

Original Research Article

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Bio-efficacy of Some Aqueous Fruit Extracts against Phytopathogenic Bacteria causing Diseases in Potato

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ABSTRACT

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The aqueous fruit extracts were prepared from locally grown six plants *Citrus aurantifolia*, *Cucumis sativus*, *Datura stramonium*, *Lycopersicon esculentum*, *Punica granatum*, *Syzygium cumunii* were tested *in vitro* following inhibition zone technique against *Ralstonia solanacearum* and *Pectobacterium carotovorum* causing wilting in growing stage and rotting at harvest in potato crop. All the selected aqueous fruit extracts exhibited various levels of antibacterial activity against *R. solanacearum* and *P. carotovorum*, the two test bacterial species. The aqueous fruit extracts of *C. aurantifolia* exhibited highest length of inhibition zone 21.3 and 21.97mm respectively. Minimum zone of inhibition (6.68 mm) was recorded in *Datura stramonium*. In control no inhibition zone was recorded.

Introduction

Potato is one of the most important food crops both in developed as well as in developing countries. It is capable of producing high amount of food per unit area per unit time. Bacterial wilt and brown rot as well as black leg and soft rot are two important bacterial diseases. Due to these diseases there is the occurrence of pre and post emergence rotting. They not only cause wilting of the crop at growing stage but also cause rotting at harvest

and storage. In India loss due to bacterial wilt ranged from 30 to 70% (Kadian *et al.*, 2007). It is very essential to follow effective plant protection management schedules. It now becomes essential aspect to use the plant products which are biodegradeable, non-hazardous and eco-friendly against plant pathogens to save our surroundings. It is also pleasure for farmers to use the botanicals presents around them against plant diseases. In this context the experiment was conducted in the Department of Plant Pathology, College of

Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar to study the efficacy of aqueous extracts of locally available fruits, i.e. *C. avarantifolia*, *C. sativus*, *D. stramonium*, *L. esculentum*, *P. granatum*, *S. cumunii*, against *R. solanacearum* causing bacterial wilt, brown rot and *P. carotovorum* causing black leg and soft rot disease in potato crop.

Materials and Methods

The healthy fresh fruits of *C. avarantifolia*, *C. sativus*, *D. stramonium*, *L. esculentum*, *P. granatum*, *S. cumunii*, were collected washed several times in sterilized water and air dried. Fifty grams from each selected fruit pulp along with 50ml of double distilled water were taken grinded with the help of pestal and mortar to a fine pulp.

The pulp was filtered through two layers of muslin cloth and gently pressed to get maximum filterate. The filterate from each fruit pulp was collected and kept separately in different sterile specimen tubes and centrifuged at 1500rpm for 15 minutes. The supernatant liquid was drawn carefully into a 5ml syringe and then passed through membrane filter of 0.45µm size to sterilize the extract. The filter sterilized extract of each part collected in sterilized tube with screw cap and stored in deep freeze maintained at -20°C. The extracts were evaluated *in vitro* following the inhibition zone technique.

In this technique, two drops of bacterial suspension of each test bacterium was transferred on to the petriplate containing Nutrient Sucrose Agar medium and spread over the surface of the medium with the help of a sterilized glass spreader. Three sets of Himedia discs(5mm), soaked for one minute in each fruit extract were placed on the media surface of each petriplate at the equidistance from the centre. In each set four numbers of discs were used to hold sufficient quantity of

the fruit extract. Two sets of petridishes were used for testing each plant extract petriplates were incubated at 27±1°C for 24 hours in a BOD incubator. After the incubation period, the petriplates were examined for development of inhibition zone around the discs. The diameters of each zone of inhibition was measured and recorded to assess the antimicrobial properties of plant extracts against each test bacterium. In control the paper discs were soaked in sterilized water. The statistical analysis of data was done as per the procedure developed by Gomez and Gomez (1984).

Results and Discussion

All the selected aqueous fruit extracts exhibited various levels of antibacterial activity against *R. solanacearum* and *P. carotovorum*, the two test bacterial species (Table 1). The aqueous fruit extracts of *C. avarantifolia* exhibited highest length of inhibition zone 21.3 and 21.97mm respectively (Plate-1 and 2) against both the two test bacterial species which showed almost equal level of sensitivity.

R. solanacearum was found to be more sensitive to the aqueous fruit extract of *D. inertia* than *P. carotovorum*. The zone of inhibition of growth of *R. solanacearum* recorded to be 9.23mm and only against 6.68mm in case of *P. carotovorum* when sterile discs soaked with aqueous fruit extracts of *D. inertia* were placed at centre of the test bacterial smear separately.

On the other hand *P. carotovorum* was found to be more sensitive than *R. solanacearum* to aqueous extracts of *P. pomegranate* followed by *L. esculentum*. The zone of inhibition due to fruit extracts of *P. pomegranet* and *L. esculentum* were recorded to be 8.92 and 6.00mm against *R. solanacearum* by the respective fruit extracts (Table 2).

Table.1 Local name, common name, scientific name and traditional uses of test plants

Sl No	Local name	Common name	Scientific name	Family	Traditional uses of test plants
1	Nimbu	Lemon	<i>Citrus auarntifolia</i>	<i>Rutaceae</i>	Rich source of flavonoids, lower blood pressure reduces hypertension, cardiac problem, good source of vitamin-C (Okwu and Emenike, 2006; Aibinu, 2007)
2	Kakudi	Cucumber	<i>Cucumis sativus</i>	<i>Cucurbitaceae</i>	Depurative, diuretic, heat stress, cosmetic(softening of skin)
3	Datura	Jimsonweed	<i>Daturastramonium</i>		Roasted Leaves paste relieve pain from body parts, seed have antiasthma properties (Singh, 2014).
4	Tomato	Tomato	<i>Lycopersicumesculentum</i>	<i>Solanaceae</i>	lower blood pressure reduces hypertension ,cardiac problem prevents Urinary Tract Infection (Malik, 2013), anti breast cancer, colon cancer EL-Racy <i>et al.</i> , 2013
5	Dalimba	Pomegranet	<i>Punicae granatum</i>	<i>Pnicacea</i>	Bactericidal, analgestis, anticoagulants, anti-ulcer (Morton, 1987)
6	Jammu	Black berry	<i>Syzygiumcumini</i>	Rosaceae	lower blood pressure reduces hypertension, cardiac problem reduces blood sugar (Chattopadhyay, 1998)

Plate.1 Inhibition zone formed by *Citrus auarntifolia* against *R. solanacearum*



Table.2 Inhibition of growth of test bacterial species by aqueous fruit extracts under *in-vitro* condition

Sl . N o.	Scientific Name	Common (English) name	Local (Odia) name	Diameter of inhibition zone (mm.)	
				<i>Ralstoniasol anacearum</i>	<i>Pectobacteriu mcarotovorum</i>
1	<i>Citrus aurantifolia</i>	Lemon	Lembu	21.30 (4.67)	21.97 (4.74)
2	<i>Cucumissativus</i>	Cucumber	Kakudi	7.30 (2.80)	7.01 (2.74)
3	<i>Daturastramonium</i>	Jimson weed	Durdura	9.23 (3.12)	6.68 (2.68)
4	<i>Lycopersicon esculentum</i>	Tomato	Tomato	6.00 (2.55)	11.33 (3.44)
5	<i>Punicaegranatum</i>	Pomegranate	Dalimba	8.92 (3.07)	13.34 (3.72)
6	<i>Syzygiumcuminii</i>	Black bery	Jammu	7.68 (2.68)	7.01 (2.74)
	Sterilised water			0.00 (0.71)	0.00 (0.71)
	SE (m)±			0.21	0.29
	CD(P=0.0.5)			0.61	0.84

/X+0.5 transformed values

Plate.2 Inhibition zone formed by *C. auarntifolia* against *P. caotovorum*



The zone of inhibitions of the bacterial growth due to fruit extracts of *C. sativus* and *S. cuminum* against the two test bacterial species were almost uniform and varied between 7.01 to 7.68 mm. No zone of inhibition of bacterial growth was observed in control.

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