INTERNATIONAL JOURNAL OF PLANT PROTECTION | VOLUME 7 | ISSUE 1 | APRIL, 2014 | 115-118
e ISSN-0976-6855 | *www.researchjournal.co.in* | Open Access

IJPP

RESEARCH ARTICLE

Survey for the status of pomegranate bacterial blight in Northern Karnataka

■ R.B. GAMANGATTI* **AND** M.B. PATIL

Department of Plant Pathology, College of Agriculture, University of Agricultural Sciences, RAICHUR (KARNATAKA) INDIA

ARITCLE INFO

Received : 21.10.2013
Revised : 25.02.2014
Accepted : 10.03.2014

Key Words :
Survey, Pomegranate, Bacterial blight, *Xanthomonas*

***Corresponding author:**
Email: rajaniagri@gmail.com

ABSTRACT

An intensive roving survey was conducted in different villages of Raichur (Chandrabanda, Tuntapur, Yeganur, Kortakonda, Yapaldinni) Koppal (Koppal, Tavareger, Kustagi, Kalkabandi) and Bellary (Yellapurcross, Shirigericross and Mallapurcross) districts of Karnataka during 2008 and 2009 to assess the incidence of bacterial blight of pomegranate. It was observed that fruits were more vulnerable to the attack by bacterial blight than leaf as evidenced by more disease severity on fruits, irrespective of the season, location and variety. Among the different districts surveyed, maximum fruit infection of 44.9 PDI was recorded in Koppal district followed by Bellary (18.5PDI) and Raichur (17.35 PDI) district. Highest leaf severity of 30.75 in Koppal district and the lowest disease index on leaf was recorded in Raichur(10.4 PDI) district. Correspondingly highest lesions per plant on stem was observed in Koppal (7.4) district, lowest was at Bellary(2.3) district. Maximum disease incidence was recorded in Koppal district. The reason being, the crop by most of the farmers grown, during mrigbahar was the most vulnerable season for the existence of favourable environment such as continuous intermittent rainfall and optimum maximum temperature.

How to view point the article : Gamangatti, R.B. and Patil, M.B. (2014). Survey for the status of pomegranate bacterial blight in Northern Karnataka. *Internat. J. Plant Protec.*, **7**(1) : 115-118.

INTRODUCTION

Pomegranate (*Punica granatum* L.), so called "fruit of paradise" is one the major crops of arid regions. The fruit has wide consumer preference for its attractive, juicy, sweet-acidic, and refreshing arils and it is meeting the growing demand for good quality fruits both for fresh use and processing into juice, syrup and wine. It is mainly grown in the states of Maharastra, Karnataka, Andhra Pradesh and Tamil Nadu. Pomegranate is a popular fruit and is much liked on its medicinal value and distinctive taste as a table fruit and for its cool refreshing juice. It is also as a national flower in Spain. Pomegranate is used as a table fruit wherein the arils of the well matured fruits is consumed as such and also in processed form, it is consumed as juice or concentrate, syrup jelly. The area under pomegranate is increasing even in low fertility soils. Pomegranate (*Punica granatum*) is a favourite table fruit in tropical and sub-tropical regions of the world. In India pomegranate is commercially cultivated in Maharashtra and small scale plantations are seen in Gujarat, Rajasthan, Karnataka,Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Punjab and Haryana (Chadha, 2001). Pomegranate is grown all over India covering 1.25 lakh hectares with the production of 7.92 lakh tones. However, maximum area (87,552 ha) under pomegranate is in Maharashtra followed by Karnataka (11,200 ha) Andhra Pradesh (6,000 ha) and Gujarat (3,700 ha). In Maharastra, Solapur is having maximum area (30,000 ha) followed by Nasik(25,000 ha), Sangli (9,000ha), Ahemednagar (6,118 ha) and rest of the districts have less than 5,000 ha. In Karnataka it is mainly grown in Bijapur district and in AP in Anantpur. Pomegranate bacterial blight caused by *Xanthomonas axonopodis* pv. *punicae* is one of the major diseases of pomegranate (Manjula and Khan, 2002). Bacterial

blight is known to cause more than 80 per cent of yield loss under severe epiphytoic conditions (Chand and Kishun, 1991). Very little work has been done on systematic survey of this disease in Northern Karnataka. Hence, the present investigation was initiated on survey for bacterial blight in major pomegranate growing districts of Northern Karnataka to identify the incidence of the disease over time and geographical locations.

MATERIAL AND METHODS

An intensive rowing survey was conducted during 2008 and 2009 to know the incidence and severity of bacterial blight in pomegranate growing areas comprising Bellary, Koppal, and Raichur districts of Karnataka. Incidence and severity of the disease on fruits and foliage, number of lesions on stem were counted and recorded. The disease severity was recorded by using the scale developed by Sharma (2005). The survey was conducted in five villages of Raichur, four villages of Koppal and three villages of Bellary districts. Per cent disease index was recorded in each field, weighted mean for each village, taluka and district was worked out.

Grade	Per cent infection	
	Leaf	Fruit
0	0.00	0.00
1	Up to 1	Upto1
2	>1-10	>1-10
3	>10-20	>10-20
4	>20-40	>20-40
5	>40- 100	>40-70
6	–	>70-100

Per cent incidence on fruits and per cent disease index on fruits and leaves were calculated by applying the formula:

$$\text{Per cent incidence} = \frac{\text{Number of fruits infected}}{\text{Total number of fruits}} \times 100$$

$$\text{Per cent Disease Index} = \frac{\text{Sum of individual disease ratings}}{\text{Total number of fruits / leaves examined}} \div \frac{100}{\text{Maximum grade}}$$

During survey, characteristic symptoms of the disease were studied. Infected plant parts from the areas of survey were collected for isolation of the pathogen and for further studies.

RESULTS AND DISCUSSION

The village wise severity of bacterial blight of pomegranate has been presented in Table 1 and 2 for 2008-2009 and 2009- 2010, respectively.

During 2008 per cent disease index on leaf ranged from 2.5 to 45.5 with highest disease index recorded in Kushtagi taluka followed by 29.5 per cent in Koppal, 22.6 per cent in Tavaregere (Kushtagi) and 20.2 per cent in Yeganur (Raichur) villages. Stem infection was also recorded with maximum of 5.4 lesions per branch in Koppal taluka followed by 4.6, 3.1, 2.9 lesions per branch observed in Tavaregere (Kushtagi), Kortakonda (Raichur) and Yeganur (Raichur) villages, respectively. Highest fruit incidence of 60.8 per cent was recorded in Kushtagi taluka followed by 49.5 per cent in Tavaregere (Kushtagi) and 38.8 per cent in Kalakbandi (Kushtagi) villages (Table 1).

Similarly survey report of 2009 revealed that highest leaf severity of 47.8 per cent was recorded in Kushtagi village during mrig bahar whereas, 31.5 and 25.3 per cent leaf severity in Koppal and Tavaregere villages, respectively. Stem infection was recorded at Tuntapur (4.3), Kustagi (4.5), Kalakabandi (4.9) villages with highest number of lesions per plant observed at Koppal (7.4) village. Highest fruit infection to an extent of 62.3 per cent in Kustagi village followed by 49.5 and 41.0 in Tavaregere (Kushtagi) and Koppal villages, respectively (Table 2).

Table 1: Survey on the bacterial blight of pomegranate caused by *Xanthomonasaxonopodis* pv. *punicae* in major areas of Karnataka during 2008

Sr. No.	District	Taluk	Village	No. of fields	Bahar	Cultivar	Leaf	Stem	Fruit
							Per cent disease index	No. of lesions/branch	Per cent disease index
1.	Raichur	Raichur	Chandrabanda	2	Hasta bahar	Bhagwa	4.2	1.2	11.2
			Tuntapur	3	Hasta bahar	Arakta	2.5	2.2	14.3
			Yeganur	2	Hasta bahar	Bhagwa	20.2	2.9	17.1
			Kortakonda	1	Hasta bahar	Bhagwa	3.6	3.1	17.2
			Yapaldinni	4	Hasta bahar	Bhagwa	15.3	2.1	18.7
2.	Koppal	Koppal	Koppal	4	Mrig bahar	Bhagwa	29.5	5.4	38.0
		Kustagi	Tavaregere	3	Hasta bahar	Bhagwa	22.6	4.6	49.5
			Kustagi	3	Mrig bahar	Bhagwa	45.5	2.4	60.8
			Kalkabandi	2	Hasta bahar	Bhagwa	20.4	2.8	38.8
3.	Bellary	Bellary	Yallapur cross	3	Hasta bahar	Bhagwa	18.3	1.2	15.3
			Mallapur cross	3	Hasta bahar	Bhagwa	19.6	2.0	19.9
			Shirigeri cross	2	Hasta bahar	Arakta	17.4	2.1	18.6

Taluka wise intensity of bacterial blight of pomegranate surveyed during 2009 exhibited that maximum disease intensity of 31.0 per cent on leaf was observed in Kushtagi taluka followed by Koppal (30.5%) and Bellary (20.0%) taluka. Lowest leaf severity of 10.4 per cent was found in Raichur taluka. Number of lesions on the stem ranged between 2.3 to 8.5 per branch as observed in all the districts. Fruit infection ranged with highest incidence of 50.4 and lowest 17.35 in Kustagi and Raichur taluka, respectively (Table 3).

The pooled results (Table 4) obtained over years of survey indicated that fruits are more vulnerable to attack by the bacterial blight than leaf and stem. Looking into the district average, the highest fruit infection of 44.9 per cent was in Koppal district followed by 18.5 per cent and 17.35 per cent in Bellary and Raichur districts, respectively. Leaf intensity of disease ranged with highest amount of disease on leaf observed in Koppal (30.5%) district whereas, pomegranate plots in Raichur (10.4%) district indicated least disease index on leaf. Among the varieties, Bhagwa occupied the larger cultivating area of pomegranate and was found highly susceptible to bacterial blight. Minimum disease incidence on fruit and leaf was recorded in Bellary and Raichur districts because most of the farmers in both districts have grown their crop during hastabahar (September to March) during which weather conditions such as no rainfall is received from November till the harvest of crop (in both the years) and low minimum temperature which were found unfavorable for the disease development and spread. However, minimum disease incidence on leaf and fruit was observed due to favourable environment for shorter period (intermittent rainfall and minimum temperature). Maximum disease incidence was recorded in Koppal district, the reason being the crop by most of the farmers grown during mrigbahar was the most vulnerable season for the existence of favourable environment such as

Table 2 : Survey on the bacterial blight of pomegranate caused by *Xanthomonasaxonopodis* pv.*punicae* in major areas of Karnataka during 2009

Sr. No.	District	Taluk	Village	No. of fields	Bahar	Cultivar	Leaf	Stem	Fruit
							Per cent disease index	No. oflesions/ plant	Per cent disease index
1.	Raichur	Raichur	Chandrabanda	2	Hasta bahar	Bhagwa	5.2	1.7	15.2
			Tuntapur	3	Hasta bahar	Arakta	4.5	4.3	17.3
			Yeganur	2	Hasta bahar	Bhagwa	22.2	3.1	19.1
			Kortakonda	1	Hasta bahar	Bhagwa	7.6	3.2	19.7
			Yapaldinni	4	Hasta bahar	Bhagwa	19.3	4.1	23.7
2.	Koppal	Koppal	Koppal	4	Mrig bahar	Bhagwa	31.5	7.4	41.0
		Kushtagi	Tavaregere	3	Hasta bahar	Bhagwa	25.3	6.6	49.5
			Kushtagi	3	Mrig bahar	Bhagwa	47.8	4.5	62.3
			Kalkabandi	2	Hasta bahar	Bhagwa	23.7	4.9	41.9
3.	Bellary	Bellary	Yallapur cross	3	Hasta bahar	Bhagwa	21.3	3.2	17.2
			Mallapur cross	3	Hasta bahar	Bhagwa	23.5	3.1	21.3
			Shirigeri cross	2	Hasta bahar	Arakta	20.3	2.9	19.3

Table 3 : Taluk wise mean incidence and severity of bacterial blight of pomegranate in major areas of Karnataka (2008-2009)

Sr. No.	District	Taluk	Leaf			Stem			Fruit		
			PDI			No. of lesions/branch			PDI		
			2008	2009	Average	2008	2009	Average	2008	2009	Average
1.	Raichur	Raichur	9.1	11.7	10.4	2.5	3.2	2.8	15.7	19.0	17.35
2.	Koppal	Koppal	29.5	31.5	30.5	5.4	7.4	6.4	38.0	41.0	39.5
		Kustagi	29.5	32.2	31.0	3.2	5.3	8.5	49.7	51.2	50.4
3	Bellary	Bellary	18.4	21.7	20.0	1.7	3.0	2.3	17.9	19.2	18.5

Table 4 : District wise mean incidence of bacterial blight of pomegranate in major areas of Karnataka (2008 -2009)

Sr. No.	District	Leaf			Stem			Fruit		
		PDI			No. of lesions/branch			PDI		
		2008	2009	Average	2008	2009	Average	2008	2009	Average
1.	Raichur	9.1	11.7	10.4	2.5	3.2	2.8	15.7	19.0	17.35
2.	Koppal	29.5	31.85	30.75	4.3	6.35	7.4	43.8	41.6	44.9
3.	Bellary	18.4	21.7	20.0	1.7	3.0	2.3	17.9	19.2	18.5

continuous intermittent rainfall and optimum maximum temperature.

The data on pooled results of two years revealed that, fruits were more vulnerable to the attack by bacterial blight than leaf as evidenced by more disease incidence on fruits, irrespective of the season, location and variety. Among the different districts surveyed, maximum fruit infection of 44.9 per cent was recorded in Koppal district followed Bellary (18.5%) and Raichur (17.35%) district. Bacterial blight incidence varied from locality to locality because of varied agro-climatical situations, cropping pattern, varieties grown and cultural practices. Even it could also be attributed to existence of variability or pathogenic diversity present in the bacterium.

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