



Plant Pathology Journal

ISSN 1812-5387

science
alert

ANSI*net*
an open access publisher
<http://ansinet.com>

Use of Botanical Products for Breakdown the Parasitize of New Recorded *Penicillium funiculosum* of Aonla

¹S.M. Yadav, ¹R.K. Patil, ²Saurabh Singh, ²L.P. Balai and ²Rai Ajay Kumar

¹Department of Plant Pathology, B.A. College of Agriculture, Anand Agricultural University,
Anand-388 110 (Gujarat), India

²Department Mycology and Plant Pathology, I.A.S., Banaras Hindu University,
Varanasi 221005, U.P., India

Abstract: The present investigation on was undertaken in the Department of Plant Pathology, B.A. College of Agriculture, A.A.U., Anand. The *Penicillium funiculosum* rot of aonla was found a new record in Gujarat and it was identified by Division of Mycology and Plant Pathology, Indian Agricultural Research Institute, New Delhi (ITCC No.: 7046.08). Bio-efficacy of nine phytoextracts at 10% were tested against the mycelial growth and sporulation of *Penicillium funiculosum in vitro*, among them significantly lowest mycelial growth of *P. funiculosum* was recorded in neem leaf extract (7.75 mm) showing 89.49% growth inhibition. Further it was also proved most effective in reducing the *Penicillium* rot severity both in pre- (20.44%) and post-inoculation (20.87%) treatments at 7 day after inoculation, respectively. The next best treatment in tested phytoextracts tulsi and garlic were found both in *in vitro* and *in vivo* condition.

Key words: Aonla, bio-efficacy, phytoextracts, *Penicillium funiculosum*

INTRODUCTION

The Aonla (*Emblica officinalis* Gaertn., Syn. *Phyllanthus emblica* L.) is an important arid fruit crop in India. The area under aonla cultivation in India is about 50,000 hectares with an annual production 2,00,000 metric tonnes (Goyal *et al.*, 2008). In Gujarat state has 12,000 hectares area under aonla cultivation with an annual production of one lakh MT (Shah *et al.*, 2006). In India, nearly 20-25% of perishables are lost due to post harvest diseases (Sharma and Mashkoo Alam, 1998). It is reported that around 35% of produce is lost in storage and transits (Rawal and Saxena, 2005). In crop protection studies, various natural plant products have been identified and employed to control post harvest diseases of fruits.

MATERIALS AND METHODS

In vitro: Efficacy of different phytoextracts of plant species having medicinal value were tested *in vitro* by Poisoned Food Technique Method against aonla fruit rot pathogen (Nene and Thapliyal, 1979). All the phytoextracts were tested at 10% conc. Fresh and healthy 100 g plant parts of each species were thoroughly washed with tap water and then with

sterile distilled water. They were macerated separately in grinder mixture by adding 100 mL ethanol.

The mixture was filtered through two fold sterilized muslin cloth and the filtrate was centrifuged at 5000 rpm for 10 min. and the clear supernatant extract was collected in sterilized conical flasks. After evaporating the ethanol from extract, the clear extract was collected and diluted with 100 mL distilled sterile water to make volume 1:1 (w/v). This was considered as 100 per cent concentration for the study to test the efficacy of plant extracts (Sinha and Saxena, 1989). Each phytoextracts (10%) were mixed thoroughly in sterilized 100 mL PDA medium filled in 250 mL flask under aseptic condition. The medium was supplemented with streptomycin sulphate @ 50 ppm to prevent bacterial contamination.

In vivo: The phytoextracts studied *in vitro* conditions were tested at 10% concentration by following pre- and post-inoculation methods.

Pre-inoculation method: The healthy, semi-ripe, uniform size aonla fruits of Gujarat Aonla-1 cultivar were surface sterilized by dipping in 0.1% HgCl₂ solution for one minute followed by three washings with distilled sterile water and inoculated separately by the stem end injury method. The spores from 7 day old culture of fruit rot

pathogen were scrapped with the sterile needle and mixed in 200 mL distilled sterile water. The fruits were first dipped in phytoextracts (10%) separately and then inoculated with the pathogen by keeping 12 h interval. The fruits were injured with sterilized cork borer at stem-end and dipped in spore suspension (10^6 spores mL) for 2 min and air dried for 15-20 min. The inoculated and uninoculated (dipped in distilled sterile water) fruits were placed in sterilized polythene bags. One fruit was accommodated in one bag. A piece of sterilized moist absorbent cotton swab was placed inside the bag and mouth of the bag was loosely tied. The bagged fruits were incubated at $27 \pm 1^\circ\text{C}$ for 7 day.

Post-inoculation method: In post-inoculation treatment, the fruits were first inoculated with the pathogen and then treated with the phytoextracts. Further procedure was followed as mentioned above.

RESULTS AND DISCUSSION

In vitro: All the phytoextracts screened were found significantly superior in inhibiting the mycelial growth and sporulation of *P. funiculosum* over control. The results presented in Table 1 revealed that significantly highest mycelial growth inhibition was recorded in neem leaf extract (89.49%) followed by tulsi leaf extract (87.79%) and garlic cloves extract (84.74%). The next best treatment in order of merit were lemon grass, datura leaf, bittergourd fruit, alovera leaf and ginger rhizome extract giving 77.28, 69.49, 63.72, 61.69 and 59.66% growth inhibition, respectively. While, arduci leaf extract found least effective in inhibiting the mycelial growth (39.66%). None of the phytoextracts supported spore production of *P. funiculosum*.

The present findings are supported by the work carried out by Godara and Pathak (1995). They screened five plant extracts *in vitro* and reported that *Ocimum sanctum* leaf extract proved highly effective against *P. italicum* and *Botrydipodia theobromae* causing pre

and post-harvest rots of sweet oranges. Khilare and Gangawane (1997) observed that leaf extract of *Azadirachta indica* (100 PGI) found most effective against *Penicillium* rot of mosambi (72.4 PGI). Raju and Naik (2006) reported that nimbicidin (2.5 and 5.0%) completely inhibited the mycelial growth of blue mould in onion (*Penicillium digitatum*) followed by garlic extract (64.19 and 67.46%).

In vivo: All the phytoextracts (10%) were found significantly superior in reducing the *Penicillium* rot severity over control at 4 and 7th d after inoculation both in pre - and post - inoculation methods (Table 2).

Pre-inoculation: The results presented in Table 2 revealed that the significantly lowest *Penicillium* rot severity was noted in fruits treated with neem leaf extract (15.00 and 20.44%) at 4 and 7th day of inoculation, respectively but it was at par with tulsi leaf extract (16.84%) at 4th d after inoculation. The next best treatment in order of merit was tulsi leaf extract (24.14%) at 7th day of inoculation followed by garlic cloves extract (17.15 and 25.08%), lemon grass leaf extract (20.23 and 25.26%), ginger rhizome extract (21.75 and 29.48%), datura leaf extract (23.37 and 28.98%), bittergourd fruit extract (24.52 and 30.47%) and arduci leaf extract (24.90 and 32.07%) at 4 and 7th day after inoculation, respectively. *Alovera* leaf extract proved least effective in reducing the *Penicillium* rot (26.00 and 31.44%).

Post-inoculation: Significantly lowest *Penicillium* rot severity was recorded in fruits treated with neem leaf extract (14.71 and 20.87%) at 4 and 7th day of inoculation, respectively. The next best treatment in order of merit was tulsi leaf extract (17.61 and 23.75%) followed by garlic cloves extract (18.84 and 25.60%), lemon grass leaf extract (22.14 and 26.36%), ginger rhizome extract (22.14 and 30.96%), *datura* leaf extract (25.08 and 30.12%), bittergourd fruit extract (25.27 and 31.44%) and arduci leaf extract (25.81 and 33.96%) at 4 and 7th day of

Table 1: Bio-efficacy of phytoextracts against *Penicillium funiculosum* in *in vitro*

Phytoextracts (10% conc.)	Botanical name	Mycelial growth (mm)	PGI	Sporulation
Ardusi	<i>Azadirachta indica</i>	44.50	39.66	-
Ginger	<i>Zingiber officinale</i>	29.75	59.66	-
Bittergourd	<i>Momordica charantia</i>	26.75	63.72	-
Datura	<i>Datura stramonium</i>	22.50	69.49	-
Alovera	<i>Aloe barbadensis</i>	28.25	61.69	-
Garlic	<i>Allium sativum</i>	11.25	84.74	-
Tulsi	<i>Ocimum sanctum</i>	9.00	87.79	-
Neem	<i>Azadirachta indica</i>	7.75	89.49	-
Lemon grass	<i>Cymbopogon flexuosus</i>	16.75	77.28	-
Untreated	Control	73.75	00.00	++++
S.Em±			0.872	
C.D. at 5%			2.518	
C.V.%			6.45	

PGI: Percent growth inhibition

Table 2: Bio-efficacy of phytoextracts on the severity of *Penicillium* rot of aonla

Phytoextracts (10%)	Botanical name	Penicillium rot severity (%)			
		Pre-inoculation		Post- inoculation	
		4th day	7th day	4th day	7th day
Ardusi	<i>Adhatoda vasika</i>	24.90 (17.75)*	32.07 (28.25)	25.81 (19.00)	33.96 (31.25)
Ginger	<i>Zingiber officinale</i>	21.75 (13.75)	29.48 (24.25)	22.14 (14.25)	30.47 (25.75)
Bitter gourd	<i>Momordica charantia</i>	24.52 (17.25)	30.47 (25.75)	25.27 (18.25)	31.44 (27.25)
<i>Datura</i>	<i>Datura stramonium</i>	23.37 (15.75)	28.98 (23.50)	25.08 (18.00)	30.12 (25.25)
Aloevera	<i>Aloe barbadensis</i>	26.00 (19.25)	31.44 (27.25)	26.72 (20.25)	32.07 (28.25)
Garlic	<i>Allium sativum</i>	17.15 (8.75)	25.08 (18.00)	18.84 (10.50)	25.60 (18.75)
Tulsi	<i>Ocimum sanctum</i>	16.84 (8.50)	24.14 (16.75)	17.61 (9.25)	23.75 (16.25)
Neem	<i>Azadirachta indica</i>	15.00 (6.75)	20.44 (12.25)	14.71 (6.50)	20.87 (12.75)
Lemon grass	<i>Cymbopogon flexuosus</i>	20.23 (12.00)	25.26 (18.25)	22.14 (14.25)	26.36 (19.75)
Untreated	Control	30.48 (25.75)	37.00 (36.25)	31.60 (27.50)	37.88 (37.75)
S.Em±		0.639	0.650	0.732	0.855
C.D. at 5%		1.844	1.877	2.113	2.470
CV.%		5.80	4.57	6.36	5.85

*Values parenthesis are original value, while outside are the arc sine transformed values

inoculation, respectively. Alovera leaf extract found least effective in controlling the *Penicillium* rot (26.72 and 32.02%).

The results of present investigation are in consonance with the results obtained by Kaur and Verma (2004). They noted that neem dry leaf extracts ($5 \times 10^4 \mu\text{g mL}^{-1}$) found most effective in pre- (94.44%) and post-inoculation (50.00%) in controlling green mould rot (*Penicillium digitatum*) of kinnow fruits. Five% extract of *Azadirachta indica* found better than *Curcuma longa*, *Zingiber officinale*, *Cartharanthus roseus*, *Ocimum basilicum* and *Allium sativum* in controlling the *Penicillium* rot of aonla both in pre and post-inoculation treatments (Meena, 2006). Singh and Sumbali (2003) noted that leaf extract of *Azadirachta indica* was most effective in controlling the *Penicillium expansum* infecting apple fruits.

CONCLUSION

In *in vitro* all nine phytoextracts screened (10%) were found significantly superior in inhibiting the mycelial growth of *P. funiculosum* over control. Lowest mycelial growth was recorded in neem leaf extracts (7.75 mm) showing 89.49 per cent growth inhibition over control. The next best treatment in order of merit was tulsi leaf extract (87.79 PGI). While, ardusi leaf extract found least effective in inhibiting the mycelial growth (39.66%).

Neem leaf extract (10%) proved highly effective in reducing the *Penicillium* rot severity (20.44 and 20.87%) followed by tulsi leaf extract (24.14 and 23.75%) both in pre- and post-inoculation at 7th day of inoculation, respectively. Alovera leaf extract found least effective in controlling the *Penicillium* rot.

ACKNOWLEDGMENT

Authors are grateful to the Professor and Head, Department of Plant Pathology and Principal, B.A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) for providing necessary facilities.

REFERENCES

- Godara, S.L. and V.N. Pathak, 1995. Effect of plant extract on post harvest rotting of sweet orange fruits. Proceedings of the Global Conference on Advances in Research on Plant Diseases and their Management, February 12-17, 1995, Udaipur, India, pp: 172-172.
- Goyal, R.K., R.T. Patil, A.R.P. Kingsly, H. Walia and P. Kumar, 2008. Status of post harvest technology of Aonla in India-A review. Am. J. Food Technol., 3: 13-23.
- Kaur, P. and K.S. Verma, 2004. Efficacy of neem based crude preparation against green mould and styler-end rots of kinnow fruits. J. Res. P.A.U., 41: 227-230.

- Khilare, V.C and L.V. Gangawane, 1997. Application of medicinal plant extract in the management of thiophanate methyl resistant *Penicillium digitatum* causing green mold of mosambi. *J. Myco. Pl. Pathol.*, 27: 134-137.
- Meena, R.D., 2006. Factors affecting post harvest *Penicillium* fruit rot of aonla, (*Emblica officinalis* Gaertn) incited by *Penicillium fellutatum*, Biourge and its management. M. Sc. Thesis, S.K.N. College of Agriculture, RAU, Jobner, Bikaner.
- Nene, Y. L. and R.N. Thapliyal, 1979. Fungicides in Plant Disease Control. 11th Edn., Oxford and IBH Publishing Co., New Delhi, pp: 7-10.
- Raju, K. and M.K. Naik, 2006. Effect of pre harvest spray of fungicides and botanicals on storage disease of onion. *Indian Phytopath.*, 59: 133-141.
- Rawal, R.D. and A.K. Saxena, 2005. Management of post harvest diseases of tropical fruits with reference to India. Proceedings of the 2nd Global Conference, Plant Health-Global Wealth, November 25-29, 2005, Udaipur, India, pp: 1-33.
- Shah, B.R., P.M. Vaghasiya and A.B. Patel, 2006. The fast spreading of Arid Crops in Gujarat. Proceedings of the National Seminar on Production and Processing of Aonla (*Emblica officinalis*. Gaertn). November 21-23, 2006, Amadavad, Gujarat, pp: 99-101.
- Sharma, N. and M. Mashkoo Alam, 1998. Post Harvest Diseases of Horticultural Perishables. International Books Distributing Co., Lucknow, pp: 226-253.
- Singh, Y.P. and G. Sumbali, 2003. Management of *Penicillium expansum* rot of apple by certain plant extract and essential oils. *J. Myco. Pl. Pathol.*, 33: 504-504.
- Sinha, P. and S.K. Saxena, 1989. Effect of treating tomatoes with leaf extracts of certain plant on the development of the fruit rot caused by the *Aspergillus niger* in presence of *Drosophila busekii*. *J. Phyto. Res.*, 2: 97-101.