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Bacterial Blight of Pomegranate: A Menace in Quality Fruit Production

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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 2008-10. The disease was very severe in Mrig bahar. Demonstration was conducted in farmer field involving various components like selection of Ambiabahar treatment, use of antibiotics along with copper compounds and Bioagents. 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 10.15% in orchards where measures were adopted over three years. The average yield levels were 5.27 tons/hectare in demonstration plots. In orchard with control, the disease severity on trees was up to 38.51% with average yield levels of 2.07 tons per hectare. Hence yield increased 6.12 tons, which worth Rs. 5.81 lakhs, when compared to untreated control.

Key words: Pomegranate, *Xanthomonas axonopodis*, Integrated disease management.

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. Hingorani and Mehta (1952)[1] 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 in Karnataka[2]. This disease also had an outbreak in the year 2007 in pomegranate orchards of South Africa[3].

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MATERIALS AND METHODS

Roving survey was conducted during 2009 and 2010 in all the cropping seasons *viz.*, *Mrigbahar, Hastbahar* and *Ambiabahar* and observations of disease severity (PDI) and disease incidence were recorded on leaf, stem and fruit of different varieties and also observations recorded in different stages of crop growth by following 0 to 5 scale for leaf and 0 to 6 scale for stem and fruit. The different parts of the pomegranate plant showing characteristic symptoms of bacterial infection were collected from different locations and were isolated on Yeast-Dextrose- Calcium carbonate agar (YDCA) plates aseptically and incubated at temperature (30±1°C) for 2 days. Colonies grown within 48 hrs were picked out and again streaked on YDC agar plates, discrete colonies were subcultured on YDC agar slants for further studies.

Evaluation of chemicals and bio agents experiment was conducted in an orchard at Bandi village, Taluk Yalburga, Koppal district, during 2010 A*mbiabahar*. The variety, Kesar was used and sprayed with different chemicals and bioagents. The experiment included nine treatments and one check with three replications. The per cent disease index (PDI) on leaves, stem and fruit were calculated and angular transformed data were analyzed statistically.

RESULTS AND DISCUSSION

Survey on the incidence and severity of bacterial blight of pomegranate revealed the magnitude of the problem on hand and serves as a precursor for evolving the management strategies. Bacterial leaf spot of pomegranate in Annamalainagar of the then TamilNadu. The disease was reported in Solan region of Himachal Pradesh[5]. Hence, in the present investigation, roving survey was undertaken for two years in major pomegranate growing areas of Karnataka to assess the incidence and severity of bacterial blight. During the survey, it was generally observed that, disease incidence on fruit was more than its severity in most of the areas surveyed. From the survey data, it was observed that, fruits were more vulnerable to the bacterium than leaf as evidenced by more disease incidence and severity

Table 1. Percent disease index of bacterial blight on leaf, stem and fruit of pomegranate and percent severity on trees during different bahars of 2009-10 in North Karnataka

Sl.No.	District	Mrigbahar				Hastabahar				Ambiabahar			
		Leaves	Stem	Fruit	Per cent Severity on Tree	Leaves	Stem	Fruit	Per cent Severity on Tree	Leaves	Stem	Fruit	Percent Severity on Tree
1.	Bagalkot	40.0	46.6	50.0	48.3	17.0	17.5	17.5	17.4	25.0	30.0	30.0	29.5
2.	Bijapur	44.5	40.0	65.0	57.9	13.0	13.4	13.4	13.3	39.5	22.5	32.5	31.2
3.	Gadag	48.0	45.0	32.5	36.5	20.0	18.4	20.0	19.6	36.0	27.5	25.0	26.6
4.	Koppal	55.5	50.0	32.5	38.3	25.0	18.9	25.0	23.7	41.0	30.0	32.5	32.8
5.	Raichur	43.5	27.5	35.0	40.0	13.7	8.4	15.0	13.6	28.5	22.5	27.5	26.6
	Mean	46.3	41.8	43.0	44.2	17.7	15.3	18.2	17.5	34.0	26.5	29.5	29.3

Table 2. Management of bacterial blight of pomegranate caused by *Xanthomonas axonopodis* pv. *punicae*; fruit yield

Sl. No.	Treatments	Per cent disease index on fruit after 7th spray	Total number of fruits/plant	Total number of healthy fruits/plant	Average weight of the fruit (g)	Fruit yield / tree(kg)	Estimated yield (tonnes/ha)
1	Streptomycin sulphate 90% + Tetracycline hydroxide 10%	13.13	39.25	31.71	254.78	8.07	5.19
2	2-Bromo-2-Nitro Propane-1,3,-Diol	19.33	38.85	29.64	257.40	7.62	4.90
3	Copper oxy chloride	12.56	40.21	33.98	248.69	8.45	5.43
4	Copper hydroxide	12.12	40.85	34.96	244.79	8.55	5.50
5	*Pseudomonas fluorescence*	19.25	38.45	30.45	260.07	7.91	5.09
6	*Bacillus subtilis*	18.65	37.54	28.62	266.38	7.62	4.90
7	Streptomycin sulphate 90%, Tetracycline hydroxide 10% + Copper oxy chloride	10.15	45.25	42.01	221.00	9.28	5.96
8	Streptomycin sulphate 90%, Tetracycline hydroxide 10% + Copper hydroxide	11.12	42.56	38.35	234.96	9.01	5.79
9	Quat – NX (Botnical)	22.95	37.56	27.61	266.24	7.35	4.72
10	Untreated control	38.59	26.56	8.56	376.50	3.22	2.07
	SEm ±	0.24	NS	0.44	0.29	0.26	0.32
	CD at 0.05	0.72	NS	1.25	0.83	0.73	0.92

on fruits, irrespective of season, location and variety (Table 1). Among the different districts surveyed maximum disease incidence on fruit (70.00%) was recorded in Bagalkot district followed by Koppal (58.57%), Gadag (50.00%), Bijapur (48.57%) and Raichur (48.57) districts. Correspondingly, average PDI on fruits was observed as maximum in Bagalkot district (35.00%) and minimum was found in Bijapur and Raichr district (24.28%). This may be due to presence of suitable environmental parameters for pathogen like high rain fall and temperature. The disease was comparatively less during hastabahar, this may be due to the presence of unfavorable factors for the bacteria, like lower temperature and dry weather. The present findings are also in conformity with the work of scientists[6-7] who reported the devastating nature of bacterial blight of pomegranate in Bellary, Bijapur and Bagalkot districts on all the varieties, irrespective of age of the plant during late summer and *kharif* season of 2001-02. Among the seasons, *mrigbahar* was found more vulnerable than *ambiabahar* and *hastbahar* because of environmental factors like rainfall and temperature which are less in *ambiabahar* and *hastabahar* season

Continuous use of chemicals in the management of disease also brought new problems such as pollution of air, water, soil, residual toxicity, development of resistance in the pathogen, harmful effects on non target organisms etc. Contrary to these plant extracts and bioagents are environmentally non pollutive, renewable, in-exhaustible, indigenously available, readily biodegradable and relatively cost effective. Hence, use of plant products against the pathogen is essentially required to minimize the use of chemicals and is considered as one of the components in the integrated disease management.

By utilizing the *in vitro* information a field experiment was planned and executed during ambiabahar 2010 (Jan - May). Seven different chemicals and two bioagents and an untreated control were evaluated for their efficacy in disease control on pomegranate diseased leaves, stem and fruits (Table 2). The results after seven sprays revealed that, Streptocycline + COC (0.05%+0.25%) and Streptocycline + Copper hydroxide (0.05%+0.25%) were significantly effective than all other chemicals in minimizing the disease incidence followed by Copper hydroxide, COC each at 0.25%, Streptocycline at 0.05%, Pathonil at 0.5% and Bromopal at 0.05%. In respect of reducing the disease severity, all the chemicals were found to be significantly effective with the record of lowest disease severity ranged between 12.56 to 24.56 PDI on leaves, 22.60 to 38.69 PDI on stem and 10.15 to 22.95 PDI on fruits**.** The present findings on efficacy of Streptocycline or other bactericides *viz.*, Bactrinashak or bactinash-200[8-10] were found effective in control of bacterial blight of pomegranate with the sprays of Streptocycline or K cycline or bacterinol-100. The highest yield was recorded in Streptocycline + COC and followed by Streptocycline + Copper hydroxide treatment 6.12 and 5.91 tonnes/ha respectively (Table 5b).

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