



Antibacterial Activity of Plant Extracts Against *Xanthomonas Axonopodis* P.V. *Punicae* Causing Bacterial Blight of Pomegranate (*Punica Granatum* L.)”

KEYWORDS

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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, Maharashtra 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).

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

Sr.No.	Plant used	Extract solvent	Zone of inhibition (mm)
1	Murraya Koeninngi	Water	8
		Alcohol	19
		Acetone	20
2	Calotropis procera	Water	10
		Alcohol	15
		Acetone	18
3	Aloe vera	Water	8
		Alcohol	12
		Acetone	19
4	Tridax procumbens	Water	9
		Alcohol	17
		Acetone	19
5	Azadirachta indica	Water	9
		Alcohol	14
		Acetone	18
6	Ocimum sanctum	Water	9
		Alcohol	12
		Acetone	18
7	Moringa oleifera	Water	10
		Alcohol	13
		Acetone	16

8	Allium sativum	Water	10
		Alcohol	12
		Acetone	20
9	Mentha spicata	Water	9
		Alcohol	13
		Acetone	22
10	Ricinus communis	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 *Mentha spicata* (22 mm), *Allium sativum* (20 mm) and *Murraya Koenigii* (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* pathovers (Satish et.al., 1999). Leaf, stem and bark extracts of *Azadirachata 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. Sativum* and *Azadirachta indica* caused inhibition of *Curvularia Peneseti* (Singh 2008). The extracts of onion bulbs and garlic cloves were effective against *Drechslera oryzae* (Sunder et al., 2010). The extracts of *Allium sativum*, *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.

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