

Research Article

Antifungal Activity of Plant Extracts against Resistant Mutant of *Alternaria Alternata* Causing Fruit Rot of Grapes

K. S. Kadam

¹Department of Botany, K.K.M. College, Manwath-431505, Dist. Parbhani (MS), India**Article History**

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Abstract: The objectives of present study was to evaluate antifungal activity of plant extracts viz. *Adhathoda vasica* Nees, *Capsicum annum* L., *Curcuma longa* L., *Eucalyptus globulus* Labill., *Phyllanthus emblica* Gaertn., *Piper niger*, and *Terminalia bellerica* L. alone and in mixture with Aureofungin against resistant mutant of *Alternaria alternata* causes fruit rot of grapes. All tested plant extracts showed some Antifungal activity, the results revealed that the individual PCE of *Piper niger* (72.46 & 58.72); *Adhathoda vasica* Nees (70.54 & 62.24); *Phyllanthus emblica* (61.13 & 48.94); *Curcuma longa* (52.65 & 51.67) were highly effective alone while aureofungin along with these plant extracts, the PCE was again increased. Use of plant extracts in combination with aureofungin was more fruitful.

Keywords: Fruit rot, Aureofungin, Plant extracts, *Alternaria alternata*.

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INTRODUCTION

Fruit rot of Grapes caused by many fungal pathogens, of these *Alternaria alternata* fruit rot is important one in the orchard and also in storage or transport (Chahal and Malhi, 1969; Krishnauah *et al.*, 1983). Aureofungin is most effective fungicide against *Alternaria*. (Ghosh and Gemawat, 1976; Krishna *et al.*, 1998). In recent years, antifungal activities of different plants extracts have been reported against *Alternaria* (Singh, J. and Majumdar, 2001; Patni and Kolte, 2006.; Pandey and Prasad, 2007; Raja, 2010; Waghmare, 2012; Mahapatra and Das, 2013; Harde and Suryawanshi, 2014; Sadana and Didwania, 2015; Debbarma *et al.*, 2017; Kadam *et al.*, 2018.; Gupta *et al.*, 2019). Therefore, present investigation was made to find out antifungal activity of plant extracts against resistant mutant of *Alternaria alternata*.

MATERIALS AND METHODS

Twenty isolates of *Alternaria alternata* were collected from orchards and markets of different regions of Maharashtra and Aureofungin was tested against these isolates by using food poisoning technique (Nene & Thaplial, 1993) and minimal inhibitory concentration (MIC) was calculated as described by Molnar *et al.*, (1985). It was noted that, MIC of highly sensitive isolate (At-1) was 324.89 µg/ml while that of resistant isolate (At-19) was 974.74 µg/ml. The

sensitive isolate was treated with Ethyl Methane Sulphonate (EMS) to produce highly resistant mutant (EMS- At- 3) which was used for further studies (Dekker, 1982).

Aqueous plant extracts were prepared by gridding 50 gm fresh leaves with 50ml sterile distilled water and filter through muslin cloth and this extracts was considered as 100%. Czapek –Dox agar plates were treated with plant extracts and Aureofungin (800 µg/ml) alone and in mixture (1:1).and resistant mutant of *A. tenuis* was inoculated at the centre of the Petriplate and incubated at (26±1°C). The agar plates without treatment served as control. The percentage control efficacy (PCE) was calculated 8 days after incubation period using following formula

$$PCE = 100 \left[1 - \frac{x}{y} \right]$$

Where

x = Diameter of colony on treated agar plates,
y = diameter of colony on control agar plates.

For in *vivo* study, grape fruits were surface sterilized with 0.01% Hgcl₂ solution and washed 10 times with sterile distilled water and treated with Aureofungin (1200 µg/ml) and aqueous plant extract alone and in

mixture (1:1) and inoculated with spore suspension of resistant mutant of *A. alternata* by pin prick method and percentage disease index (PDI) was calculated after eight days and on the basis of PDI, percentage control efficacy (PCE) was calculated.

$$PCE = 100 \left[1 - \frac{x}{y} \right]$$

Where,

x = Percentage disease index of treated fruits

y = Percentage disease index of untreated fruits.

Table-1: Percentage control efficacy (PCE) plants extract individually and mixture with Aureofungin (800 µg/ml) against resistant mutant of *Alternaria alternata* on agar plates.

Sr. No.	Plant extracts	Individually PCE	Mixture PCE
1	<i>Adhathoda vasica</i> Nees	70.54	88.62
2	<i>Capsicum annum</i> L.	27.45	48.79
3	<i>Curcuma longa</i> L.	52.65	66.58
4	<i>Eucalyptus globulus</i> Labill	37.41	58.66
5	<i>Phyllanthus emblica</i> Gaertn.	61.13	76.34
6	<i>Piper niger</i>	72.46	84.62
7	<i>Terminalia bellerica</i> L.	36.77	58.34
8	Aureofungin(800µg/ml)	44.67	-
	SE±	5.87	5.61
	CD @ 5%	13.91	13.28

Values are Mean ± Standard Error

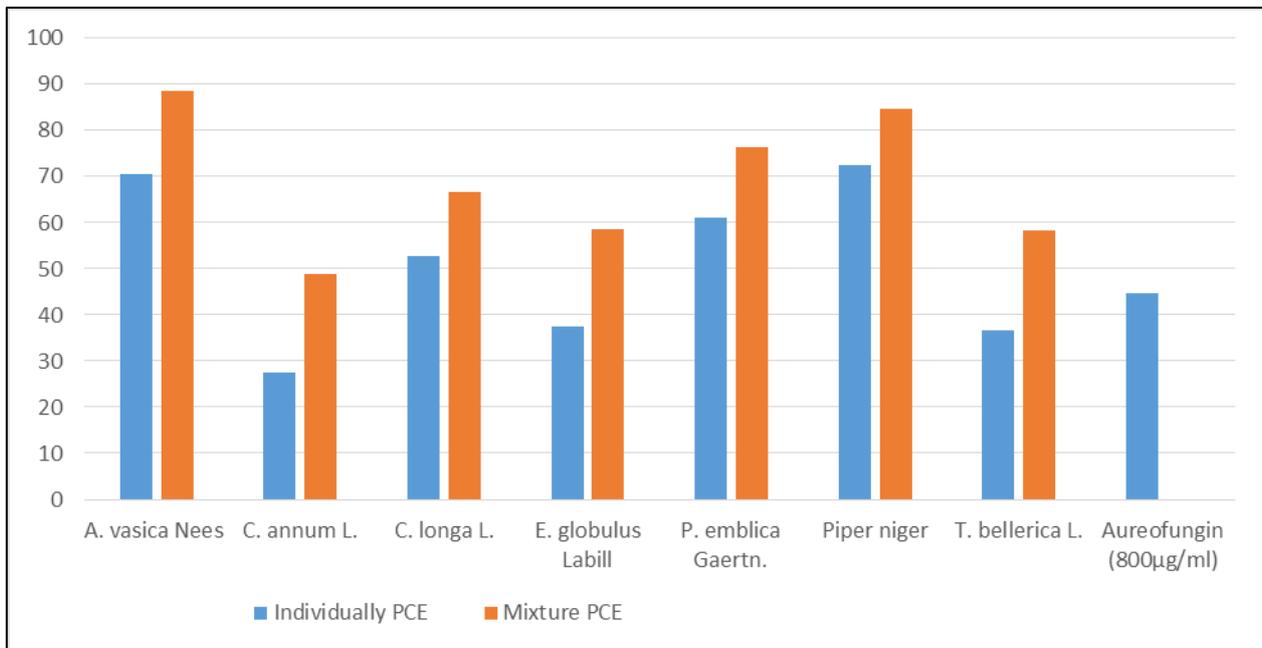


Fig.1 Percentage control efficacy (PCE) plants extract individually and mixture with Aureofungin (800 µg/ml) against resistant mutant of *Alternaria alternata* on agar plates.

Table-2: Percentage control efficacy (PCE) of plants extract alone and mixture with Aureofungin (1200 µg/ml) against resistant mutant of *Alternaria alternata* on grape fruits.

Sr. No.	Plant extracts	Individually PCE	Mixture PCE
1	<i>Adhathoda vasica</i> Nees	62.24	73.77
2	<i>Capsicum annum</i> L.	20.18	46.15
3	<i>Curcuma longa</i> L.	51.67	58.76
4	<i>Eucalyptus globulus</i> Labill	22.83	47.34
5	<i>Phyllanthus emblica</i> Gaertn.	48.94	57.83
6	<i>Piper niger</i>	58.72	70.46
7	<i>Terminalia bellerica</i> L.	26.14	47.15
8	Aureofungin (800µg/ml)	38.94	-
	SE±	5.88	4.30
	CD @ 5%	13.92	10.17

Values are Mean ± Standard Error

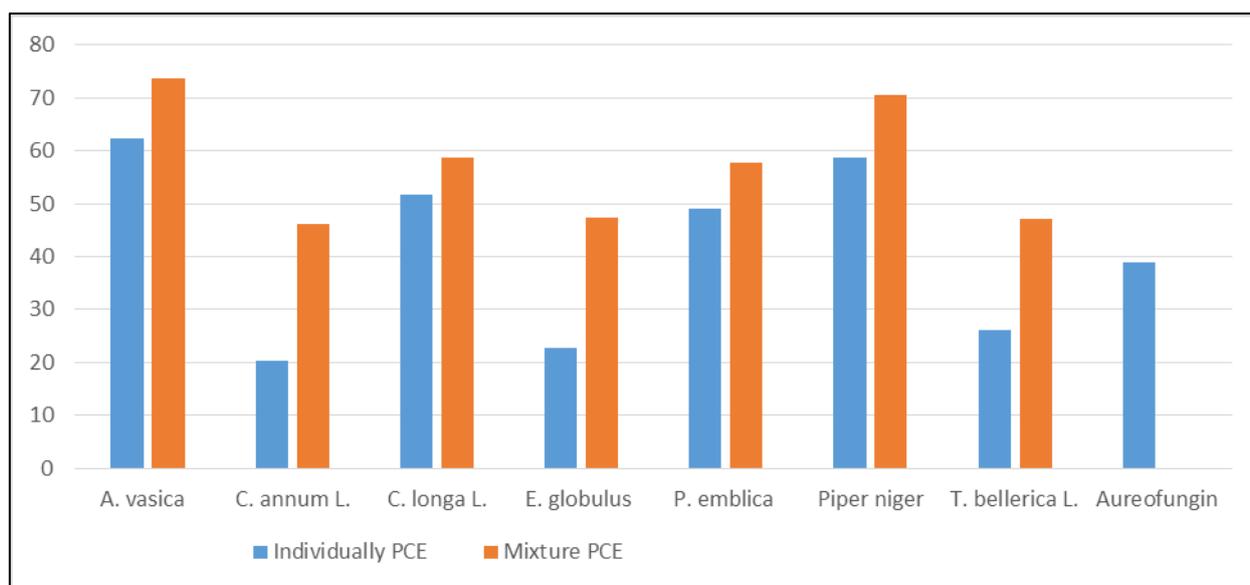


Fig.2 Percentage control efficacy (PCE) of plants extract alone and mixture with Aureofungin (1200 µg/ml) against resistant mutant of *Alternaria alternata* on grape fruits.

RESULTS AND DISCUSSION

In the present study total seven plant extracts were tested alone and mixture with Aureofungin against resistant mutant of *Alternaria alternata* (Table 1 and Table 2). It was seen that individually all the extracts of plants were inhibitory to the Aureofungin resistant mutant of *Alternaria alternata*. Among all plants extracts, *Piper niger* (72.46 and 58.72); *Adhathoda vasica* Nees (70.54 and 62.24); *Phyllanthus emblica* (61.13 and 48.94); *Curcuma longa* (52.65 and 51.67) were highly effective as they showed PCE more than Aureofungin individually. When Aureofungin was used along with the extracts of all these plants, there was again increase in the PCE against the test pathogen. The PCE was always higher than that of the Aureofungin alone in all the cases. In combination with Aureofungin (800 µg/ml) and Aureofungin (1200 µg/ml) and *Adhathoda vasica* Nees found highest PCE (88.62% and 73.77%) followed by *Piper niger* (84.62% and 70.46%) respectively.

Results from the present study could be correlated with the studies made by Rahman *et al.*, (2015) *Adhathoda vasica* extract showed the maximum inhibition of mycelial growth of *A. porri*. Masih *et al.*, (2015) who observed that the aqueous extracts of curcuma longa showed inhibitory effect on the growth of *A. solani*. Patekar *et al.*, (2017) reported that the plants like *Adhathoda vesica* *Ocimum sanctum* and other plant extracts were found very effective against control of seed borne pathogens and shown increased seed germination. Fayaz Ahmad, *et al.*, (2017) reported that plants extract of *A. sativum*, *Curcuma longa*, *M. azedarach*, *Zingiber officinale* significantly reduced *A. solani* growth on PDA. Sarfaraz *et al.*, (2018) reported that turmeric extract showed maximum inhibition of *A. solani*. Gupta *et al.*, (2019) *A. indica* and *Capsicum annum* plant extracts were found highly effective against *Alternaria brassicicola*. Among ten plant

extracts *Curcuma longa* showed highest inhibition of *A. solani* followed by *A. sativum* and *E. globulus* (Rex *et al.*, 2019).

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