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PRESENT STATUS OF BACTERIAL BLIGHT ON POMEGRANATE FROM PUNE DISTRICT OF MAHARASHTRA (INDIA)

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ABSTRACT

Pomegranate (*Punica granatum* L.) is very important in international market as table fruit because of its medicinal uses and nutritive values. Its popular varieties *viz*. Bhagawa, Ganesh, Mrudula is reported from Pune district. Successful cultivation of pomegranate in recent years has met with bacterial blight caused by *Xanthomonas axonopodis* pv. *punicae* is a major disease. A survey has been conducted to check the incidence of disease in Pune District of (M.S.) India. The disease symptoms were recorded on leaves, flowers and fruits of the plant. The disease incidence was recorded from region *viz.* Shirur, Baramati, Indapur, Purandar and Daund. The disease was found to be severe at Korhale (Baramati), Gulunche (Purandar), Shetphalgadhe (Indapur), Patas (Daund) and Shikrapur (Shirur). The study through light on present status of Bacterial blight on Pomegranate

Keywords: Pomegranate, Bacterial Blight, *Xanthomonas axonopodis*pv.*punicae*(*Xap*).

INTRODUCTION

Pomegranate (*P. granatum*) called as a "Fruit of Paradise". Pomegranate is fruit crop and it is native of Iran. In India, it is cultivated on large scale in states like Maharashtra, Karnataka, Andhra Pradesh, Telangana, Gujarat, Rajasthan, Tamil Nadu, Uttar Pradesh, Punjab and Haryana. Important pomegranate varieties cultivated in Maharashtra are Bhagwa, Ganesh , Mridula, Aarakta, and Phule Aarakta. Pomegranate cultivated in large areas of the districts *viz.* Pune, Ahmednagar, Nashik, Solapur, Sangli, Satara, Aurangabad, Jalna and Parbhani.

Economically pomegranate is very important fruit crop. The most destructive disease were observed on pomegranate is bacterial blight caused by *Xanthomonas axonopodis* pv. *punicae*(Vauterin *et al.*,1995).In India, Hingorani and Mehta (1952)reported leaf spot of pomegranate for the first time. Bacterial blight causes severe loss in terms of quality and quantity. However, under favorable environmental conditions 60-80% losses are reported in India (Mondal & Mani, 2009). Management of the disease has been the challenge for plant

protectionist (Kumar *et al*., 2009: Mondal & Sharma, 2009). Last 4 to 5 years the disease appeared epiphytotic in major pomegranate growing states like Maharashtra (Mondal *et al*., 2012). chief pomegranate growing states conducted surveys during 2006 to 2008 revealed disease prevalence in different districts of Maharashtra *viz*., Solapur, Sangli, Pune, Nashik, Osmanabad, Aurangabad, Latur and Jalna in mild to severe form (Sharma *et al*., 2011). All pomegranate cultivars gowned varieties *viz*., 'Bhagwa', 'Ganesh', 'Mridula' etc. were susceptible to disease (Sharma *et al*, 2011). The average rate of bacterial migration was highest (0.6 cm/d) 18-22 d after infection (Chand & Kishun, 1993). Temp.25 to 35ºC + RH > 50% + rains + wind is most favorable climatic scenario for the development of disease (Anonymous). A rapid build-up of blight during the rainy season was evident from a higher infection rate (0.21/unit/day) versus autumn (0.08/unit/day) (Sharma *et al*., 2010). In Pune district of Maharashtra, bacterial blight on Pomegranate has spread across different regions *viz.* Baramati, Shirur, Daund, Purandar and Indapur. Survey was carried out in the cropping season (Mrug-bahar) on major variety Bhagwa. Incidence and severity of the disease on leaf, stem and fruit was observed and recorded.

MATERIALS AND METHODS

Field survey and Collection of Samples: Diseased Pomegranate samples were collected from various regions of Pune district *viz*. Shirur, Baramati, Indapur, Purandar and Daund, during year 2014. Field survey was taken up in orchard the randomly selected plants were observed for incidence and severity of bacterial blight. Incidence of disease was also recorded in commercially using *Bhagwa* variety. During Survey of bacterial blight on Pomegranate the disease severity was recorded by using the scale developed by NRCP (National Research Center of Pomegranate) Solapur. Disease severity was recorded by using 0-5 scale on leaf and 0-6 on fruit and stem.

Grade	Percent Infection	
	Leaf	Fruit and Stem

0	0	0
1	Up to 1	Up to 1
2	>1-10	>1-10
3	>10-20	>10-20
4	>20-40	>20-40
5	>40-100	>40-70
6	-	>70-100

Percent incidence and percent disease index (Wheeler, 1969) on leaf, stem and fruit was calculated by applying the formula given below:

$$\text{Percent incidence} = \frac{\text{Number of leaves/stems/fruits infected}}{\text{Total number of leaves/stems/fruits}} \text{ X } 100$$

$$\text{Percent Disease Index} = \frac{\text{Number of leaves/stems/fruits X disease grade}}{\text{Total leaves/stems/fruits observed in a set X Max.grade}} \text{ X } 100$$

Result indicated that (Table: 1) average percent.

These collected diseased samples brought to the laboratory for further investigation. Isolation of bacterial pathogen was done as per the following method:

Isolation of bacteria: The infected Pomegranate leaf, stem and fruits were washed with sterile distilled water. Infected parts were cut with a sterilized sharp blade. The infected pieces were then placed in sterile cavity blocks containing few drops of sterile distilled water and cut to ooze the pathogen. Twenty ml of the Nutrient Agar (NA) medium at 45°C was poured and solidified in petridishes (9 cm size). The bacteria were streaked out with a sterile wire loop on to the NA plate. Laminar Air-flow was used for the purpose of isolation. After 48-72 hrs of incubation at 30±2°C; the developed colonies were transferred to NA slants (Kumar *et al*., 2009; Dye, 1962)

Confirmation of the Pathogen: After incubation, colonies of bacteria were developed, which were then transformed on NA slants for pure culture. The pathogenecity of the isolates was confirmed by adopting Koch's postulates (Pawar, 2007).

RESULTS

Bacterial Blight of pomegranate was recorded from various regions of the Pune district such as Shirur, Baramati, Indapur, Purandar and Daund.

During the visit, it was recorded that several Pomegranate cultivating areas of the Pune region were showing the disease symptoms on leaves, stem & fruits. Number and size of spots were variable on the basis climatic conditions, physiological factors, and susceptibility of Pomegranate. The disease show small, brown and water soaked spots on leaves, flowers and fruits of pomegranate in different orchards of observed region.

Symptoms on Leaf Initially, disease show water soaked legion on lower surface of leaves. Then convert into small, circular with yellowish border and brown centre spot. Later on, number of adjacent spots coalesced with each other and formed elongated and irregular lesions. In many cases, spots were restricted on leaves by veins, resulting in linear stripes. Tissue necrosis and defoliation occurred in advanced cases of infection. The disease appeared on stem as brown to black colored spots around the nodes leading to girdling and cracking of nodes. Symptoms on Fruit Manjula and Khan(2002) described the minute water soaked lesions as symptoms both on leaves and fruits. Severely infected fruits split opens, exposing the arils. Brown to black spots appeared and which later turned to fruit cracking. Brown to black spots also appeared on fruit pericarp, which later turned to 'L', 'Y', 'X' or Star shaped cracking within the spots. Defoliation of the infected fruits was seen in severe infection.

Isolation of Bacteria: All isolates showing typical characters of *Xanthomonas axonopodis* pv. *punicae* with pale yellow, glistening colonies were obtained on NA medium. Studies on pathogen's survivability revealed that *Xanthomonas axonopodis* pv. *punicae* was able to survive in naturally infected leaves collected from the diseased orchard for one year under laboratory conditions (25.0-38.0°C) (Sharma *et al*. 2011). These isolates were obtained from samples collected from Pune district region *Viz*., Malegaon, Korhale, Undawadi at Baramati region,

Shetphalgadhe, Nimgaon-ketaki, Lasurne at Indapur region, Nira-shivtakrar, Pimpre, Gulunche at Purandar region, Kusegaon, Yawat, Patas, Warvand at Daund region and Shikrapur, Nagargaon and Navhra at Shirur region.

In Pune district were surveyed covering 29 orchards. PDI on the leaf, fruit and stem was 45.12%, 35.06% and 28.64% respectively. Disease Index indicated that, maximum intensity on leaf as 54.22 PDI was in Baramati region and minimum intensity of 41.13 PDI in Shirur taluka. Also on the fruit Disease Index was recorded, maximum intensity in Baramati region is 42.15 PDI and minimum intensity of 29.74 PDI in Shirur region. Maximum disease severity of 42.06% was observed in Baramati region followed by Purandar (35.28%), Daund (33.63%) and Indapur (31.99%). Minimum severity was observed 30.98% in Shirur region.

DISCUSSION

The disease was found severe at Korhale, Malegaon, Shetphalgadhe, Gulunche, Patas and Shikrapur. The Disease Highly severe on fruit of Pomegranate from Korhale Tal. Baramati. Bacterial blight of pomegranate spreads rapidly during rains. Varied disease intensity in different locations is accredit to the type of susceptible or resistant variety, inoculums density and virulence of location specific isolate of the pathogen, added to which the season supported by favorable environment for the pathogen. It is felt that an urgent attention is to be paid for its management.

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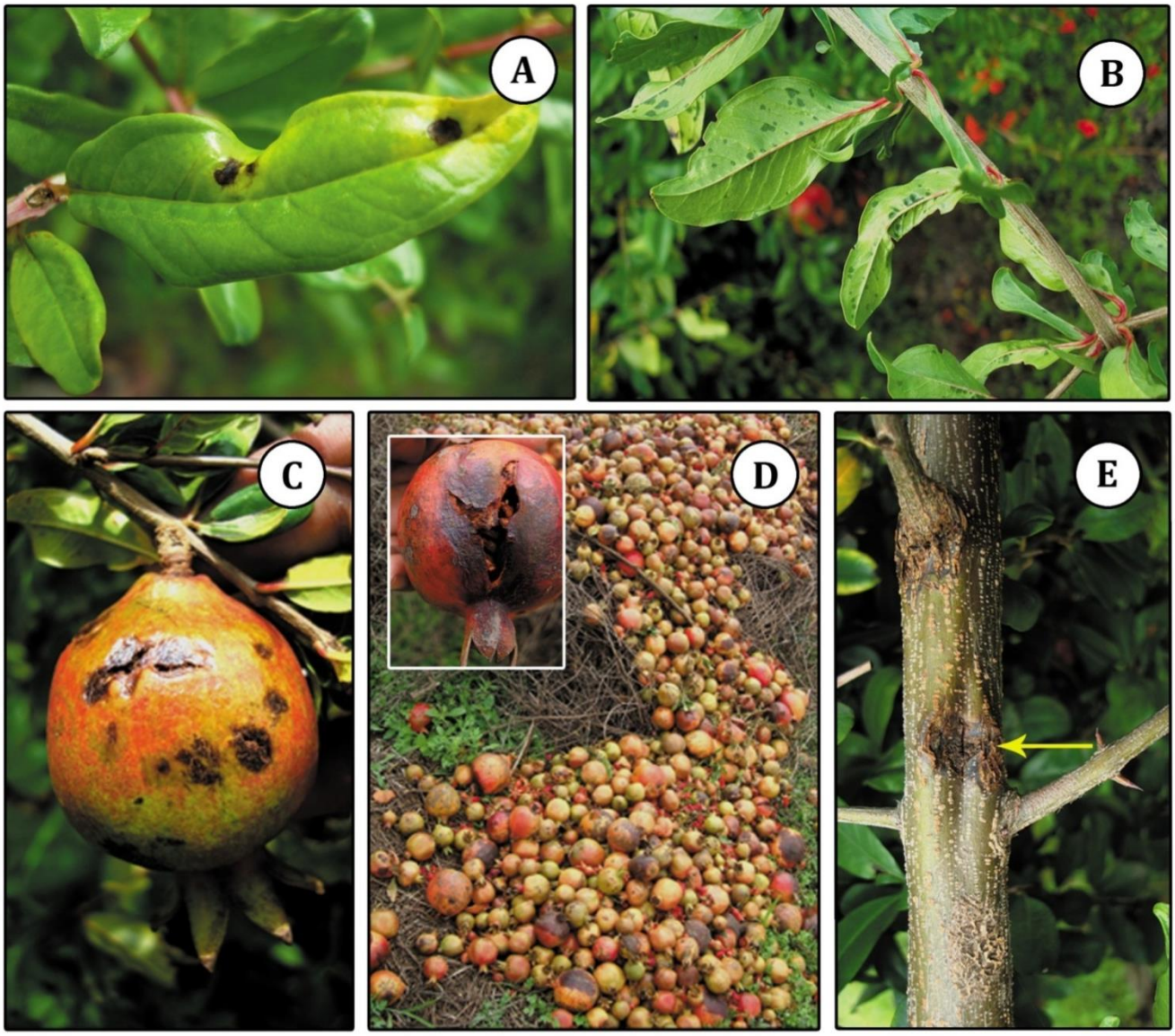
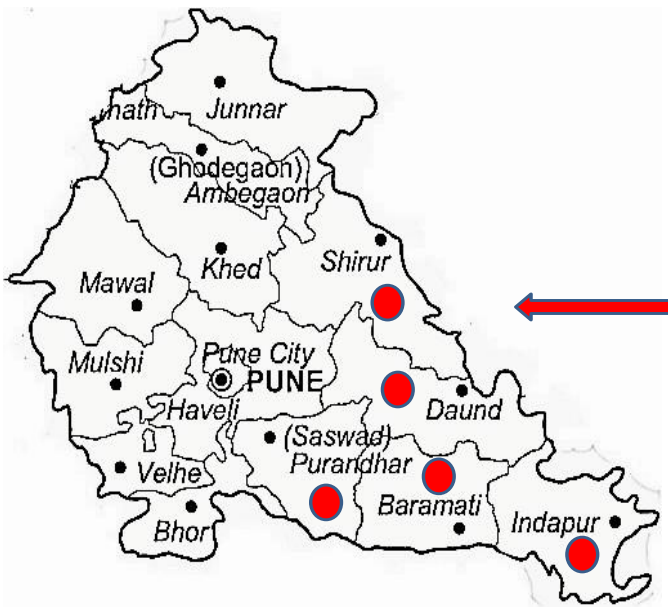
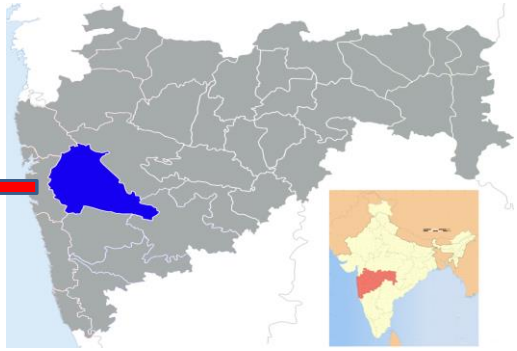


AREA UNDER STUDIED



Pune District Region (M.S.)



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Village Name	Orchards	Leaf		Fruit		Stem		Disease Severity (%)
		PI	PDI	PI	PDI	PI	PDI	
Baramati Tal.								
Malegaon	1	59.67	47.74	59.37	29.68	80	40	33.54
	2	63.46	42.30	68.96	34.48	80	40	36.36
Korhale	1	93.05	77.54	80	64	90	45	61.55
	2	77.05	64.58	72	57.60	90	45	55.77
	3	86.66	57.77	83.33	55.55	80	40	52.65
Undawadi (Supe)	1	43.33	34.66	54.16	27.08	40	20	26.41
	2	55	55	55.33	26.66	40	20	28.16
Mean		**68.31**	**54.22**	**67.59**	**42.15**	**71.42**	**35.71**	**42.06**
Purandar (Saswad) Tal.								
Gulunche	1	76	60.80	70	46.66	75	35	45.74
	2	56.66	45.33	56	37.33	40	20	34.66
Pimpare	1	43.33	34.66	50	25	40	20	24.96
Nira-Shivtakrar	1	47.14	37.71	57.89	38.59	50	25	35.78
Mean		**55.78**	**44.62**	**58.47**	**36.89**	**51.25**	**25**	**35.28**
Indapur Tal.								
Nimbgaon-Ketaki	1	50	40	40	20	30	15	21.00
Lasurne	1	51.28	30.76	45.45	15.15	30	15	16.67
Shetphal-Gadhe	1	66.66	53.33	73.33	48.88	70	35	46.54
	2	64	51.20	70	46.66	60	30	43.78
Mean		**58.06**	**43.82**	**57.19**	**32.67**	**47.5**	**23.75**	**31.99**
Shirur Tal.								
Shi krapur	1	80	80	76.66	51.11	80	40	51.77
Nagargaon	1	36.36	21.81	36.66	18.33	50	25	20.01
Navhara	1	36	21.60	40	20	50	25	21.16
Mean		**50.78**	**41.13**	**51.10**	**29.74**	**60**	**30**	**30.98**
Daund Tal.								
Patas	1	64	51.20	73.33	48.81	80	40	47.28

Kusegaon	1	46.66	37.33	55	36.66	60	30	35.39
Yawat	1	48.57	38.85	46.66	23.33	50	25	25.21
Warvand	1	50	40	53.33	26.66	40	20	26.66
Mean		**52.30**	**41.84**	**57.08**	**33.86**	**57.5**	**28.75**	**33.63**
Total Mean of Pune District		**57.04**	**45.12**	**58.28**	**35.06**	**57.53**	**28.64**	**34.78**

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