



Antibacterial activity of plant extracts against *Xanthomonas axonopodis* Pv. *Punicae* causing bacterial blight of Pomegranate (*Punica granatum* L.)

Alane S K and C S Swami

Department of Botany, Dayanand Science College, Latur-413 512

Article Info

Received: 03-09-2015,
Revised: 12-11-2015,
Accepted: 15-11-2015

Keywords:

Pomegranate, Antibacterial activity, *Xanthomona*, bacterial blight

Abstract

Pomegranate (*Punica granatum* L.) is the important fruit crop cultivated throughout the world. It is famous for its refreshing fruits. The crop is affected by 'bacterial blight' caused by *Xanthomonas axonopodis* pv. *punicae*, which is responsible for the failure of crop. It results in the dropping of leaves as well as fruits. It is very hard to manage the disease with chemicals as well as antibiotics and farmers suffer from heavy economic losses. In the present study, aqueous, ethyl alcohol and acetone extracts of ten medicinally useful plants were used against *Xanthomonas axonopodis* pv. *punicae* *in vitro*. The plant extracts showed antibacterial activity and caused inhibition of growth of *Xanthomonas axonopodis* pv. *Punicae*. Among them, *Mentha spicata*, *Murraya Koeninngi*, *Allium sativum* and *Tridax procumbens* caused maximum inhibition of the test bacterium.

INTRODUCTION

Pomegranate (*Punica granatum* L.) is fruit crop famous for its refreshing fruits. The fruits are having medicinal properties (Maria *et al.*, 2010) and consumed fresh or by making juice or processed in jam jelly, anardana or syrups etc.

It is a shrub cultivated world wide in cold and had dry arid areas in India. Maharashtra is top cultivar followed by Karnataka, A. P., Telangana, Gujarat etc. The main challenge to farmers since 2005 is 'bacterial blight' caused by *Xanthomonas axonopodis* pv. *punicae*, which is responsible for the failure of crop upto 60-80 % (Ramesh Chand and Ram Kishan, 1991). It has become an increasingly serious threat for pomegranate growers of the states Andhra Pradesh, Maharastra and Karnataka State of the Indian Subcontinent (R. Kumar *et al.*, 2009). The disease shows symptoms on all aerial plant parts like leaves, fruits and stems. In the beginning of infection, water soaked spots are developed (Deshpande *et al.*, 2014). They look like oil imbibed region hence locally the disease is

called 'Telya' meaning oily spots. Later this area turns brown with yellow margin on leaves. It is followed by leaf fall. The fruits split open from the infected region and drops down. The stem also collapse from the region of infection. Under moist and warm condition, disease spreads very fast and it is very hard to manage with chemicals as well as antibiotics and farmers loose the crop making them heavy economic losses and frustration.

In the present study, aqueous, alcohol and acetone extracts of ten medicinally useful plants were used against *Xanthomonas axonopodis* pv. *punicae* *in vitro*. The use of plant extract to manage disease is eco friendly, economical and toxin free method. It will be beneficial to farmers, consumers as well as nature. India is the largest producer of medicinal herbs and is appropriately called the Botanical garden of the world (Ahmedulla & Nayar, 1999). Approximately 20% of the plants found in the world have been submitted to pharmacological or biological test (Suffredini *et al.*, 2004).

MATERIALS AND METHODS

To study the efficacy of plant extracts, locally available plants were collected. The leaf extract of *Murraya Koeninngi*, *Calotropis procera*, *Aloe vera*, *Tridax procumbens*, *Azadirachta indica*, *Ocimum sanctum*, *Moringa oleifera*, *Allium sativum*, *Mentha spicata*, and *Ricinus communis* were studied for their antibacterial potential. The leaves were shade dried and powdered. Ten gram of the powder was added separately to 100 ml of water, alcohol and acetone. The solution was stirred

for 15 minutes and filtered using Whatman No. 1 filter paper. This filtrate was used to study antibacterial activity *in Vitro*. Suspension of *Xanthomonas axonopodis pv. punicae* was spread on a Petri plate containing solidified *Xanthomonas* agar medium. On this medium, cups of 7 mm were made with the help of sterile borer. In these cups, 1 ml of the plant extract was added and the Petri plates were incubated at 30° C for 24 hours. After incubation, zone of inhibition due to the plant extract was noted.

RESULTS AND DISCUSSION

Table 1 : Antibacterial activity of plant extracts on growth of *Xanthomonas axonopodis pv. punicae*.

| Sr.No. | Plant used | Extract solvent | Zone of inhibition (mm) |
|--------|---------------------------|-----------------|-------------------------|
| 1 | <i>Murraya Koeninngi</i> | Water | 8 |
| | | Alcohol | 19 |
| | | Acetone | 20 |
| 2 | <i>Calotropis procera</i> | Water | 10 |
| | | Alcohol | 15 |
| | | Acetone | 18 |
| 3 | <i>Aloe vera</i> | Water | 8 |
| | | Alcohol | 12 |
| | | Acetone | 19 |
| 4 | <i>Tridax procumbens</i> | Water | 9 |
| | | Alcohol | 17 |
| | | Acetone | 19 |
| 5 | <i>Azadirachta indica</i> | Water | 9 |
| | | Alcohol | 14 |
| | | Acetone | 18 |
| 6 | <i>Ocimum sanctum</i> | Water | 9 |
| | | Alcohol | 12 |
| | | Acetone | 18 |
| 7 | <i>Moringa oleifera</i> | Water | 10 |
| | | Alcohol | 13 |
| | | Acetone | 16 |
| 8 | <i>Allium sativum</i> | Water | 10 |
| | | Alcohol | 12 |
| | | Acetone | 20 |
| 9 | <i>Mentha spicata</i> | Water | 9 |
| | | Alcohol | 13 |
| | | Acetone | 22 |
| 10 | <i>Ricinus communis</i> | Water | 8 |
| | | Alcohol | 16 |
| | | Acetone | 17 |

From table, it becomes clear that, acetone extracts of all the plants were most effective in controlling the growth of *Xanthomonas axonopodis pv. punicae*, followed by the alcohol extracts and water extracts. Among the different plants studied, acetone extract of *Metha spicata* (22 mm), *Allium*

sativum (20 mm) and *Murraya Koeningii* (19 mm), *Tridax procumbens* (17mm) and *Ricinus communis* (16 mm) were found to be most effective. The water extracts *Moringa oleifera* (10 mm), *Calotropis procera* (10 mm) and *Allium sativum* (10 mm) caused inhibition at some extent.

This study reveals that, these plant extracts showed antibacterial activity and caused inhibition of growth of *Xanthomonas axonopodis* pv. *punicae*. Much work has been done on the use of plant extracts against plant- pathogenic fungi and bacteria.

Aqueous extracts of *Prosopis juliflora*, *Oxalis corniculata* and *Lawsonia intermis* showed antibacterial activity against *Xanthomonas campestris* pathovars (Satish *et al.*, 1999). Leaf, stem and bark extracts of *Azadirachta indica* were found to be effective against some bacteria (Arora *et al.*, 2005). The extracts of *Allamanda cathartica*, *Cassia tora*, *Bixa Chebula* showed antifungal activity against *Alternaria brassicola* (Das and Das, 2005). The extract of *Polyalthia longifolia*, *Annona squamosa*, *Curcuma longa* and *Azadirachta indica* were found to inhibit *Alternaria solani*, *Curvularia lunata*, *Fusarium oxysporum* (Swami and Mukadam, 2006). *Catharanthus roseus*, *Ocimum sanctum* and *Euphorbia pulcherrima* were effective against *Colletotricum gloeosporioides*, *C dematium*, *Aspergillus flavus* and *Fusarium oxysporum* (Sreelatha and Bagyanarayana, 2008). The extracts of *Adhatoda vasica*, *Allium Cepa*, *A. Sativam* and *Azadirachta indica* caused inhibition of *Curvularia Penneseti* (Singh, 2008). The extracts of onion bulbs and garlic cloves were effective against *Drechslera oryzae* (Sunder *et al.*, 2010). The extracts of *Allium sativam*, *A. cepa* and *Azadirachta indica* was effective against white rust and blight of mustard (Yadav, 2009). *Azadirachta indica* was effective against *Fusarium udum* (Pradeep Kumar Singh *et al.*, 2010). *Abrus precatorius*, *Andrographis paniculata* and *Asparagus recemosus* showed fungicidal property against *Rhizoctonia solani* (Tiwari and Kuntal Das, 2011). Garlic clove extract inhibited growth of for *Sclerotinia sclerotiorum* (Yadav *et al.*, 2011). Gachande *et al.* (2013) reported that, the ethanolic extracts of *Datura* sp. showed antimicrobial activity against *Bacillus subtilis*, *Escherichia coli*, etc.

LITERATURE CITED

Ahmedulla M and MP Nayar. 1999. Red data book of Indian plants. Vol-4, Calcutta: Botanical survey of India.
 Arora, DS, Dhariwal Sandeep and Kaur Gurinerjeet, 2005. Antimicrobial activity of *Azadirachta indica* (Neem). *Geobios*, 32 (2-3): 113-120.
 Das J and Das TK, 2005. *In vitro* antifungal property of plant extracts against *Alternaria*

brassicola (Schw.) Willshire. *Geobios*, 34(4) : 305-306.

Deshpande Tejal, Sharmila Sengupta, K.S.Raghuvanshi , 2014. International Journal of Computer Science and Information Technologies, 5 (3) : 4638-4645.

Gachande BD and E M Khillare. 2013. In Vitro evaluation of *Datura* species for potential antimicrobial activity. *Bioscience Discovery*, 4(1):78-81.

Kumar, R., MR Shamarao Jahagirdar, ST Yenjerappa, HB Patil, 2009. Epidemiology and management of bacterial blight of pomegranate caused by *Xanthomonas axonopodis* pv. *punicae*. *ISHS Acta Horticulturae* 43:818.

Maria G. Miguel, Maria A. Neves and Maria D. Antunes ,2010. Pomegranate: A medicinal plant with myriad biological properties- A short review. *Journal of Medicinal Plants research* 4 (25): 2836-2847.

Pradeep Kumar Singh, Anis Khan, Robin Gogoi and Ritesh Kumar Jaiswal, 2010. Plant leaf extracts and bioagents for ecofriendly management of wilt of pigeon pea caused by *Fusarium udum*. *Indian phytopath.*, 63(3): 343-344.

Ramesh Chand and Ram Kishan,1991. Studies on bacterial blight (*Xanthomonas campestris* pv. *punicae*) of pomegranate. *Indian Phytopathology*, 44 (3): 370-372

Satish, S., Raveesha KA and Janardhana GR, 1999. Antibacterial Activity of Plant extracts on phytopathogenic *Xanthomonas Campestris* pathovars. *Letters in Applied Microbiology*, 28(2): 145-147.

Sreelatha R. and Bagyanarayana G, 2008. Biocontrol efficacy of botanicals on anamorphic Fungi. *J Mycol. Pl. Pathol.*, 38(3): 647-649.

Sunder S, Ram Singh and DS Dodan, 2010. Evaluation of fungicides, botanicals and non - conventional chemicals against brown spot of rice. *Indian Phytopath.*, 63(2): 192-194.

Suffredini JB, HS Sader, AG Goncalves, AO Rais, AC Gales, AD Varella and RN Younes 2004.

Screening of antimicrobial extracts from plants native to the Brazillian Amazon rainforest and Atlantic forest. *Brazil. J. med. Biol. Res.* 37: 379-384.

Swami CS and Mukadam DS, 2006. Antifungal property of some plant extracts against tomato fungi. *Geobios*, 33(4): 261-264.

Tiwari RKS and Kuntal Das, 2011. Inhibition effect of cow urine based plant extracts against

Rhizoctonia solani causing sheath blight of rice. *Indian Phytopath.* **64**(3): 265-268.

Yadav MS, Nasim Ahmed, Saroj Singh, Bambawale OM and Hyadava DK, 2011. Evaluation of *Trichoderma* and garlic clove against

Sclerotinia Sclerotiorum of *Brassica juncea*. *Indian Phytopath.* **64**(3): 305-307.

Yadav MS, 2009. Biopesticidal effect of botanicals on the management of mustard diseases. *Indian phytopath.* **62**(4): 488 - 492.

How to Cite this Article:

Alane S K and C S Swami, 2016. Antibacterial activity of plant extracts against *Xanthomonas axonopodis* P.v. *Punicae* causing bacterial blight of Pomegranate (*Punica granatum* L.). *Bioscience Discovery*, **7**(1):70-73.