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Threat of bacterial blight on pomegranate in India – Mitigation by an integrated approach

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Abstract. Pomegrante (*Punica granatum* L.), so called "fruit of paradise" is one of the major fruit crops of arid region. It is mainly grown in states of Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu. Bacterial blight of pomegranate, caused by *Xanthomonas axonopodis* pv. *Punicae*, considered to be a minor disease, was reported as bacterial leaf spot in the 1950s. At present this disease is observed on leaf, stem and on fruits, and has been responsible for the removing of many orchards in south India. Recently this disease was also observed in Rajasthan. A survey was conducted in North Karnataka during 2008-09 and 2009-10. Disease severity on the trees was 29.8 and 19.3% during 2008-09 and 2009-10 respectively. The disease was very severe in Mrig bahar (severity of 20.8%). Demonstrations were conducted for three years (2008-09 to 2010-11) in farmers fields over 6 locations involving various components like selection of hasta bahar treatment, proper training, sanitation, use of micro nutrients, use of organics and use of antibiotics along with copper compounds. The results indicated that before adopting the orchard integrated control management measures, the observed severity on the trees was up to 69%, and it was brought down to 3.0% in orchards where measures were adopted over three years. The average yield levels were 10 tons/hectare in demonstration plots. In orchard with nor integrated control, the disease severity on trees was up to 33.1% with average yield levels of 5.2 tons per hectare. Hence yield increased 4.8 tons, which worth Rs. 4.8 lakhs (1 lakh = 10^5), when compared to non-adopted orchards.

Keywords. Pomegranate – Bacterial blight – Integrated disease management – Causes of epidemics.

I – Introduction

Pomegranate (*Punica granatum* L.) is a good table fruit growing well in tropical and sub-tropical region of the world belongs to Punicaceae family.

During the last five to six years, farmers are facing a severe threat from bacterial blight disease. During recent years, the disease has reached its alarming stage bringing substantial damage to the crop and heavy losses to the farmers.

II – Early history and development of the disease

Hingorani and Mehta (1952) observed bacterial leaf spot disease in pomegranate for the first time in India. Ramesh Chand noticed this disease on leaves, nodes and fruits at IIHR Bangalore, during 1989. The bacterium was first noticed in some farms in Bellary district in the 1980; it started spreading rapidly in the early 2000s and took epidemic proportions in the last 4 to 5 years. It has caused severe damage and destroyed 90% of the cultivated area in the districts of Bagalkot, Belgaum, Bellary, Bijapur, Chitradurga, Gulburga, Koppal, Raichur, and Tumkur. As per Horticulture Department report, many farmers have resorted to uprooting of the trees across growing areas thereby causing a revenue loss of about Rs. 200 crore (at an average price of Rs 50,000 per tonne; 1 crore = 10^7) in Karnataka (Giridhar, 2008). This disease also had an outbreak in the year 2007 in pomegranate orchards of South Africa (Petersen *et al.,* 2010).

Table 1. Average severity of bacterial blight over the years in Northern Karnataka (India)

Name of Districts	2008-09					2009-10					2010-11				
	No. of fields	L†	F†	S†	SOT†	No. of fields	L	F	S	SOT	No. of fields	L	F	S	SOT
Bijapur	25	47.4	11.6	33.8	19.6	65	28.6	8.7	32.2	15.9	20	36.1	27.5	32.6	11.7
Bagalkot	12	38.1	70.9	69.0	66.7	51	41.5	18.4	38.0	23.5	21	42.2	23.8	39.7	23.7
Koppal	20	35.1	3.8	28.9	13.5	108	41.8	14.3	19.4	17.4	30	36.7	29.2	36.1	21.8
Bellary	26	43.8	13.5	35.5	19.2	35	51.6	12.7	38.4	20.4	30	51.0	28.0	40.4	19.4
Total	83	41.1	24.9	41.8	29.8	259	40.8	13.5	32.0	19.3	101	41.5	27.1	37.2	19.1

†L: Severity on leaves; F : Severity on fruits; S = Severity on stems; SOT: Severity on trees (10 L + 70 F + 20 S)

Table 2. Bahar wise disease severity in Karnataka during 2009-10

Name of Bahar	Period of survey	Total No. of fields	Severity on			Severity on Tree
			Leaf	Fruit	Stem	
Ambe	Jan-May	34	31.4	10.8	25.3	15.8
Mrig	June-Aug	132	40.9	15.7	30.2	20.8
Hasta	Sept-Dec	79	53.8	11.1	25.6	17.3

III – Present practices and its impact on the outbreak of bacterial blight of pomegranate

(i) Use of diseased seedling for planting.

(ii) The recommended spacing between the plant and rows is 4.5 x 4.5 meters is not followed.

(iii) Many farmers take crop soon after 1 year or 1 ½ year of planting.

(iv) Many farmers take up bahars (pruning) soon after the harvest of crop, without keeping the prescribed rest period of the tree.

(v) Wrong pruning methods and time of pruning.

(vi) Farmers are unaware of the role of sanitation in management of bacterial blight.

(vii) Many farmers are not supplying the required nutrients in a balanced manner at different growth stages of the crop.

(viii) Most of the farmers are using the pruning knife without any treatment.

(ix) Farmers are unaware that insect menaces increase the severity of disease.

(x) Frequent and unnecessary spraying.

(xi) Identification of bacterial blight of pomegranate.

(xii) After pruning, many farmers are not treating with bourdaeux paste.

(xiii) Movement of workers from diseased fields into healthy fields.

IV – Integrated management of bacterial blight of pomegranate

(i) Select disease-free planting material.

(ii) Growing of tall trees all along the orchard.

(iii) Use recommended dose of NPK along with FYM and bioagents.

(iv) Recommended plant spacing of 4.5 x 4.5 m or 4.0 x 4.5 m.

(v) Orchard sanitation:

- Application of microbial consortia at 25 g each PSB, Trichoderma, Pseudomonas and azospirrilium / plant along with farm yard manure.

- It is proved that insects like anar butterfly, ants, aphids, blister beetle, and larvae of fruit borer can disseminate bacteria; hence management of insects is a must.

- A minimum period of 4-6 months rest.

- Pruning should be taken during September-October months.

- Avoid unnecessary spraying of chemicals.

- Disinfection of pruning tools with a 2.5% sodium hypochlorite solution.

- Spray 1% Boudreaux Mixture before pruning and after pruning.

- Use of 100 g beaching powder at the base of the plant.

- Stem smear with streptocycline 0.5 g + Copper oxychloride 3 g + Red oxide 200 g/l of water.

- Use of a talc based formulation of Pseudomonas fluorescens at 10 g/l of water as a spray.

- Prophylactic spray of streptocycline at 0.05% + Copper oxychloride at 0.2%, followed by - Zinc sulphate 0.1% + Boron 0.1% + Magnesium sulphate 0.1% + Calcium sulphate 0.1%.

- Remove weeds in the orchard specially Tridex and Acharanthus spp.

- Mass eradication programme.

It has been clearly observed that by adopting integrated diseases management (IDM) practices the severity of the bacterial blight can be reduced to 5%. The yields are 9-12 tons /ha in orchards where IDM was practiced, but only 4-5 tons/ha were obtained in non-adopting orchards (Table 3).

Table 3. Disease severity and yield of pomegranate before and after adopting the IDM practices

Demo. sites	Demonstration plots							Farmer plots	
	Severity on tree (%)				Yield/ha (t)			Severity on tree (%)	Yield/ha (t)
	Before adopt.	After adopt.							
		08-09	09-10	10-11	08-09	09-10	10-11		
Hebbal†	69.1	3.4	2.5	2.4	12.00	12.00	7.0	33.1	4.0
H.B. Halli	18.3	1.4	1.5	1.4	10.50	12.00	14.0	21.4	6.5
Hanumasagar	26.2	--	--	5.2	--	--	9.0	28.1	5.0

†Severe attack by anthracnose.

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