the season of Kharif 2018-2019 at Department of Plant Pathology, College of Agriculture, Badnapur, V.N.M.K.V Parbhani. The results obtained on the above aspects during the present
investigations are being interpreted and presented in the following paragraphs.

Prashanth et al., (2008) evaluated the plant extracts of eucalyptus, garlic extract, ocimum leaf extract, Polyalthia longifolia leaf extract inhibited the growth of C. gloeosporoides the causal organism of pomegranate anthracnose.

Jadav et al., (2008) reported that garlic bulb (10 %) extract was effective in inhibiting the growth of Colletotrichum gloeosporioidees.

Materials and Methods

In vitro evaluation of different phyto-extracts

Plant based pesticides which are relatively economical, safe and non-hazardous can be successfully used against the plant pathogenic fungi. The following plant extracts/botanicals were selected to know their efficacy in inhibition of Colletotrichum gloeosporioidees Penz. and Sacc. (as virulent one). Antifungal activity of different plant extracts were studied under in-vitro condition. The nine medicinal plant species viz., Allium cepa, Allium sativum Linn., Catharanthus roseus, Ocimum sanctum, Azadirachta indica, Bougainvillea spectabilis, Gliricidia maculate L., Sapindus marginatus, Eucalyptus spp. Control were used to study antifungal activity.

Preparation of phyto-extracts

Fresh healthy plant parts (leaves/cloves/bulbs) collected from fields were washed with distilled water and air-dried. 100 gms of each plant extract was crushed in 100 ml of acetone (Garlic and Onion crushed in 100 ml of distilled water) (v/v). The extract was filtered through double layered, muslin cloth and further filtrated through Whatman No.1 filter paper using funnel and volumetric flasks (100 ml cap.).

To study the antifungal mechanism of plant extract, the poisoned food technique was used (Nene and Thapliyal, 1982). An appropriate quantity of each plant extract (100 %) was separately mixed thoroughly with autoclaved and cooled (40 °C) PDA medium in conical flasks (250 ml cap.) to obtained desired concentrations of 10 % (10 ml solution mixed with 90 ml molten PDA media). The PDA medium amended separately with plant extracts was then poured (10 ml/plate) into sterile glass petri plates (90 mm dia.) and allowed to solidify at room temperature.

After solidification of PDA, all the treatment and control plates were aseptically inoculated by placing in the center a 5 mm mycelial disc obtained from a week old actively growing pure culture of Colletotrichum gloeosporioidees Penz. and Sacc. Plates containing plain PDA without any botanical extract served as untreated control. For each test botanical extract, three plates / treatment were maintained. All these plates were then incubated at 27 ± 2 °C temperature for a week or till the untreated control plates were fully covered with mycelial growth of the test fungus.

All these plant extracts were evaluated @ 10 per cent and observations on radial mycelial growth of the test pathogen were recorded at 24 hrs. interval and continued till growth of test pathogen in untreated control plate was fully covered. Per cent inhibition of test pathogen was also calculated by applying the formula given by (Vincent, 1927).

Per cent inhibition (I)

\[
C - T = \frac{C - T}{C} \times 100
\]

Where, \( C \) = growth (mm) in control plate

\( T \) = growth (mm) in treatment plate
Results and Discussion

**In-vitro evaluation of plant extracts against C. gloeosporioides**

The extracts of nine botanicals (each @ aqueous conc. of 10 %) were evaluated in-vitro against *C. gloeosporioides* and the results obtained on its mycelial growth and inhibitions are presented in the results revealed that all the nine botanicals evaluated were found fungistatic against *C. gloeosporioides* and recorded significantly reduced mycelial growth of the test pathogen over untreated control (Table 1, Fig. 1 and Plate 1).

**Radial mycelial growth**

At 10 per cent concentration, mycelial growth of the test pathogen was ranged from 15.53 mm (*Allium sativum* Linn.) to 68.32 mm (*Catharanthus roseus*) against untreated control (90 mm). However, significantly least mycelial growth was recorded with *Allium sativum* (15.53 mm). This was followed by the botanicals *viz.*, *Azadirachta indica* (17.30 mm), *Ocimum sanctum* (20.61 mm), *Gliricidia maculate* L. (38.43 mm), *Bougainvillea spectabilis* (40.72 mm) *Allium cepa* (45.34 mm), *Sapindus marginatus* (50.13 mm) *Eucalyptus spp.* (55.05 mm) and *Catharanthus roseus* (68.32 mm) depicted in (Table 1, Fig. 1 and Plate 1).

**Per cent mycelial growth inhibition**

At 10 per cent, mycelial growth inhibition of *C. gloeosporioides* was ranged from 24.08 % (*Catharanthus roseus*) to 82.74 % (*Allium sativum*) per cent. However, significantly maximum mycelial growth inhibition was recorded with *Allium sativum* (82.74 %). This was followed by the plant extracts *viz.*, *Azadirachta indica* (80.77 %), *Ocimum sanctum* (77.10 %), *Gliricidia maculate* L. (57.32 %), *Bougainvillea spectabilis* (54.75 %) *Allium cepa* (49.62 %), *Sapindus marginatus* (44.29 %) *Eucalyptus spp.* (38.83 %) and *Catharanthus roseus* (24.08 %) presented in (Table 1, Fig. 1 and Plate 1).

The results of present investigation resembling the findings of earlier workers *viz.*, Mukherjee *et al.*, (2011), Anteneh *et al.*, (2013), Hegde *et al.*, (2014), Sonawane and Sumia Fatima (2016), Gwa and Nwankiti (2017).

### Table 1 Details of experiments

| Treat. No. | Name of Plant extracts | Common name         | Dose  | Plant part used      |
|------------|------------------------|---------------------|-------|----------------------|
| T<sub>1</sub> | *Allium cepa*          | Onion               | 10 %  | Bulb Extract         |
| T<sub>2</sub> | *Allium sativum* Linn. | Garlic              | 10 %  | Clove Extract        |
| T<sub>3</sub> | *Catharanthus roseus* | Periwinkle           | 10 %  | Leaf Extract         |
| T<sub>4</sub> | *Ocimum sanctum*      | Tulsi                | 10 %  | Leaf Extract         |
| T<sub>5</sub> | *Azadirachta indica*  | Neem                 | 10 %  | Leaf Extract         |
| T<sub>6</sub> | *Bougainvillea spectabilis* | Bougainvillea   | 10 %  | Leaf Extract         |
| T<sub>7</sub> | *Gliricidia maculate*  | Giripushpa           | 10 %  | Leaf Extract         |
| T<sub>8</sub> | *Sapindus marginatus*  | Soap nut             | 10 %  | Fruit Extract        |
| T<sub>9</sub> | *Eucalyptus spp.*      | Nilgiri              | 10 %  | Leaf Extract         |
| T<sub>10</sub> | Control                | -                   | -     | -                    |
Table 2 *In-vitro* efficacy of different plant extracts against radial mycelial growth and per cent inhibition of *C. gloeosporioides*.

| Tr No | Treatments               | Common Name     | Colony Dia. of Pathogen**(mm)** | % Inhibition   |
|-------|--------------------------|-----------------|---------------------------------|----------------|
| T1    | *Allium cepa*            | Onion           | 45.34                           | 49.62 (44.55)  |
| T2    | *Allium sativum* Linn.   | Garlic          | 15.53                           | 82.74 (65.45)  |
| T3    | *Catharanthus roseus*    | Periwinkle      | 68.32                           | 24.08 (29.38)  |
| T4    | *Ocimum sanctum*         | Tulsi           | 20.61                           | 77.1 (61.40)   |
| T5    | *Azadirachta indica*     | Neem            | 17.30                           | 80.77 (63.99)  |
| T6    | *Bougainvillea spectabilis* | Bougainvillea | 40.72                           | 54.75 (47.72)  |
| T7    | *Gliricidia maculate* L. | Giripushpa      | 38.43                           | 57.32 (49.20)  |
| T8    | *Sapindus marginatus*    | Soap nut        | 50.13                           | 44.29 (41.72)  |
| T9    | *Eucalyptus* spp.        | Nilgiri         | 55.05                           | 38.83 (22.84)  |
| T10   | Control                  | -               | 90.00                           | 00.00 (00.00)  |
|       | **SE ±**                 | -               | **0.93**                        | **1.14**       |
|       | **C.D. @ 0.01**          | -               | **2.58**                        | **3.16**       |

*Mean of three replications; Dia.-Diameter; Conc. - Concentration; Figures in parenthesis are arc sine transformed value.
In-vitro inhibitory efficacy of different plant extracts at 10% on radial growth and inhibition of *C. gloeosporioides* Penz. and Sacc.

- $T_1$: Onion
- $T_2$: Garlic
- $T_3$: Periwinkle
- $T_4$: Tulsi
- $T_5$: Neem
- $T_6$: Bougainvillea
- $T_7$: Giripushpa
- $T_8$: Soap nut
- $T_9$: Nilgiri
- $T_{10}$: Control
**Fig.1** *In-vitro*, effect of different plant extracts on radial mycelium growth and per cent inhibition of *C. gloeossprioides*
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