



Network Project on Mitigating the Bacterial Blight Disease of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh

(Funded by Ministry of Agriculture, Government of India)



Progress Report

First Year
2008 - 09



National Research Centre on Pomegranate

(Indian Council of Agricultural Research)

Solapur - 413 006 (Maharashtra)



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Network Project on Mitigating the Bacterial Blight Disease of Pomegranate
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Project Director



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National Highway-9 Bypass Road, Shelgi, Solapur 413 006 (Maharashtra), India





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Preface

India is the leading world wide producer of pomegranate fruit, with almost 80 per cent of pomegranate grown in Deccan Plateau, mainly Maharashtra, Karanataka and Andhra Pradesh are the other two important pomegranate growing areas. Looking into the therapeutic and commercial potential of pomegranate other states are also venturing to take pomegranate crop.

Remunerative returns from the pomegranate cultivation have motivated growers to adopt new improved varieties and hi-tech horticulture. As a result the disease like bacterial blight which was practically unknown or of little economic importance few years back has become a serious problem today, inhibiting farmers to take pomegranate cultivation. It is a cause of concern not only for growers but more so for researchers and policy makers.

The area under pomegranate had started dwindling as growers suffering heavy losses, started uprooting the orchards in the absence of any effective chemical for its control, hence an 'Orchard Health Management (OHM) schedule' was finalized by the pomegranate workers from all over India, at a high level meeting, under the Chairmanship of DDG, ICAR, New Delhi in Feb. 2007. In order to demonstrate the success of this schedule a Network Project on 'Mitigating the Bacterial Blight Disease of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh' was sanctioned by the Dept. Agri. & Cooperation, Ministry of Agri. Govt, of India, New Delhi vide letter F.No. 33-10/2007-hort, dt. March 3, 2008. The schedule was demonstrated in 35 adopted orchards covering three states. Most of the demonstrations have given encouraging results, which has helped in building up the confidence of the growers, consequently, the area, production and export which was falling down has again started showing an upward trend.

The OHM schedule focuses on orchard sanitation, cultural practices and spray schedules. Avoiding rainy season crop and preferring winter season crop is most important to manage bacterial blight. The work for the first year of adoption has been completed and the results and observations received from the participating organizations have been compiled and presented in this report. I am sure that the schedule if followed judiciously, in the succeeding 3 to 4 years will yield more promising results in terms of reduction in pathogen inoculum and economic losses due to bacterial blight.

I convey my best wishes to all the participating organizations for successful demonstration of the 'OHM Schedule' and also to all concerned with the growth of pomegranate industry in India.

VT Jadhav
Director
NRCP, Solapur

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Project Details

Sanction No. of the Project	No. F.No. 33 -10/2007-hort, Dept. Agri. & Cooperation, Govt, of India, N. Delhi, dt. Sept. 17, 2007
Revised Sanction	March 3, 2008
Date of Revalidation	May 12, 2008
Duration	2 Years (2008-09 and 2009-10)
Cost of the Project	360.71 lakhs
Nodal Agency	National Research Centre on Pomegranate, Solapur (Maharashtra)
Participating Organizations	
 Maharashtra	<ol style="list-style-type: none">1. National Research Centre on Pomegranate (NRCP), Solapur2. Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri3. Marathwada Agricultural University (MAU), Parbhani
 Karnataka	<ol style="list-style-type: none">4. Indian Institute of Horticultural Research (IIHR), Bangalore5. University of Agricultural Sciences (UAS), Dharwad
 Andhra Pradesh	<ol style="list-style-type: none">6. Andhra Pradesh Horticultural University, West Godavari District



WORK PROGRESS AT A GLANCE

**First Year of Adoption
2008 - 09**

Work Progress at a Glance

Bacterial blight of pomegranate caused by *Xanthomonas axonopodis* pv. *punicae*, which affects all plant parts and is most destructive on fruits, causing heavy losses to growers in Maharashtra, Karnataka and Andhra Pradesh - the major pomegranate growing areas in India. A 'Network Project on Mitigating the Bacterial Blight of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh' was therefore sanctioned for two years, to demonstrate Orchard Health Management (OHM) schedule in growers' orchards in a network mode, conduct surveys for assessing the incidence, to forecast the disease based on weather parameters and to train the departmental officers as well as resource farmers on disease management.

Surveys were conducted during 2008-2009, by participating organizations in their respective regions. Bacterial blight was the most serious disease as the fruits were vulnerable to blight pathogen causing major losses.

In **Maharashtra** though bacterial blight was prevalent in more than 70% orchards of 10 surveyed districts, severe attack of bacterial blight was recorded in less than 20% orchards of Solapur and Latur districts. The disease severity was moderate or in traces in rest of the affected orchards. Disease was not noticed in orchards at Ahmednagar and Jalana district during 2007, however, in 2008-09 bacterial blight was recorded in 66.66% orchards with moderate to severe intensity. In Nashik during 2007 about 19 per cent of surveyed orchards were affected by bacterial blight with severity mostly in traces, but in 2008-09 some orchards were severely affected and disease prevalence also increased. Dhule was found free of bacterial blight, but recently bacterial blight has been reported in traces in one orchard. Apart from bacterial blight and wilt, fruit spots and rots were other diseases found in orchards, where proper spray schedule were not followed.

In **Karnataka** the disease was prevalent in more than 80 per cent of surveyed orchards with disease severity ranging between 8.8 % in Belgaum to 66% in Bagalkot. Gadag also recorded high severity of 51.1%. Apart from bacterial blight, other diseases/pests like, wilt, anthracnose, scab, Alternaria and Cercospora fruit spots and root knot nematodes were observed.

In **Andhra Pradesh** pomegranate is grown only in two districts i.e. Anantpur and Mahaboobnagar. Both the districts recorded 100% prevalence of bacterial blight in surveyed areas, however, the highest intensity at Anantpur was 21.65 % and at Mahaboobnagar 16.6 per cent.

Based on the surveys conducted **disease mapping** has been done to show Bacterial blight affected states in India, affected districts in each state and affected talukas of Solapur district

Disease forecasting Unit has been procured and installed at NRCP Farm Kegaon. Similar unit has also been procured by UAS, Dharwad. Data recorded on **weather parameters and disease development** show that though day temperatures remain conducive for most part of the year in Solapur, night temperatures and slight drizzles play important role in disease development. Rain played role in disease spread, more the number of rainy days more the spread of the pathogen. The maximum severity in Solapur was recorded in October, 2008, when the min-max temperatures ranged between 18-33.6°C, humidity between 19-91% and intermittent rainfall with 5 rainy days rain ranged between 1.1-20.8 mm.

Demonstrations were taken in 35 adopted orchards (1 ha each) in the major pomegranate growing areas of the three states:Karnataka,Maharashtra and Andhra Pradesh.

Demonstrations by NRCP Solapur were taken at Village Wadgi, Janoni and Kasegaon in District Solapur, Malegaon (Baramati), Dist. Pune and Tuljapur, Dist. Osmanabad. Quality of irrigation water, soil physicochemical properties, fertility status of the adopted orchards and leaf nutrient status were analysed and necessary corrections made. Bacterial blight was successfully controlled in two orchards (Kasegaon and Malegaon) out of five orchards adopted for demonstration. The cost benefit ratio was above 1:2 in Tuljapur and Kasegaon and 1:5.27 in Malegaon. In Janoni though highly satisfactory disease control was achieved in late Hasta Bahar, about 70% fruits were lost due to abiotic cracking caused by acute water shortage. In Wadgi, effective disease control (less than 5%) was recorded till May end while taking Ambe bahar (February flowering), but the orchard was discontinued due to non cooperation of the owner.

Five orchards (two at Osmanabad, two at Beed and one at Latur) were adopted **by Maratwada Agricultural University (MAU), Parbhani**. There was reduction in disease severity in all the adopted orchards at harvest w.r.t. non adopted orchards. The cost benefit ratio ranged between 1.12-1.6 in three adopted orchards, while in other two, crop was lost.

Mahatma Phule Krishi Vidyapeeth, Rahuri adopted 3 Orchards in Deola Tahasil of Nashik district, 3 in Sangola Tahshil of Solapur district, 2 in Jat Tahasil of Sangli district and 1 each in Sangmner Tahasil of Ahmednagar District and Baramati Tahasil of Pune district for demonstrations. Bacterial blight in adopted orchards could be checked $\geq 50\%$ in 4 adopted orchards at Telangwadi, Lotewadi, Dahitane and Pimpri Kurd. The control of bacterial blight to the extent of 35-40% was achieved in orchards at Atpadi, Vadgaon Landge and Naranwadi but the demonstrations failed to yield positive results in other three adopted orchards each at Indira Nagar, Thengoda and Arai Shivar in Nasik district. The yield data have been reported only in six orchards where it was slightly better (max difference of 1.93 t/ha) than non-adopted orchards.

University of Agricultural Sciences, Dharwad selected 6 pomegranate orchards. High disease control ($>70\%$) compared to that at the time of adoption was recorded at harvest in all the adopted orchards except one at Bandi, district Koppal, where only 46.67 % reduction of disease was observed. When compared with non- adopted orchards, the control was higher at Bandi (64 %), Baradol (86.94%) and Utnal (85.5%). The harvest of disease free fruits also increased in adopted orchards. The yield of all the adopted orchards except one at Utnal was 52.3-79.16% higher than non-adopted orchards, whereas, at Utnal it was only 33.33% higher. The lower fruit yield at Utnal can be attributed to hail storm for 2 hrs in the month of May, which damaged a large number of fruits.

Indian Institute of Horticultural Research, Bangalore selected 3 orchards for demonstrations, one each at Tumkur, Chitradurga and Davangere. The crop was taken during Hasta Bahar (September - October). The soil and irrigation water of these orchards were analyzed respectively for nutrient status and suitability of irrigation water in all the three adopted orchards. Highly satisfactory bacterial blight control at harvest was recorded i.e above $>92\%$ -100% when compared to severity at/before adoption and $> 83\%$ -100% when compared to non-adopted orchard at harvest. The orchard health management schedule significantly affected fruit yield. The highest fruit yield of 8.0 tonnes/ha was obtained in the adopted pomegranate orchards at Hiriur, followed by 7.0 tonnes/ha at Jagalur and 6.5 tonnes/ha at Sira, Tumkur, whereas, in the non-adopted orchards it was 3.0, 1.5 and 1.5 tonnes/ha, respectively.

Demonstrations by Andhra Pradesh Horticultural University, Anantpur were taken in 8 orchards in Anantpur and Mehboobnagar. Though the disease incidence and severity was less in demonstration plots as against the non-demonstration plots, the margin was narrow, probably because, the farmer adopted almost similar practices which were adopted in demonstration plots. Highest per cent disease incidence and severity on leaf and stem was recorded in orchard at Gundumala and fruit incidence in orchard at Godiselapalli. Lowest disease incidence was recorded at Kondampalli orchard. The variation may be due to the level of phytosanitary measures adopted in different orchards.

Highest fruit yield (15.1 tons/ha) and net returns (Rs. 2,10,429/-) was obtained in orchard at Ammalladinne followed by Kanekal Cross orchard with 13.7 tons/ha fruit yield and Rs. 2,04,280/- as net return. In all the demonstration orchards the additional benefit over non-demonstration plots varied between Rs. 15,000/ha to 96,000/ha by adopting Orchard Health Management Schedule. The cost benefit ratio in adopted orchards ranged between 1:0.23 to 1:3.69 whereas, in non-adopted it ranged between complete loss to 1:2.65.

Four **Training Manuals** (2 in English and 2 in Marathi) were prepared and published by the National Research Centre on Pomegranate, Solapur. These manuals are a complete package on pomegranate cultivation including nursery raising, pest identification and orchard health management with special reference to bacterial blight. These manuals have some other useful information appended as annexure. The training manual "Pomegranate Orchard Health Management - Training manual for Farmers and Nursery Men (English)," prepared by NRCP, Solapur, has been translated in Kannada by UAS, Dharwad and published. The university has also prepared and published other relevant literature in English and Kannada for the benefit of farmers. The university has organized 10 **training programmes** at different locations. IIHR, Bangalore organized 2 training programmes for farmers, the first at Sira, Tumkur district and the second at Jagalur, Davanagere district. Project Coordinator APHU, Anantpur organized 2 training programmes and participated as a resource person in 11 training programmes organized by Department of Horticulture.

The proforma for **nursery inspection** has been finalized and distributed to all the participating organizations. The NRCP will conduct inspection of nurseries in Solapur, Sangli, Pune; MAU Parbhani will inspect nurseries in Aurangabad, Jalana, Latur, Osmanabad and Parbhani and MPKV in Ahmednagar, Dhule, Jalgaon and Nashik. The nurseries located at Chigicherla farm of Department of Horticulture were visited regularly by APHU, Anantpur and monitored for disease incidence and development of bacterial blight.

The Govt. of India had sanctioned a **budget** outlay of Rs 360.71 lakhs (for 2 years) for the three states, Maharashtra, Karnataka and Andhra Pradesh. The National Horticultural Mission, Karnataka released the entire budget of 15.99 and 34.84 lakhs respectively for IIHR, Bangalore and UAS, Dharwad, during the first year, out of which the expenditure reported was 8.8 and 15.58 lakhs, respectively. The NHM, Andhra Pradesh released 11.42 lakhs and expenditure was 8.64 lakhs. The budget sanctioned by MSHMPB, Pune for Maharashtra was Rs 59.5, 41.92 and 24.34 lakhs respectively for NRCP, Solapur, MPKV, Rahuri and MAU, Parbhani, for the first year, out of which budget released to respective organizations was 42.1, 10.35 and 7.5 lakhs and total expenditure was 39.24, 6.20 and 4.78 lakhs respectively.

Four **workshops and meetings** were organized during the first year of the project at NRCP Solapur to finalize the action plan and review the work.



INTRODUCTION

INTRODUCTION

Pomegranate is gaining a lot of attention world over, because of its high economic and nutraceutical values. India is the largest pomegranate producer in the world (8.6 lakhs tonnes) sharing about 36% of the world's production and about 30% of the international pomegranate trade by exporting 34,811 tonnes fruit worth Rs. 1146 million in 2008-09. Maharashtra state (Cultivated area 96.5 Thousand ha) is considered as pomegranate basket in India contributing almost 80% (593.6 Thousand) of pomegranate production followed by Karnataka, Andhra Pradesh, Gujrat, Rajasthan and Tamilnadu. Other states like Bihar, Punjab etc are also venturing to take pomegranate crop in their farming system. It is an ideal crop for the sustainability of small holdings as it comes up well under the agro-climate and topographic situation existing in arid and semi-arid regions.

Innovations in pomegranate cultivation had a dramatic impact on the livelihood of poor people in the semi-arid regions of India where farmers adopted cultivation of this crop. Growers have adopted new improved varieties and hi-tech horticulture to produce more and more quality fruit in order to keep pace with growing export market. As a result, some of the diseases which were practically unknown or of little economic importance few years back have become a serious problem today and this is why, farmers are scared to take pomegranate crop. Among various fungal and bacterial diseases of pomegranate, bacterial blight/oily spot and wilt/decline are the two most important diseases and also the cause of concern to the growers.

Bacterial blight of pomegranate caused by *Xanthomonas axonopodis* pv. *punicae*, was first reported in India from Delhi in 1952. Later it was reported from Bangalore (Karnataka) in 1959. The disease was of minor importance until 1992, when

it appeared in epidemic proportions in Bangalore, resulting in 60-80% yield losses. Today, the disease has become a threat to pomegranate productivity, badly affecting production in all the three major pomegranate growing states - Maharashtra, Karnataka and Andhra Pradesh.

The disease affects all the above ground plant parts including flowers, leaves, twigs, stems, buds and fruits, but it is more destructive when fruits are infected (Plate 1). All commercially grown cultivars are susceptible to this disease. On an average the disease is reported to cause 30-50% losses, however, under favourable environmental conditions 80-100% losses are also reported.

The bacterial blight disease is also known as nodal blight or black spot. It is also known as oily spot or *Telya* in Maharashtra. The bacterial blight disease symptoms are reported to appear between temperature range of 26-31°C and relative humidity between 36-88%. It requires free water on the surface to initiate the disease infection. Even a small quantity of free water available under favourable temperature and environmental conditions is sufficient to initiate the disease. The pathogen gets water for infection to occur either through light showers or ineffective spray water. It has been seen that under favorable temperature and humidity conditions, disease incidence increases after every shower.

Any disease which appears year after year in an orchard has an inoculum source in the orchard itself. It may enter into the new orchard through infected planting material; therefore, getting disease free planting material is a prerequisite for prevention of the disease. Once a disease enters into the orchard, it may develop and spread under favourable environmental conditions.

The disease spreads easily in the orchard through plant to plant contact, rains, run off water, rain



Plate 1: Bacterial blight symptoms on different parts (leaves, fruits and stems) of pomegranate

or spray water splashes, wind blown rain splashes, persons handling the plants, contaminated tools and insects.

The bacterial blight pathogen cannot survive long in the soil without plant debris; however, it can survive on infected plant debris lying on the orchards floor for more than 8 months. It can also survive for long periods on infected twig cankers of plants in the orchard or in dormant buds. Infected fruits in the stores are also potential source of inoculum. Twig cankers, dormant buds and plant debris are therefore major sources of primary inoculum for the next crop season.

Looking into the heavy losses caused by this disease and absence of satisfactory control measures, an 'Orchard Health Management (OHM) Schedule' was worked out by the

pomegranate workers from all over India, at a high level meeting, under the Chairmanship of DDG, ICAR, New Delhi in Feb. 2007. This schedule was successfully demonstrated by the NRCP in an adopted orchard, severely affected with bacterial blight (100 % incidence and >90% severity) during Hast Bahar in 2007-2008, at Solapur through reduction of BBD by above 80% in comparison to neighboring non-adopted orchard and consequently, a disease free harvest of 16 tons was obtained from approximately 1 ha. area.

The OHM schedule focuses on orchard sanitation, cultural practices and spray schedules. It is quite sure that the schedule if followed judiciously, within a year of implementation, would reduce pathogen inoculum and hence, will have lower disease incidence. The result is expected to be

more promising in the succeeding year. If the OHM schedule is followed for 3-4 years pathogen inoculum will be reduced to a level which can be managed effectively and subsequently, economic losses will be minimized.

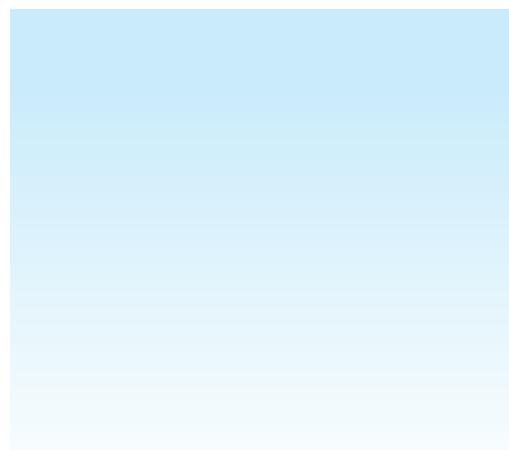
Several farmers of Maharashtra and Karnataka were helpless in absence of any recommended effective management practices and they were about to uproot their orchards. But with the adoption of 'Orchard Health Management Schedule' they have regained their confidence in managing the disease effectively. In order to demonstrate the success story of this schedule, a Network Project on Mitigating the Bacterial Blight Disease of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh was submitted by NRC on Pomegranate to the Dept. Agri. & Cooperation, Govt. of India, New Delhi and it was sanctioned vide letter F. No. 33-10/2007-hort, dt. March 3, 2008. The project was finally revalidated on May 13, 2008 and the participating organizations were informed accordingly. The work under the project started soon after its validation.

A training manual has also been prepared under this network project to create awareness among SAU and Govt. officials as well as farmers and nursery men on diagnosis, assessment of damage caused by various diseases and insect pests and more specifically, proper orchard health management. The project has completed first half of its duration and the progress for the first year on implementation is reported here.

Objectives:

- (a) Survey and surveillance of disease for assessing the incidence and to forecast the disease based on weather parameters
- (b) Demonstrate the available technology in participatory mode for mitigating the disease.
- (c) Train the departmental officers as well as resource farmers on disease management.

Targets fixed for the participating organisations								
S.No.	Work Element	Physical Targets for each organization						
		NRCP	MPKV	IIHR	UAS	MAU	APHU	Total
1.	Survey & Surveillance	√	√	√	√	√	√	
2.	Demonstrations in farmers field	5	10	3	5	5	5	33
3	Training to State/SAU officers	1	-	1	-	-	-	2
4.	Training to officers and resource farmers	5	15	2	5	6	2	35



WORK PROGRESS

First Year of Adoption
2008 - 09

I. SURVEY AND SURVEILLANCE

The survey of major pomegranate growing areas in Maharashtra, Karnataka and Andhra Pradesh was carried out by all the participating organizations for their respective regions using common survey and surveillance procedures supplied by NRC on pomegranate. NRC on Pomegranate had already conducted an intensive survey in recent past and hence, did not take up survey work once again. However, the information generated from the survey are illustrated in the following paragraphs.

Maharashtra

The surveys were aimed at assessing the disease scenario in these regions, with special emphasis on bacterial blight. Bacterial Blight was the most prevalent disease and had its presence in mild to severe form, covering even up to 88% orchards in some districts like Solapur followed by wilt (Table1).

Table 1: Status of Bacterial Blight and Wilt of Pomegranate in Major Districts of Maharashtra 2007

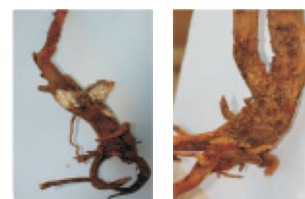
District	Per cent orchards affected	
	Bacterial Blight	Wilt
Solapur	73.29	47.02
Sangli	81.82	27.3
Nashik	19.04	61.9
Pune	20.00	90.00
Ahmednagar	00.00	50.00
Latur	16.67	33.30
Osmanabad	66.67	33.30
Aurangabad	37.50	37.50
Satara	00.00	91.70
Jalana	25.00	00.00
Average	34.00	47.20

Wilt (Plate 2), in terms of prevalence was next important disease after bacterial blight, specially in Satara, Pune, Nashik, Ahmednagar and Solapur, where respectively 91.7, 90.0, 60.9, 50.0 and 47.2 per cent orchards were found affected. Leaf and fruit spots and rots (Plate 2), were also observed to cause severe losses in some orchards. Nematodes, shot hole borers and some insect pests were also noticed in some areas.

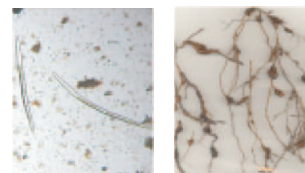
Fruit cracking, internal breakdown and sun scald were the major disorders affecting pomegranate production. Severe attack of bacterial blight was recorded in less than 20% orchards of Solapur and Latur districts. The disease severity was moderate or in traces in rest of the affected orchards (Table2). Disease was not noticed in orchards at Ahmednagar and Jalana district during 2007, however, in 2008-09 bacterial blight was recorded in 66.66% orchards with moderate- severe intensity (Table 3a & 3b).

In Nashik during 2007 about 19 per cent of surveyed orchards were affected by bacterial blight with severity mostly in traces, but in 2008-09 some orchards were severely affected and disease prevalence also increased. Among other districts Aurangabad, Pune, Jalana, Latur and Osmanabad were found affected with bacterial blight in varying intensities. Dhule was found free of bacterial blight, but recently bacterial blight has been reported in traces in one orchard.

Apart from bacterial blight and wilt, fruit spots and rots were other diseases (Table 4) found in orchards, where proper spray schedules were not followed. Physiological disorders like, internal breakdown of arils - where discoloration of arils takes place in an otherwise apparently healthy looking pomegranate, abiotic fruit cracking and sun scald were observed specially in Solapur and Sangli districts during hot dry months.



Root and Collar Rots



Nematode Infestation



Shot Hole Borer

Pomegranate wilt and various agents associated with it



Pomegranate scab



Cercospora Spots



Fruit rot

Plate 2: Diseases other than bacterial blight found during survey in Maharashtra

Table 2: Status of Bacterial Blight in Maharashtra (2007)

S.No.	District	Talukas	No. of Orchards	Percent orchards affected with Bacterial blight			
				Severel (Incidence > 40%)	Moderatel (Incidence >10 to 40%)	Traces (Incidence up to 10%)	Blight Free
1.	Solapur	6	34	17.65	17.65	38.24	26.71
2.	Sangli	4	11	0	0	81.81	18.18
3.	Nashik	3	21	0	4.71	14.29	80.96
4.	Pune	2	10	0	0	20	80
5.	Ahmednagar	2	4	0	0	0	100
6.	Latur	5	6	16.67	0	0	83.33
7.	Osmanabad	6	3	0	66.67	0	33.33
8.	Aurangabad	-	8	0	12.5	25	62.5
9.	Satara	-	12	0	0	0	100
10.	Jalana	-	4	0	25	0	75

Table 3a: Status of Bacterial Blight in Maharashtra (2008-09)- as Reported by MAU and MPKV

S.No.	District	Number covered			Prevalence (%)	Severity on a tree (%)
		Talukas	Villages	Orchards		
1.	Osmanabad	03	11	15.24	100	15.24
2.	Beed	06	12	11.36	100	11.36
3.	Latur	03	05	16.00	100	16.00
4.	Ahemadnagar	5	6	6	16.67	4.56
5.	Pune	4	4	4	25.00	1.97
6.	Nashik	3	8	12	100	35
7.	Sangli	7	7	7	85.70	16.21
8.	Solapur	3	3	3	100	15.8

Table 3b : Bacterial Blight Severity During 2008 in Maharashtra - Reported by NRCP)

S. No	District	No. of Orchards surveyed	Blight Prevalence (%)	Percent orchards affected with Bacterial blight			
				Severely (Incidence > 40%)	Moderately (Incidence >10 to 40%)	Traces (Incidence up to 10%)	Blight Free
	Solapur	39	58.97	12.8	20.51	5.64	41.02
	Pune	6	83.33	0	16.66	6.66	16.66
	Nashik	2	0	0	0	0	100
	Ahemadnagar	3	66.66	33.33	33.33	0	33.33
	Dhule	5	0	0	0	0	100
	Osmanabad	3	100	0	66.66	3.33	0
	Satara	2	0	0	0	0	100

Table 4 : Other Diseases and Disorders of Pomegranate in Maharashtra
(Av.Of 10 Major Districts)

Disease	Per cent orchards affected
Wilt	47.20
Fruit spots	54.67
Rots	30.26
Internal Breakdown	07.81
Cracking	13.05
Scald	11.56

Karnataka

In Karnataka, survey of Bagalkot, Koppal, Bellary, Bijapur, Gadag and Belagum districts of Northern Karnataka and Chitradurga district of south Karnataka was conducted by UAS Dharwad.

The surveyed data clearly indicated that the severity of bacterial blight on trees was found to be very high wherever, the fruits were present. Since, the fruits were more vulnerable to bacterial blight. In almost all surveyed areas, the disease

pathogen was found to affect branches and main stem of the trees. The disease incidence and severity was moderate to high on leaves of the trees, probably because the affected leaves fall down and once fruits appear, the disease attack is more on fruits than on trees. The disease was prevalent in more than 80 per cent of surveyed orchards with disease severity ranging between 8.8 % in Belagum to 66% in Bagalkot. Gadag also recorded high severity of 51.1% (Table 5).

Table 5: Status of Bacterial Blight in Karnataka

District	Number covered			Area (acres)/ Variety	Bacterial Blight		Wilt Incidence (%)
	Talukas	Villages	Orchards		Prevalence (%)	Severity (%)	
Belguam	2	4	5	29 / Arakta Sindhoor. Ganesh	80	8.8	1.6
Gadag	1	10	23	102.7/ Kesar 124 / Kesar,	100	51.1	1.4
Bellary	2	16	26	Bhagwa , Ganesh, Ganga, Mridula,	100	19.2	6.6
Bagalkot	4	6	12	Ruby 67.05 /Sindh oor Kesar, Ganesh, Arakta	100	66.7	6.5
Koppal	3	9	20	187.4 /Kesar, Ganesh, Arakta	80	13.5	0.8
Bijapur	2	5	25	64/ Ganesh, Araktha Kesar,	95	19.6	3.5
Chitradurga	1	4	12	50/ Bhagwa , Kesar	100	23.2	1.6
Tumkur Devanagere	Surveys are being conducted in 2 nd year, however according to initial surveys > 50% orchards are affcted						
Detailed taluka/village wise data of each district in Annexures 1-7							

Apart from bacterial blight, other diseases/ pests like, wilt, anthracnose, scab, *Alternaria* and *Cercospora* fruit spots, root knot nematodes

(Table 6, Plate 3) were observed. At the same time, micro-nutrient deficiencies and *Ganoderma* infection on stem were also noticed.

Table 6: Other Diseases and Pests of Pomegranate in Northern Karnataka

District	Root Knot Nematode	Fruit spots			
		Anthracnose	Alternaria spots	Scab	Cercospora spots
Bijapur	10	25	5	5	1
Bagalakot	15	15	2	1	2
Koppal	15	35	5	2	2
Bellary	5	15	15	5	2
Gadag	12	18	2	3	1



Wilt



Shot hole borer



Root Knot Nematide



Ganoderma



Anthracnose



Fruit Rot



Alternaria spots



Scab



Cercospora

Plate 3: Diseases other than bacterial blight found during survey in Karnataka

Andhra Pradesh

In Andhra Pradesh, pomegranate is grown only in two districts *i.e.* Anantpur and Mehaboobnagar. APHU monitored the two districts periodically at monthly intervals from Nov., 2008 to June, 2009.

Both the districts recorded 100% prevalence of bacterial blight in surveyed areas, however, the highest intensity was 21.65 % in the month of November, 2008 at Anantpur and 16.6 % in the month of April, 2009 in Mehaboobnagar (Table 7).

Table 7: Status of Bacterial Blight in Andhra Pradesh

District / Survey Period	Number covered			Area (acres)/Variety	Bacterial Blight	
	Talukas	Villages	Orchards		Prevalence (%)	Severity (%)
Anantpur (November 2008)	5	10	17	90/Bhagwa, Ganesh,	100	21.65
Mehaboobnagar (April 2009)	1	4	5	29 Bhagwa, Mridula	100	16.6
APHU has monitored the two districts periodically at monthly intervals from Nov 2008 – August 2009. Taluka wise detailed Monthly tables of which are presented as Annexures 8- 17, however, to simplify, the data of the month, when maximum severity was reported is presented here						

Disease Mapping

Based on the surveys conducted disease mapping has been done to show Bacterial blight affected states in India, affected districts in each state and affected talukas of Solapur district (Plate 4a, 4b, 4c)

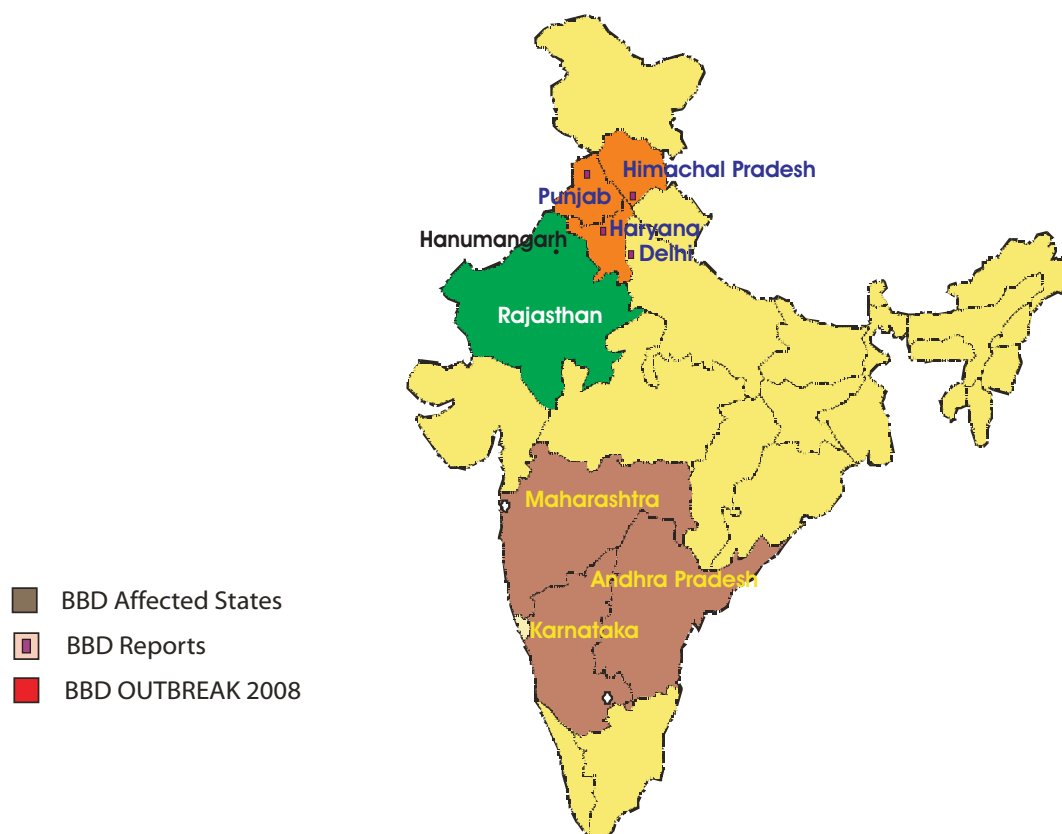


Table 4.a : Map showing prevalence of bacterial blight in India,

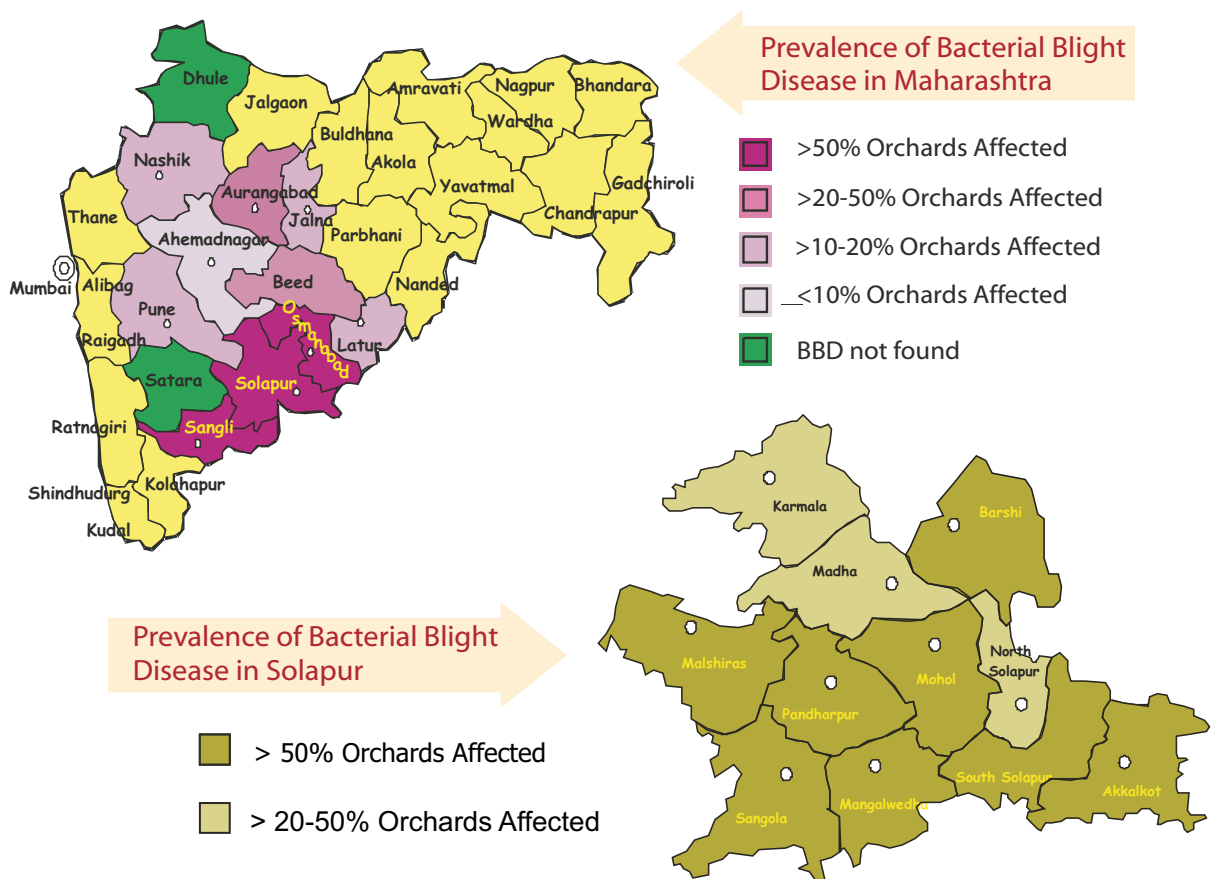


Plate 4.b: Maps showing prevalence of bacterial blight in Maharashtra and Solapur.

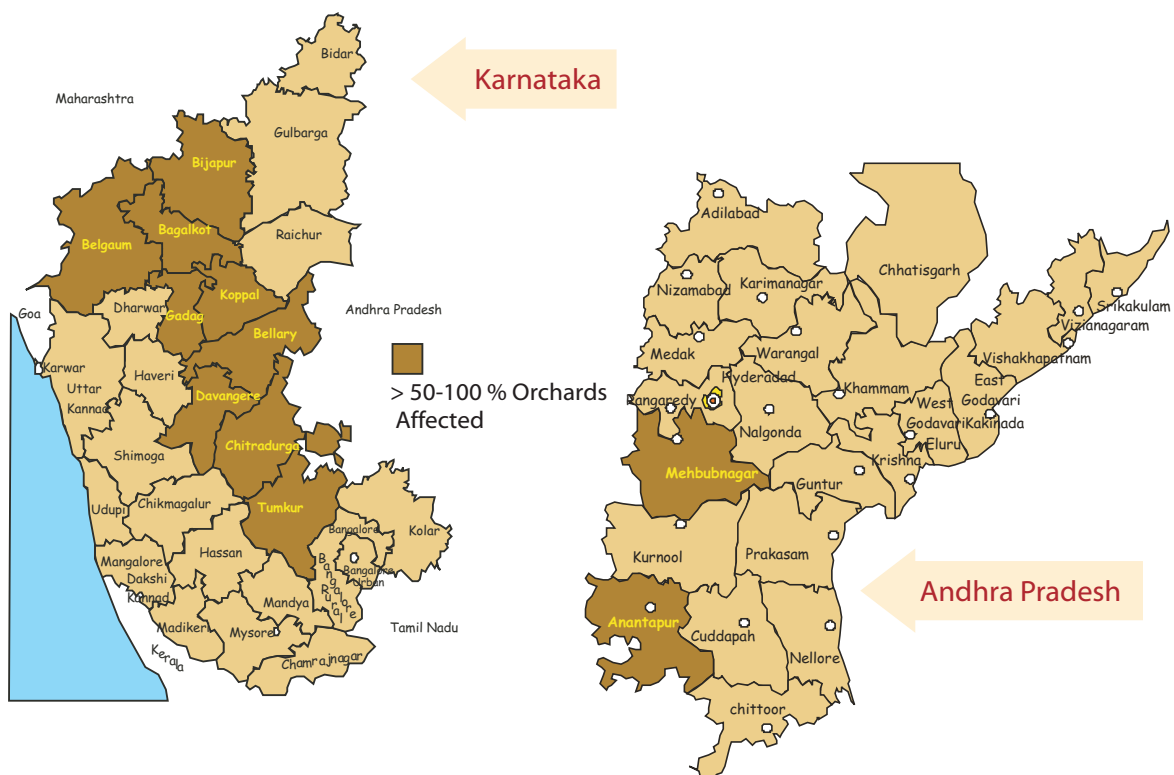


Plate 4.c: Maps showing prevalence of bacterial blight in Karnataka and Andhra Pradesh

II. WEATHER PARAMETERS AND DISEASE DEVELOPMENT

Disease forecasting Unit has been procured and installed at NRCP Farm Kegaon (Plate 5). Similar unit has also been procured by UAS, Dharward and will be installed at farmer's field. MAU, MPKV and APHU are in the process of procuring the Disease Forecasting Unit.



Plate 5: Disease forecasting unit installed at NRCP Kegaon farm, Solapur

At NRCP, Disease Forecasting Unit was installed on June 25, 2009. Data on various weather parameters are being recorded at hourly intervals and disease data at weekly intervals.

Prior to installation of disease forecasting unit, weather data were recorded by manual observatory at Kegaon and disease development was correlated with weather parameters. Perusal of data in Table 8 shows that the bacterial blight severity started increasing in the month of June, 2008 when the temperatures ranged between 23-38.5°C, humidity between 31-78% and intermittent rainfall with 6 rainy days rain ranging between 0.8-17.2 mm. The maximum severity reached in October, 2008, when the temperatures ranged between 18-33.6°C, humidity between 19-91% and intermittent rainfall with 5 rainy days rain ranging between 1.1-20.8 mm. Heavy and/or more number of rains in July to September helped in spreading of disease through run off and rain splashes and at the same time, conducive temperature and humidity conditions stimulated the development of bacterial blight and hence, had increased severity. The disease severity suddenly fell down in November, probably because of dipping down of minimum

Table 8: Meteorological Observations and Bacterial Blight Development at Solapur (2008-09)

Month Year	Temperature (Min. – Max. °C)	Humidity (Min. – Max. %)	Rainfall		Per cent blight Severity
			Total Rainfall in mm (No. of Rainy Days)	Min – Max. (mm)	
April 08	18 - 43	14 - 76	29.0 (2)	4.5 - 24.5	2.0
May 08	18 - 41	18 - 76	15.6 (2)	2.4 - 13.2	1.0
June 08	23 - 38.5	31 - 78	47.6 (6)	0.8 - 17.2	5.5
July 08	21.8 - 35	34 - 92	160.6 (5)	7.4 - 105.2	10.0
August 08	21 - 32	42 - 96	75.3 (10)	0.6 - 54.2	38.0
September 08	20.2 - 33.5	36 - 88	219 (17)	3.8 - 44.6	38.0
October 08	18.0 - 33.6	19 - 91	48.3 (5)	1.1 - 20.8	50.0
November 08	14.2-34.0	21 - 93	75.5 (3)	0.6 - 65.1	14.5
December 08	13.0 - 31.9	18 - 90	2.2 (2)	1-1.2	13.2
January 09	13.8 - 35.5	18 - 91	0.0	-----	6.0
February 09	16.2 - 38.6	20 - 63	0.0	-----	6.0
March 09	19 - 40.2	24 - 69	5.2 (1)	5.2	60.5
Favourable temperatures and humidity with intermittent rains resulted in BBD development and spread in <i>Mrig bahar</i> (June- Oct.) crop					

temperatures to 14°C though day temperatures and humidity remained conducive. The severity of blight continued to decrease till Feb.y, 2009 due to low night temperatures and no rainfall. However, increase in night temperature to 19°C or more with slight drizzle in the month of March resulted in sudden increase in disease severity. This shows that though day temperatures remain conducive for most part of the year in Solapur, night temperatures and slight drizzles play important role in disease development, whereas more number of rainy days play role in the spread of pathogen. Slight drizzles provide free water for entry of pathogen through natural openings or injuries.

Based on the weather parameters viz. maximum and minimum temperatures, relative humidity and rainfall recorded in the Department of Agro-meteorology at Agricultural Research Station, Anantapur and forecasting information received from India Meteorological Department, Hyderabad, farmers of Anantapur district were guided with the information on bacterial blight viz. its occurrence, spread and management practices to be adopted through the weather based agro-advisory bulletins that are published in local news papers. The process has been initiated to procure the disease forecasting unit at APHU, Anantpur.



III. DEMONSTRATIONS OF ORCHARD HEALTH MANAGEMENT SCHEDULE IN ADOPTED ORCHARDS

Technology for management of bacterial blight was demonstrated to the farmers in adopted orchards in the three states: Karnataka, Maharashtra and Andhra Pradesh. All the orchards were selected in the major pomegranate growing areas of the three states. Orchards were selected for demonstration on the basis that there should be minimum 1ha area orchard for one demonstration and not more than 1ha per taluka. Orchards having above 50% disease incidence and severity above 10 % were preferred for demonstration. Soil samples, irrigation water and leaf samples were analyzed for diagnosing nutrient deficiencies if any, so that necessary correction measures may be taken up while carrying out the demonstrations. The twig infections were removed through pruning. Phyto-sanitary measures like collection and burning of fallen plant parts (leaves, fruits, twigs etc.) were undertaken with top priority in implementing OHM schedule. The orchard management schedule was followed judiciously in selected orchards.

Printed matter was distributed in the form of bulletins, leaflet, pamphlets etc in local languages and services of various media (news papers, television, and radio) were used as and when required for dissemination of information, technologies and advices. Surveillance of orchards selected for rejuvenation was conducted by the group of scientists to monitor the health status of the orchards from time to time.

DEMONSTRATIONS BY NRCP SOLAPUR

Five demonstration plots each of 1ha orchard with more than three years old plantation at Tuljapur,

Wadgi, Pandharpur, Janoni and Malegaon were selected (Table 9).

The irrigation water, soil and leaf samples from adopted orchards were analyzed for assessing irrigation water quality and nutrient status of soil and plant and necessary correction measures were taken up while carrying out the demonstrations. The results of analysis are presented in (Tables 10-13).

Soil physicochemical properties and fertility status of the adopted orchards

The soils of adopted orchards were normal to slightly alkaline with pH ranging from 7.15 to 8.27 and electrical conductivity ranging from 0.11 to 0.16 dSm⁻¹. The soil organic carbon content of orchard at Janoni (0.18%) and Kasegaon (0.43%) was low, it was medium (0.53-0.60%) in orchards at Wadgi and Malegaon (a) and high (0.84-0.97%) in orchards at Malegaon (b) and Tuljapur. Soils of all the adopted orchards were calcareous with CaCO₃ content ranging from 8.9 to 19.3%. The higher CaCO₃ content is reported to have adverse effect on plant growth through its effect on nutrient availability.

The soil fertility status as indicated by macro and micronutrient content showed that soils of all the orchards were medium in available nitrogen, low to medium in available phosphorus and high in available potassium content (Table 10).

DTPA extractable Fe content was low in all the orchards whereas, Cu content was very high in all the orchards which might have resulted from the use of copper fungicides for disease control. DTPA extractable Mn content was towards higher side of the sufficiency range in orchards at Wadgi, Tuljapur and Malegaon (a) & (b) whereas it was

towards lower side in orchards at Janoni and Kasegaon. DTPA extractable Zn content was also

low in most of the orchards except in Kasegaon and Malegaon (a) orchards where it was in the sufficiency range.

Table 9 : Details of Demonstration plots Selected by NRCP Solapur

Parameters	Kasegaon, Pandharpur	Mangalveda, Janoni	Wadagi	Sindphal, Tulajapur	Malegaon Baramati,	
					Khurd	Nepatwalan
	1	2	3	4	5a	5b
Area	1 ha.	1.40 ha.	1 ha.	1 ha.	1 acre	1.5 acre
No. of Plants	759	1000	800	740	350	375
Variety	Bhagawa	Bhagawa	Bhagawa	Bhagawa	Bhagawa	Bhagawa
Spacing	10' X 15'	10' X 15'	10' X 15'	9' X 15'	11' x 13'	10' x 15'
No. of gaps	19	11	9	8	48	10
Age of Plant (years)	5 +	4 +	4 +	4 +	8 +	3+
Type of Land	Plane	Low lying	Plane / low lying	Sloppy Land	Plane	Plane
Type of Soil	Light Soil	Light Soil	Medium to light Soil	Light Soil	Light	Black
Wind breaks used	None	None	On one side — Shewaga	Casuarina equisetifolia	Casuarina equisetifolia	None
Date of Defoliation	28 th July, 2008	11 th Aug., 2008	7 th Aug, 2008	2 nd Aug, 2008	11 th Aug., 2008	11 th Aug., 2008

Table 10: Analysis of Soil of Adopted Orchards by NRCP, Solapur

Adopted Orchard	Phyco-chemical properties				Available Macronutrients (Kg/ha)			Available Micronutrients (ppm)			
	pH	EC (ds/m)	OC (%)	CaCO ₃ (%)	N	P	K	Fe	Cu	Mn	Zn
Kasegaon, Pandharpur, Solapur	8.27	0.159	0.43	14.7	320.5	11.5	744.8	0.31	3.7	1.21	0.96
Janoni, Mangalveda, Solapur	8.15	0.134	0.18	18.8	302.7	14.9	67.2	0.81	0.68	1.29	0.16
Wadji, S. Solapur, Solapur	8.05	0.142	0.53	16.9	213.7	16.0	733.6	0.29	1.23	3.22	0.29
Sindphal, Tulajapur, Osmanabad	7.15	0.141	0.84	19.3	338.3	14.7	313.6	1.51	3.14	9.94	0.36
Malegaon, Baramti, (a)	7.88	0.112	0.65	11.7	409.5	41.3	924	0.53	6.46	3.5	1.16
Pune (b)	7.58	0.156	0.97	8.9	373.9	22.7	991.2	0.25	2.6	5.24	0.45

Quality of irrigation water

The irrigation water used in adopted orchards was of moderate salinity as indicated by pH and EC values given in Table 11. This type of water can be safely used for irrigation purpose in most of the soils provided drainage provision is proper. The water used for irrigation at Osmanabad orchard had moderate content of residual sodium carbonate ($RSC > 1.25$ me/l). Other parameters, such as calcium, magnesium, carbonates and

bicarbonates as well as chlorides contents were within the permissible limits which can be safely used for pomegranate production.

Leaf nutrient status

(a) At adoption

The data on nutrient content in the leaves of all the adopted orchards at the time of adoption showed that most of the nutrients were within low to optimum range except potassium (Table 12).

Table 11: Analysis of Irrigation Water at Adopted Orchards by NRCP, Solapur

Adopted orchard	Source	pH	EC(ds/m)	Ca+Mg	Carbonates	Bicarbonates	Chlorides	Sodium	SAR
(me/L)									
Janoni, Mangalveda, Solapur	Well	7.65	0.687	4.80	0.40	4.70	2.80	3.80	2.46
Sindphal, Tuljapur, Osmanabad	well	7.73	0.732	7.30	0.00	4.60	4.40	2.70	1.41
Kasegaon, Pandharpur, Solapur	well	7.33	0.675	4.40	0.00	2.20	1.80	2.30	1.55
Wadji, S. Solapur, Solapur	Well	7.39	0.745	8.00	0.60	7.30	4.00	3.00	1.50

Table 12; Analysis of Leaf Samples of Adopted Orchards by NRCP, Solapur for Nutrient Status (At adoption July, 2008)

Adopted orchard	Macronutrients (%)			Micronutrients (ppm)			
	N	P	K	Fe	Mn	Cu	Zn
Janoni, Mangalveda, Solapur	1.54	0.25	0.98	103.9	25.9	22.3	17.1
Kasegaon, Pandharpur, Solapur	1.26	0.16	2.30	92.9	21.3	30.3	17.7
Malegaon, Baramti, Pune	(a) 1.61	0.17	0.74	135.5	48.9	55.4	25.1
	(b) 1.65	0.24	1.69	75.4	80.4	22.5	24.3
Sindphal, Tuljapur, Osmanabad	2.03	0.23	2.28	98.9	23.9	17.8	23.9
Wadji, S. Solapur, Solapur	1.26	0.16	2.51	92.8	23.0	22.4	28.5

The N content of all the orchards was in the optimum range. The leaf phosphorus content of Janoni, Baramati (b) and Tuljapur was towards higher side while it was optimum in other orchards. The potash content of most of the orchards was in higher range except Janoni and Baramati (a) where, it was in the optimum range. The micronutrient content in the leaves showed that the Fe and Zn content was optimum in all the orchards while Mn and Cu Content was low except Mn and Cu content in Baramati (a) orchard and Mn content of Baramati (b) orchard which was in the optimum range.

(b) After adoption

The leaf nutrient status after adoption of the orchard showed significant increase of all the nutrients in all the orchards except phosphorus which recorded considerable decrease over the initial values (Table 13). If we compare the data with non adopted orchards, it is observed that some of the nutrients were more in adopted and some in non adopted however, in both adopted as well as non adopted orchards nutrient contents were in the optimum limit. The N content was lower in non adopted orchards as farmers use less quantity of N fertilizers in their orchards.

Demonstration Activities

The orchard health management practices included clean cultivation and orchard sanitation

which are of primary requirement for developing a healthy orchard of any fruit crop. The twigs and branches were pruned 2 inches below the cankers and Bordeaux paste was applied on the cut ends immediately after pruning, followed by recommended sprays. The secateurs and other pruning tools were disinfected using sodium hypochlorite (1%) after completing pruning of each tree. Infected plant parts (leaves, flowers, fruits & twigs) in orchards were collected from the orchard and burnt. The ground below canopy were drenched with bleaching powder @ 25 kg/ha/1000 litre water to reduce the bacterial inoculum on left-over plant debris in soil within the orchard. Farm yard manure (FYM), NPK and micronutrient containing fertilizers were applied as per recommendation based on soil test value and insecticides were used as per requirement to check insect infestation, as these may act as carrier of the pathogen. To regulate flowering, defoliation was done using curacuron, in the month of July/Aug. Irrigation was given through drip as per requirement during the whole season. First spray of Bordeaux mixture (1%) was given immediately after pruning. Second spray was given at foliage initiation/emergence with Streptocycline (500 ppm) + Copper oxychloride (0.25%). Non ionic sticker was used with fungicides (except with Bordeaux mixture) during the rainy season. Third and subsequent spray of Bordeaux mixture (0.5%)

Table 13: Analysis of Leaf Samples of Adopted Orchards by NRCP, Solapur for Nutrient Status (Nov. 2008 Samples)

Orchard location		Macronutrients (%)				Micronutrients (ppm)		
		N	P	K	Fe	Mn	Cu	Zn
Kasegaon, Pandharpur, Solapur	Adopted	2.38	0.113	1.42	82.4	42.7	37.5	23.7
	Non adopted	1.33	0.113	2.11	113.1	66.6	44.3	20.9
Malegaon, Baramti, Pune (0.5 acre)	Adopted	1.82	0.136	2.10	147.3	65.1	64.8	26.2
	Non adopted	1.46	0.149	2.12	111.4	60.2	55.2	18.4
Malegaon, Baramti, Pune (1.5 acre)	Adopted	1.68	0.116	2.19	111.1	50.8	27.4	19.4
	Non adopted	1.49	0.147	2.34	97.1	41.1	29.1	19.1

was given at 10-15 days interval depending upon rains. Fourth spray consisted of Streptocycline (500 ppm) + Carbendazim (0.10%). Second to fourth sprays were repeated at 7-15 days period depending on weather conditions. Period was reduced under favourable weather conditions like overcast sky and rains for disease development and high disease pressure. COC/ Carbendazim were replaced with other fungicides like thiophanate methyl (0.1%), Dithane M-45 (0.25%), Kocide (0.2%) depending upon requirement. In areas, where scab (*Sphaceloma sp*) infection was noticed, spray of Thiophanate methyl (0.10%) was taken twice at monthly interval, taking first spray at fruit setting. Glyphosate (0.8%) was used to control weeds under severe weed infestation otherwise, manual weeding was preferred. Spraying of all the chemicals were withheld 25 days before harvesting whereas, spraying of carbendazim was stopped 100-110 days before harvesting. Samples were sent for pesticide residue analysis to NRC on Grapes, Pune. After

harvest a rest period of 2-3 months was allowed and during this period Bordeaux mixture (1.0%) and Streptocycline (500ppm) were sprayed alternately at 15-20 days interval provided disease infection level was high. The fertilizer doses and insecticide sprays schedule are given in Table 14 and 15 respectively.

Table 14: Fertilizer Doses Applied in Demonstration Plots by NRCP

Fertilizer	Dose/plant
FYM	20 kg
Urea	225g x3 split doses at 1 month interval
SSP	780 g
MOP	215 g
ZnSO ₄	50 g
FeSO ₄	50 g
MnSO ₄	50 g
CuSO ₄	50 g
Micronutrient mixture	2 sprays of 0.1%

Table 15: Insecticidal Sprays taken During Demonstrations by NRCP

Spray Time	Pest	Insecticide
At new flush of leaves & shoots / as and when new foliage appears	Sap sucking insects– Aphids, thrips etc	Imidacloprid 0.04%,
Pre flowering and post berry formation	Sap sucking insects—Thrips	Monocrotophos (0.1-0.15%) or Imidacloprid 0.04%
At fruit set and 50% fruit set	Fruit borer/Anar butterfly	Deltamethrin (0.1%)' Cypermethrin (0.1%)
As and when infestation seen	Mealy Bugs, Leaf eating caterpillars, Shot hole borer	Monocrotophos (0.1-0.15%), Chlorpyrifos (0.25%),
At fertilizer application or when nematodes seen in plant basin	Nematodes	Phorate 10 G (20Kg/ha),

Effect of Orchard Health Management Schedule on Bacterial Blight and Fruit Productivity in Adopted Orchards (Plates 6-12)

National Research Centre on Pomegranate successfully demonstrated the technology during hasta bahar (Winter crop) in 2007-08 in a farmer's Orchard at Hiraj, hence it ventured to take demonstrations during mrig (rainy season) bahar. Bacterial blight was successfully controlled in two orchards (Kasegaon and Malegaon) out of five orchards adopted for demonstration. Because of untimely rains, flowering in orchard at Tuljapur was prolonged and consequently, resulted in delayed fruit setting. As a result, the control of bacterial blight in the said orchard was quite satisfactory. Due to heavy disease pressure, 60% fruits were affected by bacterial blight in comparison to 100% fruit infection observed in previous year i. e. before adoption, in orchards at Wadgi and Janoni. Hence, rainy season crop was abandoned midway and subsequently, late *hasta bahar* was taken when satisfactory control of

bacterial blight was achieved. Based on the results obtained, growers are advocated to take winter season crop i.e. September-October flowering where disease incidence is above 15%. The disease control achieved and yield benefits obtained after adoption of orchards have been summarized in Table 16.a & 16.b. The cost benefit ratio was above 1:2 in Tuljapur and Kasegaon and 1: 5.27 in Malegaon. In Janoni though highly satisfactory disease control was achieved in late *Hasta Bahar*, about 70% fruits were lost due to abiotic cracking caused by acute water shortage. In Wadgi, good disease control (less than 5%) was recorded till May end while taking Ambe bahar (February flowering). However, sudden disease spread and non- cooperation from the owner, who did not provide manpower and spray pumps for taking up necessary bactericide sprays for 10 days, resulted in high incidence of bacterial blight and loss of 50- 60 % fruits, hence, the orchard was discontinued. Pesticide residue analysis of the produce at harvest was done at NRCG, Pune. Residues were not detected except of carbendazim and thiophanate metyl which were below permissible limits (Table 17).



Before Adoption



After Adoption

Blight free *Hasta Bahar* Crop of Pomegranate at Farmer's Orchard at Hiraj Adopted by NRCP in 2007-08

Table 16.a: Effect of Orchard Health Management Schedule on Bacterial Blight and Fruit Productivity in Adopted Orchards by National Research Centre on Pomegranate, Solapur

S. No	Adopted Orchard/variety/area	Flower regulation date	Disease Severity			Productivity Fruit Yield (at harvest) (t/ha)		Remarks
			Adopted (Before/at adoption)	Adopted (at harvest)	Non Adopted (at harvest)	Adopted	Non Adopted	
1	Malegaon (Baramati)/ Bhagva/ 1 ha (2 orchards of 0.5 and 1.5 acres)	Aug 3-11 2008	55.85 (average of two)	21.5 (average of two)	30	10.7 (average of two)	8	Bahar not taken along with adopted Hasta Bahar
2	Kasegaon, Tal.- Pandharpur (Solapur) /Bhagva/1 ha	August 10, 2008	30-40 % fruits lost due to BB in previous year	Nil (1.59 in Dec.)	Nil (2.41 in Dec.)	9.7	9.0	taken later Fruits in adopted were of better colour and appearance
3	Tuljapur Dist. Osmanabad,/ Bhagva/1 ha	July 10, 2008	10.0	3.07	12.25	10.6	3.0	Due to rains flowering not synchronized hence harvesting extended
4	Janoni, Mangalvedha (Solapur) /Bhagva/1 ha	July 10, 2008	100 % before adoption	63 in Nov.	Bahar not taken	--	Bahar not taken	Heavy rains, Low fruiting and high disease pressure fresh flowering taken on 8.12.09
		Dec 8, 2009	28	Less than 2 %	Upto 5 %	1.6 tons (60-70% fruits lost due to abiotic cracking*)	Nil (All fruit lost due to abiotic cracking*)	*Acute water shortage in April
5	Wadgi (Solapur) / Bhagva/1 ha	*August 8, 2009	50.5	Less than 5% in May	25.00	Had to leave orchard due to non cooperation by owner.	—	* Heavy rains, Low fruiting and high disease pressure, put to stress from Jan 03, 2009 to Feb. 24, 2009 and fresh flowering taken

Table 16.b: Effect of Orchard Health Management Schedule on Cost Benefit Ratio Based on at Cost of Cultivation and Income from Produce of Bacterial Blight Affected Adopted Orchards by National Research Centre on Pomegranate, Solapur

S. No.	Adopted Orchard	Income from Produce (Rs.)	Cost of Cultivation (Rs)	Net Profit (Rs)	Cost Benefit Ratio
1	Malegaon (Baramati)/ Bhagva/ 1 ha (2 orchards of 0.5 and 1.5 acres)	5,3,1800.00	84,834.00	4,46,966	1:5.27
2	Kasegaon, Tal.- Pandharpur (Solapur) /Bhagva/1 ha	3,42,260.00	92,831.00	2,49,429.00	1:2.69
3	Tuljapur Dist. Osmanabad,/ Bhagva/1 ha	3,28,800.00	1,03,456.00	2,24,544.00	1:2.17
4	Junoni Farm Mangalvedha (Solapur) /Bhagva/1 ha	44,800.00	1,25,000.00	Loss	Negative (*70% fruits lost due to abiotic cracking in April due to acute water shortage)
5	Wadgi (Solapur) / Bhagva/ 1 ha	Orchard left due to non cooperation of the farmer as labour was not provided			

Table 17 : Pesticide Residues at Harvest in NRCP Adopted Orchards

Pesticide	PHI (days)		Residue Level (mg/kg)			MRL	
	Present Studies	Already Existing	Pandharpur	Baramati	Tuljapur	EU	India
Carbendazim (0.1%)	120	120	0.049	0.028	0.032	0.1	0.5
Mancozeb (0.25)	40	90	--	--	--	0.05	--
Thiophanate Methyl (0.15%)	55	50	0.018	0.016	BLQ	0.1	0.5
Copper oxychloride (0.2%)	15	35	--	--	--	20	--
Imidachloprid (0.04%)	55	60	--	--	--	0.05	--
Monocrotophos (0.1%)	100	--	--	--	--	--	--
Deltamethrin (0.1%) 225/plant	60	40 (cypermethrin)	--	--	--	0.05	--
Phorate	180	120	--	--	--	--	--
-- Not detected							



Plate 6 : Some of the pomegranate orchards before/at adoption by NRCP Solapur



Plate 7 : Demonstration activities in adopted orchards by NRCP Solapur



Plate 8 : Blight free produce of adopted orchard at Kasegaon , Pandharpur



Plate 9 : Blight free produce of adopted orchard at Baramati (a)



Plate 10 : Blight free produce of adopted orchard at Tuljapur



Plate 11: Adopted orchard at Wadgi, free from blight in *Hasta* and *Ambe Bahar* till May end



Plate 12 : Adopted orchard (Late *Hasta Bahar*) at Junoni, Blight free but 70% fruits lost due to abiotic cracking

DEMONSTRATIONS BY MARATWADA AGRICULTURAL UNIVERSITY (MAU), PARBHANI (PLATE 13)

Five orchards (two at Osmanabad, two at Beed and one at Latur) were adopted by MAU, Parbhani. The criteria of orchard selection for demonstration were as per the guidelines provided by National Research Centre on Pomegranate, Solapur. Incidence of bacterial blight and its severity before the adoption of orchards are presented in Table 18. The *hasta bahar* was prolonged due to heavy rains in the month of October and November, 2008, when the demonstration plots were adopted, which resulted in the delay of various activities (pruning, defoliation) to be undertaken in the orchards. The pruning operation was undertaken in the fourth week of December, 2008 at Hangarga and second week of January, 2009 at Upala (Ma.) and Seluamba. Weather conditions at Hali Khurdali

and Upali were not favourable, hence, the orchards were pruned in March, 2009. The condition of orchards at Hali Khurdali and Upali was not good, however condition of demonstration plots adopted at Hangarga, Upala (Ma.) and Seluamba was better. Bacterial blight disease on fruits was observed in the first week of June, 2009 in demonstration plots adopted at Hangarga, Upala and Seluamba, however, the disease intensity was very low. Spraying operations were undertaken in these demonstration plots at 7 days interval. The bacterial blight disease in the above mentioned demonstration plots was under control. The harvesting of fruits in above mentioned orchards was done in the month of August-September, 2009. There was reduction in disease severity in all the adopted orchards at harvest w.r.t. non adopted orchards (Table 19). The cost benefit ratio ranged between 1:1.12-1.6 in three adopted orchards, while in other two, crop was lost (Table 20).

Table 18: Status of Demonstration Plots Adopted by MAU Parbhani

Sr. No.	Demonstration plots adopted	Variety	Disease Incidence (I) in %, Severity (S) in %					
			Leaves		Fruits		Stems / Twigs	
			I	S	I	S	I	S
1	Mrs. Kamal Uddhavrao Gilbile Upala (Ma.) Dist. Osmanabad. (Adopted in November, 08) Mr. Kishor Vasantrya Hangargekar	Bhagwa	52	18	56	25	Traces	Traces
2	Hangarga Tq. Tuljapur, Dist. Osmanabad. (Adopted in November, 08) Mr. Keshav Dattagir Giri Seluamba	Bhagwa	54	19.5	60	28	Traces	Traces
3	Tq. Ambajogai, Dist. Beed. (Adopted in December, 08) Mr. Shaikh Mayur Shaikh Rauf	Bhagwa	48	17.5	51	23.5	Traces	Traces
4	Upali, Tq. Wadawani, Dist. Beed. (Adopted in December, 08) Mr. Bhanudas Sudamrao Jadhav	Bhagwa	42	15	47	21	Traces	Traces
5	Hali Khurdali Tq. Chakur, Dist. Latur. (Adopted in November, 08)	Bhagwa	40	13.5	44	20	Traces	Traces



Plate 13: Demonstration plots and fruit quality in adopted orchards by MAU Parbhani

Table 19: Effect of Orchard Health Management Schedule on Bacterial Blight and Fruit Productivity in Adopted Orchards by MAU, Parbhani

S. No	Adopted Orchard/variety/area	Flower regulation date	Disease Severity			Productivity Fruit Yield (at harvest) (t/ha)		Remarks
			Adopted (Before/at adoption)	Adopted (at harvest)	Non Adopted (at harvest)	Adopted	Non Adopted	
1	Upala, dist. Osmanabad/ Bhagva/1 ha	Jan. 2 nd . Wk. 2009	19.5	12.7	20.3	5.75	3.20	Due to rains Bahar was taken late
2	Hangarga, dist. Osmanabad/ Bhagva/1 ha	Dec., 2008 4 th wk	21.7	13.7	21.2	4.80	2.95	
3	Seluamba, Dist. Beed/ Bhagva/1 ha	Jan. 2 nd . Wk. 2009	18.3	11.8	17.6	4.55	2.70	
4	Upali, Dist. Beed/ Bhagva/1 ha	March 2009	16.3	1.1	21.0	0	2.90	
5.	Hali Khurdali, dist. Latur/ Bhagva/1 ha	March 2009	15.5	0.7	1.6	0	0	

Table 20: Effect of Orchard Health Management Schedule on Cost Benefit Ratio Based on Cost of Cultivation and Income from Produce of Bacterial Blight Affected Adopted Orchards by MAU - Parbhani

S. No.	Adopted Orchard	Income from Produce (Rs.)	Cost of Cultivation (Rs)	Net Profit (Rs)	Cost Benefit Ratio
1.	Upala Tq. & Dist. Osmanabad	2,08,500/-	78,796	1,29,704	1:1.6
2.	Hangarga Tq. Tuljapur Dist. Osmanabad	. 1,77,000/-	75,739	1,01,261	1: 1.34
3.	Sehamba Tq. Ambejogai Dist. Beed	1,59,850/-	72,279	87,579	1:1.21
4.	Upali Tq. Wadwani Dist. Beed	0.00	69,670	loss	-
5.	Hali Khu. Tq. Chakur Dist. Latur	0.00	67,025	loss	-

DEMONSTRATIONS BY MAHATMA PHULE KRISHI VIDYAPEETH, RAHURI

Three Orchards in Deola Tahasil of Nashik district, 3 in Sangola Tahsil of Solapur district, 2 in Jat Tahasil of Sangli district and 1 each in Sangmner Tahasil of Ahmednagar District and Baramati Tahasil of Pune district were selected for demonstrations by MPKV Rahuri. The

demonstrations under network project were started in February-March, 2009, due to late approval from their university authorities. The orchard health management schedules were followed as per the approved programme. Table 21 shows that bacterial blight in adopted orchards could be checked $\geq 50\%$ in 4 adopted orchards at Telangwadi, Lotewadi, Dahitane and Pimpri Kurd. The control of bacterial blight to the extent of 35-40% was achieved in orchards at Atpadi, Vadgaon

Landge and Naranwadi but the demonstrations failed to yield positive results in other three adopted orchards one each at Indira Nagar, Thengoda and Arai Shivar in Nashik district. The yield data have been reported only in six orchards

where it was slightly better (max difference of 1.93 t/ha) than non-adopted orchards. The yield data for orchards at Telangwadi, Lotewadi, Dahitane and Arai Shivar were not made available till the time of writing this report.

Table 21: Effect of Orchard Health Management Schedule on Bacterial Blight and Fruit Productivity in Adopted Orchards by Mahatma Phule Krishi Vidyapeeth,, Rahuri

S. No	Adopted Orchard/varietal/area	Flower regulation date	Disease Severity			Productivity Fruit Yield at harvest (t/ha)		Remarks
			Adopted (Before/ at adoption)	Adopted (at harvest)	Non Adopted (at harvest)	Adopted	Non Adopted	
1	*Telangwadi, Tal. Mohol, Dist. Solapur./ Bhagwa /1.0 ha	Feb- march 2009	50.79	18.37	50.0	Report awaited	Report awaited	Work Started after getting approval by Director Research
2	*Lotewadi, Tal. Sangola, Dist. Solapur./ Bhagwa /1.0 ha	Feb- March 2009	37.02	12.72	40.0	Report awaited	Report awaited	
3	*Dahitane, Tal. Akalkot, Dist. Solapur./ Bhagwa /1.0 ha	Feb- March 2009	31.55	16.33	35.00	Report awaited	Report awaited	
4	Pimpri Kurd, Tal. Alpadi, Dist. Sangli / Bhagwa /1.0ha	Feb- March 2009	73.5	21.00	22.00	6.15	6.0	
5	Atpadi, Tal. Atpadi, Dist. Sangli/ Bhagwa /1.0ha	Feb- March 2009	33.80	20.50	23.50	6.18	5.45	
6	Indira Nagar Satana, Dist. Nashik./ Bhagwa /1.0ha	Feb- March 2009	3.7	11.3	13.10	18.25	17.18	
7	Thengoda Satana, Dist. Nashik./ Bhagwa/ 1.0ha	Feb- March 2009	50.5	43.30	49.60	8.33	7.75	
8	Arai shivar Satana, Dist. Nashik./ Bhagwa 1.0 ha	Feb- March 2009	18.8	64.50	68.70	Report awaited	Report awaited	
9	Vadgaon Landge, Tal. Sangamner, Dist. Ahmednagar. Bhagwa/1.0ha	Feb- March 2009	37.5	24.2	29.9	5.18	4.44	
10.	At. Post. Naranwadi, Tal. Narayangao, Dist. Pune./ Bhagwa / 1.0 ha	Feb- March 2009	19.2	11.9	14.6	10.36	8.43	

DEMONSTRATIONS BY UAS DHARWAD (PLATE 14a)

The survey team traveled almost all pomegranate areas of North Karnataka and selected six pomegranate orchards (5ha) based on the

severity of bacterial blight disease. The list and details of orchards selected for demonstration have been given in Table 22.

For these selected orchards, recommended doses of different chemicals viz., copper oxychloride, streptocycline, copper sulphate, bleaching

Table 22: Details of Orchards Selected by UAS, Dharwad for Demonstrations

Sl.No.	Name of farmer	Area (Ha)	Variety
1.	Mr.Rangappa Nigappa Talawar, Hebbal, Tq. Mudhol, Dt: Bagalkot	1.00	Arakta, Ganesh
2.	Mr. Sharanappa Tippanna Koudi, Hiremannapur, Tq. Kustagi, Dt: Koppal	1.00	Kesar
3.	Mr. Sharanappa Arakeri, Bandi, Tq.Yelburga, Dt: Koppal	1.00	Kesar
4.	Mr. Hari Raju, Shivanada Nagar Camp, Tq: H.B. Halli , Dt: Bellary	1.00	Bhagwa
5.	Mr. Dundappa Parasappa Navi, Baradol, Tq: Indi, Dt: Bijapur	0.50	Kesar
6.	Mr.Sharanappa Kakamari, Utnal, Tq: Bijapur, Dt: Bijapur	0.50	Ganesh



Plate 14a :Fruit quality in the orchards adopted by UAS Dharwad

powder and other micronutrients were supplied to the growers under the project. Apart from this, technical knowledge were imparted to the selected farmers and field staffs directly involved in the demonstration activities of these selected orchards.

In these demonstration plots different activities viz., pruning of branches and watery shoots of the trees, defoliating the trees with ethrel spray, burning of diseased and collected debris of the plant parts, drenching with bleaching powder to minimize the disease inoculum, pasting of pruned and disease affected parts with Bourdeaux paste, and spraying of the recommended chemicals at recommended doses (streptocycline @500 ppm + copper oxychloride @2000ppm, carbendazim @0.1%) were taken up for the management of disease. Other integrated disease management operations were also initiated at the field level by the team associated with CO-PIs and Training

Helpers in different selected orchards.

The data in Table 23 show that high disease control (>70%) w.r.t. that at the time of adoption was recorded at harvest in all the adopted orchards except one at Bandi, district Koppal, where only 46.67 % reduction of disease was observed. When compared with non- adopted orchards, the control was higher at Bandi (64 %), Baradol (86.94%) and Utnal (85.5%). The harvest of disease free fruits also increased in adopted orchards. The yield of all the adopted orchards except one at Utnal was 52.3-79.16 per cent higher than non-adopted orchards, whereas, at Utnal it was only 33.33% higher. The lower fruit yield at Utnal can be attributed to hail storm for 2 hrs in the month of May, which damaged a high percentage of fruits. The Project Director, Dr. VT Jadhav also visited the adopted orchards during his visit to Karnataka (Plate 14.b)

Table 23: Effect of Orchard Health Management Schedule on Bacterial Blight and Fruit Productivity in Adopted Orchards by University of Agricultural Sciences, Dharwad (Karnataka)

S. No	Adopted Orchard/variety/area	Flower regulation date	Disease Severity			Productivity Fruit Yield (at harvest) (t/ha)		Remarks
			Adopted (Before/at adoption)	Adopted (at harvest)	Non Adopted (at harvest)	Adopted	Non Adopted	
1	H.B. Halli, dist. Bellary/Bhagwa/1 ha	Sept. – October, 2008	18.3	1.4	8.2	10.5	4.0#	# 70% Fruits affected with BB
2	Bandi, dist. Koppal/Kesar/1 ha		13.5	7.2	20.0	9.0	2.0#	and fungal spots,
3	Hebbal, dist. Bagalkot /Arakta, Ganesh 1ha		69.1	3.4	38.3	12.0	2.5#	*Less yield due to
4	Baradol, dist.Bijapur/Kesar/0.5 ha		25.4	3.8	29.1	4.20	2.0#	hail storm for 2 hrs
5	Utnal, dist Bijapur/Ganesh/0.5 ha		7.2	1.9	13.1	3.0*	2.0#	in May, ** Reattack of BB in Nov. 3 rd wk.
6	Hiremannapur, dist. Koppal/ Kesar/1 ha		26.7	6.4	15.3	6.50**	2.5#	



Plate 14.b: Dr. VT Jadhav, Project Director visits adopted orchard at Dharwad

DEMONSTRATIONS BY INDIAN INSTITUTE OF HORTICULTURAL RESEARCH, BANGALORE (PLATE 15-17)

Three orchards, one each of 1ha area at Tumkur, Chitradurga and Davangere were selected by the

Institute for demonstration. The crop was taken during **Hasta Bahar** (September - October). The soil and irrigation water of these orchards was analyzed respectively for nutrient status and suitability of irrigation water and summarized report is given in Table 24.

Table 24: summarized report of soil and water analysis of adopted orchards by IIHR, Bangalore

Particulars	Sira	Hiriyur	Jagalur
EC	Safe	Safe	Safe
Organic carbon & Nitrogen	Low	Low	Low
Phosphorus & Potassium	Optimum	Optimum	Low
Calcium & Magnesium	High	High	High
Iron	Optimum	Low	Low
Manganese & Zinc	Optimum	Optimum	Low
Copper	Optimum	Optimum	Optimum
Soil Reaction (pH)	Alkaline	Calcareous	Calcareous
WATER ANALYSIS REPORT			
EC	High	High	High
Chlorides	High	High	High
Bicarbonates	High	High	High
Sodium	High	High	High



Hiriya



Sira

Plate 15: Demonstration plots at Hiriya and Sira, adopted by IIHR, Bangalore

Soil and water analysis of adopted orchards

Sira, Tumkur

Test report indicated that the soil was alkaline in reaction. The electrical conductivity of the soil was in the safer range. The soils were low in organic carbon and available nitrogen content. The available phosphorus level was high and that of potassium was in the optimum range. Among the micronutrients, the available iron, manganese, zinc and copper were at optimum range. Since the soil available phosphorus was high, judicious application of phosphorus was suggested. As the soil was alkaline in nature, gypsum application @ 1 ton per ha in the soil was advised. The soil has also been given for analysis of available boron status and the results are awaited.

Test report of water sample shows that it contains considerable amount of soluble salts. This

indicates that the water is not so good for irrigation purpose and continuous use of this water may result in salinity problem in the long run.

Hiriya, Chitradurga

The soils were analyzed for nutrient status and that of water for irrigation suitability. Test report indicated that the soil was calcareous in reaction. The electrical conductivity of the soil was in the safer range. The soils were low in organic carbon and available nitrogen content. The available phosphorus and potassium content were near to the optimum range. The available calcium, magnesium and sulphur were in higher range as the soil was calcareous in nature. Among the micronutrients, the available iron was only low while manganese, zinc and copper were at sufficiency range. The soil has also been given for



Plate 16: Demonstration plots at Jagalur, adopted by IIHR, Bangalore



Plate 17: Sanitation Standards at non adopted orchards near adopted orchards by IIHR Bangalore

analysis of available boron status and the results are awaited.

Test report of water sample shows that it contains high amount of soluble salts. This indicates that the water is not so good for irrigation purpose and continuous use of this water may result in salinity problem in the long run.

Jagalur, Davanagere

The soil was analyzed for nutrient status and that of water for irrigation suitability. Test report indicated that the soil was calcareous in reaction. The electrical conductivity of the soil was in the safer range. The organic carbon content, available nitrogen, phosphorus, sulphur and potassium levels were low in the soil. The available calcium and magnesium were in higher range as the soil was calcareous in nature. Among the micronutrients, the available iron, manganese and zinc were low in soil whereas, copper was at optimum range. The soil has also been given for analysis of available boron status and the results are awaited.

Test report of water sample indicates that irrigation water contains high amount of soluble salts. This suggests that the water is not so good for irrigation purpose and continuous use of this water may result in salinity problem in the long run.

Demonstration Activities

Pruning was done during September and October, 2008. Bordeaux paste (10%) was applied to the cut ends immediately after pruning. Ethrel (0.2%) spray was given along with urea phosphate (0.2%) and urea (0.1%) for defoliation. After defoliation, the plants were thoroughly sprayed with Bordeaux mixture (1%). Fifteen days after Bordeaux spray and during foliage development, as a prophylactic measure to control BBD, one application of Streptocycline (250 ppm) plus 0.25% Copper oxychloride (COC) through spray along with sticker was given. Recommended fertilizers (NPK) and FYM were applied as basal

dose a week after foliage development. One more spray of Bordeaux mixture @ 0.4% was given 15 days after the first spray of Streptocycline plus COC. The field sanitation was maintained right from pruning till harvest and the tree basins were treated with bleaching powder (150g/plant) by dusting on the ground to reduce the bacterial inoculum on left over plant debris in orchard. The application of Bordeaux mixture alternated with antibiotics plus COC checked the incidence of BBD in all the three locations, where the disease incidence after the initial treatment was 4.36, 4.23 and 4.35 PDI, respectively (Table 25). The major insect pests encountered from foliage initiation to fruit development were thrips, mites, aphids and fruit borer, *Helicoverpa armigera*. They were controlled with the application of recommended insecticides. Similarly, the major diseases noticed during cropping period were fungal scab, *Pseudocercospora punicae* and anthracnose, which were controlled with the application of Thiophanate methyl (0.15%) and Carbendazim (0.15%). Bacterial blight disease, which was a major problem in the area, was kept under check by alternate spray of Bordeaux mixture and Streptocycline + COC.

Impact of OHM

The implementation of the technology for the mitigation of BBD in pomegranate has worked very well and the disease incidence was remarkably reduced in adopted orchards as compared to non-adopted orchards (Table 25). Thus, the initial BBD incidence of 4.36, 4.23 and 4.35 PDI recorded in demonstration plots after the start of the treatment (October, 2008) gradually reduced to 0.30, 1.82 and 0.30 PDI in Sira, Hiriyur and Jagalur during the month of April, 2009, and 0.0, 4.6 and 0.2 PDI in the month of May, 2009, respectively. Whereas, in respective non-adopted orchards, the BBD incidence were 10.4, 5.4 and 6.6 PDI, respectively at the time of adoption in October, 2009 (Annexure 18), which gradually

increased and became very high after January, 2009. In the month of May, the disease incidence in non-adopted orchards in respective areas was 30.7, 27.2 and 35.9 PDI.

In all the three adopted orchards highly satisfactory bacterial blight control at harvest was recorded i.e above >92%-100% when compared to severity at/before adoption and > 83-100% when compared to non-adopted orchard at harvest.

The orchard health management schedule significantly affected fruit yield. The highest fruit yield of 8.0 tonnes/ha was obtained in the adopted pomegranate orchards at Hiriya, followed by 7.0 tonnes/ha at Jagalur and 6.5 tonnes/ha at Sira, Tumkur, whereas, in the non-adopted orchards it was 3.0, 1.5 and 1.5 tonnes/ha, respectively (Table 25).

These orchards, where OHM technology was adopted and where it was not adopted were periodically surveyed from October, 2008 to May, 2009 to see the effect of technology on disease progress. The results are presented in annexure 18. The average bacterial blight incidence in Tumkur district during the period was 11.9 PDI, with a range of 7.3 to 13.9 PDI. The mean disease

incidence in demonstration plot at Sira was 1.15 PDI with a range of 0.0 to 4.36 PDI. The mean disease incidence in four orchards, where the management practice was adopted from the demonstration plot was, 2.40, 2.50, 2.81 and 3.17 PDI. However, in the non-adopted orchard chosen for comparison, the mean incidence was 24.74 PDI (from October, 2008 to May 2009) with a range of 10.4 to 30.7 PDI. In Chitradurga district, the average bacterial blight incidence during the period was 16.73 PDI, with a range of 4.82 to 22.6 PDI. The mean disease incidence in demonstration plot at Hiriya was 2.79 PDI with a range of 0.0 to 5.90 PDI. However, in the non-adopted orchard chosen for comparison, the mean incidence was 21.50 PDI (from October, 2008 to May 2009) with a range of 5.4 to 29.9 PDI. In Davanagere district, the average bacterial blight incidence during the period was 16.56 PDI, with a range of 5.36 to 23.6 PDI. The mean disease incidence in demonstration plot at Bennehalli was 0.83 PDI with a range of 0.0 to 4.35 PDI. However, in the non-adopted orchard chosen for comparison, the mean incidence was 24.45 PDI (from October, 2008 to May 2009) with a range of 6.6 to 37.8 PDI.

Table 25: Effect of Orchard Health Management Schedule on Bacterial Blight and Fruit Productivity in Adopted Orchards by Indian Institute of Horticultural Sciences, Bangalore

S. No	Adopted Orchard/variety/area	Flower regulation date	Disease Severity			Productivity Fruit Yield (at harvest) (t/ha)	
			Adopted (Before/at adoption)	Adopted (at harvest)	Non Adopted (at harvest)	Adopted	Non Adopted
1	Yemmerahalli, Dist. Tumkur / Bhagva/1 ha	Oct., 2008	69.5	0.00	30.70	6.5	1.5
2	Hiriya, dist. Chitradurga / Bhagva/1 ha	Oct 2008	56.8	4.60	27.2	8.0	3.0
3	Jagalur, dist. Davanagere/ Bhagva/1 ha	Oct 2008	53.4	0.20	35.9	7.0	1.5
The adopted and non adopted orchards were periodically surveyed from Oct. 2008 to May 2009, monthly disease progress given in Annexure 18							

**DEMONSTRATIONS BY ANDHRA PRADESH
HORTICULTURAL UNIVERSITY, ANANTPUR**
(PLATE 18-20)

After selecting the orchards the respective farmers were briefed about the activities for conducting demonstration. Out of 8 demonstrations selected, *hasta bahar* was taken in 6 demonstrations and *ambe bahar* in one demonstration and *Mrig bahar* in another demonstration. Soil samples were collected from each demonstration plot and analyzed for their nutrient status. Pruning was carried out with disinfected (1% sodium hypochloride) secateurs and during pruning infected twigs were pruned 2" below the infection and such pruned material,

dried twigs, infected and fallen fruits were collected and burnt. Immediately after pruning, the trees were sprayed with 1% Bordeaux mixture and Bordeaux paste was applied on the cut ends. Tree basins were dusted with 4% bleaching powder to reduce the bacterial population in the soil as well as on fallen leaves. Recommended dose of fertilizers were applied. Second spray was given at foliage initiation with Streptocyclin (250 ppm) + copper oxy chloride (0.3%). Third spray was given with 1% Bordeaux mixture 15 days after second spray. Fourth spray was given at flower initiation with Streptocyclin (250 ppm)+ Carbendazim (0.1%). Under favourable conditions of overcast sky and rains, sprays were repeated with Streptocyclin (500ppm) + Carbendazim

Table 26: Profile of Demonstration Plots Selected by APHU, Anantpur

S.No	Name of the Farmer	Name of the village	Mandal	Date of adoption	Variety	Area in acre	Age (Years)
Anantpur							
1.	M.Damodhar Naidu	Ammalladinne	Peddapappur	04.09.08	Bhagwa	2.0	8
2.	V.Ramakrishna Reddy	Naminankapalli		04.09.08	Bhagwa	1.0	4
3.	U. Prabhakar	Kanekal cross	Kanekal	05.09.08	Ganesh	2.5	8
4.	M.Ramakrishna	LB Nagar	Bommanahall	05.09.08	Bhagwa	2.5	4
5.	P. Ravindra Reddy	Godiselapalli	D-heerehall	07.09.08	Bhagwa	2.5	4
6.	Ragahavendra Rao	Kondampalli	Penukonda	27.09.08	Mridula	2.0	8
7.	G. Krishnappa	Gundumala	Madakasira	02.11.08	Bhagwa	2.5	5
Mahaboob Nagar							
8.	P. Jammanna	Settyatmakur	Gadwal	17.09.08	Bhagwa	2.5	4

(0.1%) at 10 days interval. Micro and secondary nutrients, namely Ferrous sulphate, Zinc Sulphate, Magnesium sulphate and Boron were applied through foliar spray. Other plant protection measures for the management of fungal fruit spot, wilt, fruit borer, thrips, shot hole borer were adopted. Phytosanitary measures were adopted by removing and burning the infected fruits. The observation of disease incidence on leaves, stems and fruit were recorded in demonstration and non-demonstration plots at 15 days interval by adopting 0 to 6 foliar disease rating scale. For this purpose 20 plants were selected randomly and tagged in both demonstration plots and in non

demonstration plots. Later, per cent disease index and per cent severity on tree was calculated and summarized Table 27. The detailed month-wise observations for each demonstration plot have been presented in annexure 19-26. Fruit yield was recorded in demonstration as well as in non-demonstration plots at each harvest and net returns were calculated and presented in Table-28. Out of 8 demonstration conducted, harvesting of fruits was completed in 6 demonstration plots and in one orchard the crop was under progress and in other demonstration the crop failed due to severe incidence of the disease.

Table 27: Effect of Orchard Health Management Schedule on Bacterial Blight and Fruit Productivity in Adopted Orchards by Andhra Pradesh Horticultural University, Anantpur, (AP)

S. No	Adopted Orchard/variety/area	Flower regulation date	Disease Severity			Productivity Fruit Yield (at harvest) (t/ha)	
			Adopted (Before/at adoption)	Adopted (at harvest)	Non Adopted (at harvest)	Adopted	Non Adopted
1	Ammalladine, dist. Anantpur	November, 2008	18.98	14.68	22.17	15.175	11.589
2	Naminankapalli, dist. Anantpur	November, 2008	21.84	3.78	6.73	7.405	6.866
3	Kanekal, dist. Anantpur	November, 2008	45.47	6.96	10.77	13.65	11.4
4	LB Nagar, dist. Anantpur	November, 2008	23.20	8.33	11.51	3.85	3.50
5	Gudisalapalli, dist. Anantpur	November, 2008	9.2/32.67	13.88	19.63	6.583	5.250
6	Kondampalli dist. Anantpur	November, 2008	0.36	1.29	1.98	Not harvested	Not harvested
7	Gundumala, dist. Anantpur	November, 2008	7.88	18.85	26.22	Not harvested	Not harvested
8	Settyamakur, dist. mahaboobnagar	November, 2008	5.92	11.67	13.65	9000	8200
Detailed monthly observations in Annexures 19-26							

Table 28: Effect of Orchard Health Management Schedule on Cost Benefit Ratio Based on Cost of Cultivation and Income from Produce of Bacterial Blight Affected Adopted Orchards by APHU, Ananthpur

S.No	Adopted Orchard	Demonstrations				Non Demonstrations				Additional benefit over non demonstration Rs./ha.
		Income from produce (Rs.)	Cost of Cultivation (Rs.)	Net Benefit (Rs.)	Cost benefit Ratio	Income from produce (Rs.)	Cost of Cultivation (Rs.)	Net Benefit (Rs.)	Cost benefit Ratio	
1.	Ammalladinne, Pedda Pappur, Anantpur	279647/-	69218/-	210429/-	1:3.04	192660/-	78453/-	114207/-	1:1.28	96222/-
2.	Naminankapalli, Pedda Pappur Anantpur	209608/-	74044/-	135564/-	1:1.83	190070/-	81764/-	108306/-	1:1.33	27258/-
3.	Kanekal cross, Kanekal, Anantpur	262850/-	58570/-	204280/-	1:3.49	215572/-	62426/-	153146/-	1:2.45	51134/-
4.	LB Nagar, Bommanahall, Anantpur	75875/-	61768/-	14107/-	1:0.23	65945/-	66919/-	-975/-	loss	15082/-
5.	Godiselapalli, D-Heerehall, Anantpur	173690/-	48641/-	125049/-	1:2.57	134300/-	51594/-	82706/-	1:1.60	42343/-
6.	Settyatmakur, Gadwal, Mehaboobnagar,	248895/-	53034/-	195861/-	1:3.69	220610/-	60526/-	160084/-	1:2.65	35777/-

Impact of OHM

Hasta bahar crop was taken in demonstration orchards (6 orchards) and onset of flowering was delayed owing to low temperatures that prevailed during December. Owing to delayed fruit development and maturity, the crop was subjected to high temperatures during April and May and which lead to sun scald and poor pigmentation of arils. As by time, mango captured the market, pomegranate experienced medium market prices.

Detailed observations in Annexure 19-26 show that the incidence and severity of the disease on leaves, stem and fruit was more during November to February months in demonstration as well as in non-demonstration plots. It may be due to prevalence of high humidity and showers received during cyclonic rains. Except in one orchard at Gundumala, the disease incidence in all the adopted orchards was low during March to June due to prevalence of high temperatures and low relative humidity. The percent disease incidence and severity in orchard at Gundumala was more during June because of pre-monsoon rains received during the first week of June.

Though the disease incidence and severity was

less in demonstration plots as against the non-demonstration plots, the margin is less. Because, the farmer adopted almost similar practices which were adopted in demonstration plots. The percent disease incidence and severity varied among the demonstration orchards. Highest per cent disease incidence and severity on leaf and stem was recorded in orchard at Gundumala and fruit incidence in orchard at Godiselapalli. Lowest percent disease incidence on leaf, stem and fruit was recorded at Kondampalli orchard. The variation may be due to the level of phytosanitary measures adopted in different orchards.

Highest fruit yield (15.1 tons/ha) and net returns (Rs. 2,10,429/-) was obtained in orchard at Ammalladinne followed by Kanekal cross orchard with 13.7 tons/ha fruit yield and Rs. 2,04,280/- net return (Table 28). In all the demonstration orchards the additional benefit over non-demonstration plots was calculated and it was found to vary between Rs. 15,000/ha to 96,000/ha by adopting Orchard Health Management Schedule. The cost benefit ratio in adopted orchards ranged between 1:0.23 to 1:3.69 whereas, in non-adopted it ranged between complete loss to 1:2.65.



Plate 18: Demonstration activities in adopted orchards by APHU, Anantpur(AP)



Plate 19 : Visit of project coordinator APHU, Anantpur to adopted orchards



Plate 20 : Fruit quality in adopted orchards at Anantpur

IV. TRAINING

NRC on Pomegranate

Four training manuals (2 in English and 2 in Marathi) were prepared and published by the centre (Plate 21).

These training manuals are a complete package on pomegranate cultivation including nursery raising, pest identification and orchard health management with special reference to bacterial blight. These manuals have several other useful information appended as annexure. These training manuals were distributed to groups/individual farmers visiting the centre from different states and also to the farmers in Maharashtra state where our scientists were invited to impart training. Several groups of growers from Maharashtra, Karnataka and Rajasthan have expressed their interest to have such training. The NRC will organize training programme after getting the budget released under the head 'Training.' The centre has

distributed several copies of these training manuals to the participating organizations to facilitate training programme, the details of which is given in Table 29. Organizations in Karnataka- UAS Dharwad and IIHR, Bangalore and in Andhra Pradesh- APHU, Ananthpur were asked to translate the training manual for farmers in the local language of their respective states.

MAU Parbhani

The coordinators and additional coordinators of the project from MAU Parbhani attended seven training programme organized by other Govt. and private organizations, however the training programmes under the project will be conducted once the budget under the head 'Training' is released.

MPKV Rahuri

The budget under the head 'Trainings' was utilized for conducting trainings/ Farmers' School by MSHMPB Pune, hence trainings will not be conducted.

Table 29: Training manuals published by NRC and distributed to other participating organizations

TRAINING MANUAL	Number of Manuals for each organization					
	NRC	MAU	MPKV	UAS	IIHR	APHU
1. Pomegranate Orchard Health Management Training manual for Farmers and Nursery Men (English)	500	100	100	100	100	100
2. Pomegranate Orchard Health Management Training Manual for Government and Universities Officers (English)	600	25	25	25	300	25
3. <i>Rogmukta Dalimb Bag Vyavasthapan Prasikshan Patrika Sashkiya va Vidyapeeth Adhikaryankarita</i> (Marathi)	2225	750	2000	-	-	-
4. <i>Rogmukta Dalimb Bag Vyavasthapan Prasikshan Patrika Shetkari va Mali Yanchyakarita</i> (Marathi)	800	100	100	-	-	-

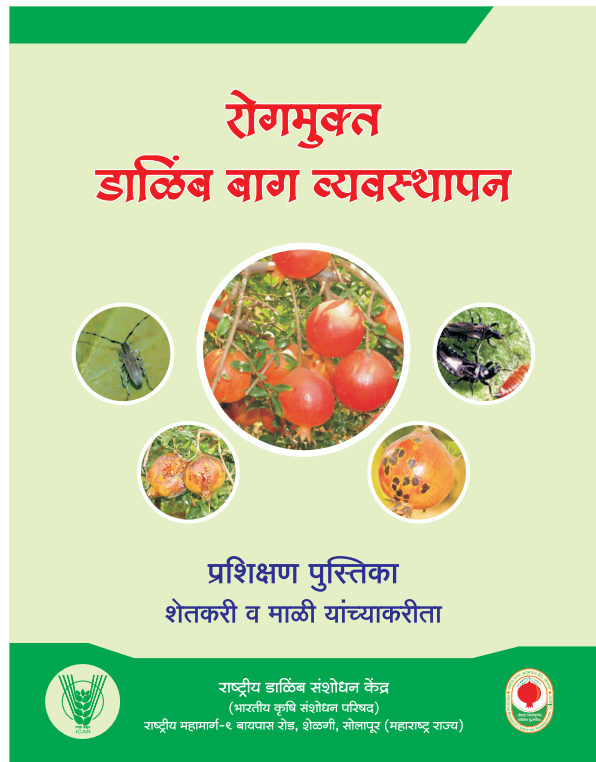
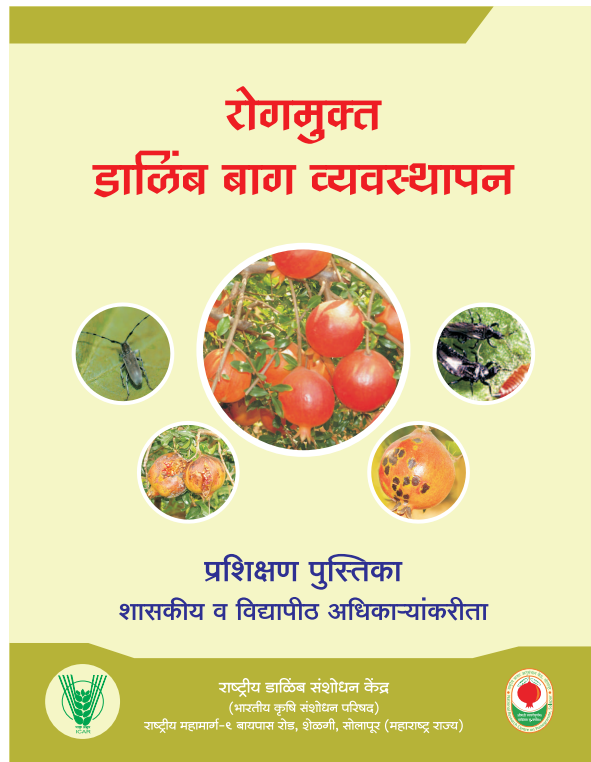
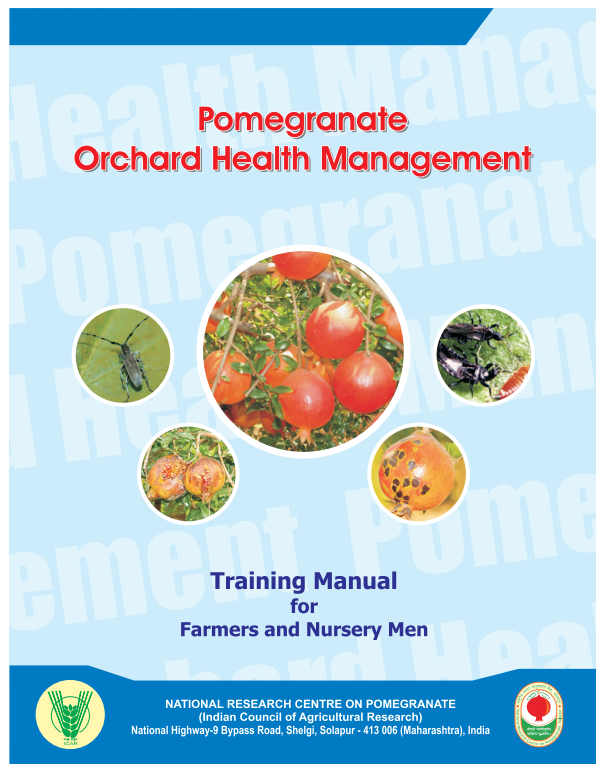
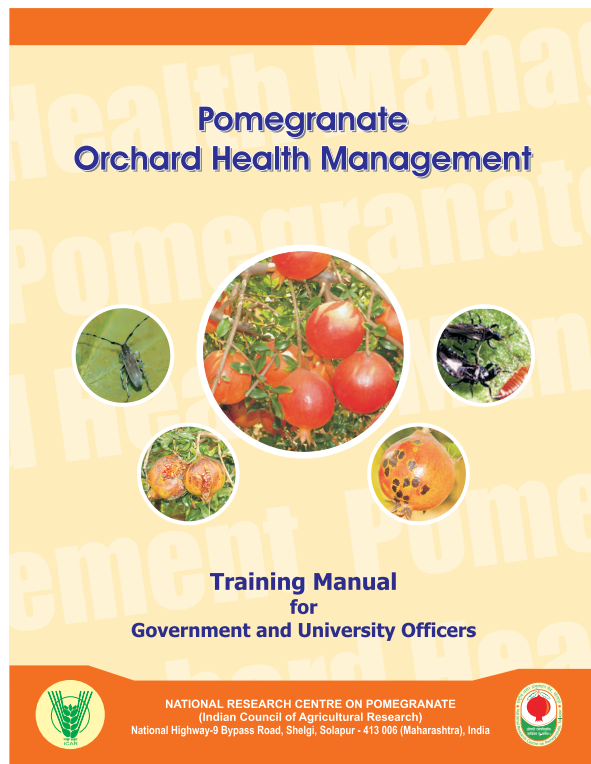


Plate 21: Training manuals published by NRC on Pomegranate

UAS Dharward

The training manual "Pomegranate Orchard Health Management - Training manual for Farmers and Nursery Men (English)" has been translated in Kannada by UAS, Dharward and published (Plate 22) The university has also

prepared and published other relevant literatures in English and Kannada for the benefit of farmers (Plate 23). The university has organized ten training programme (Table 30) at different locations.

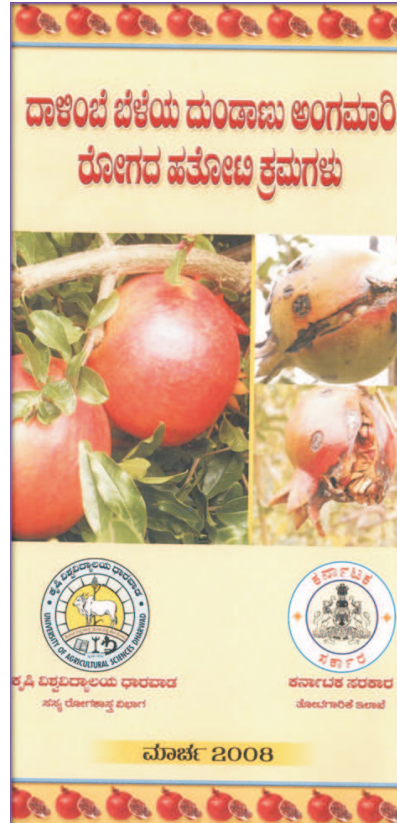
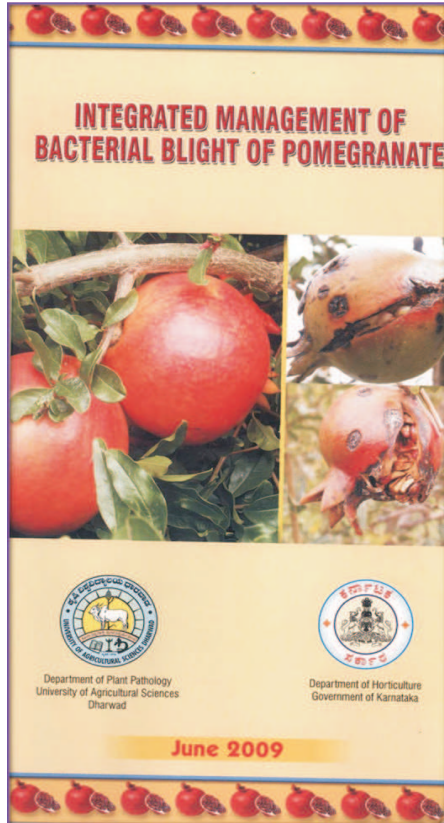
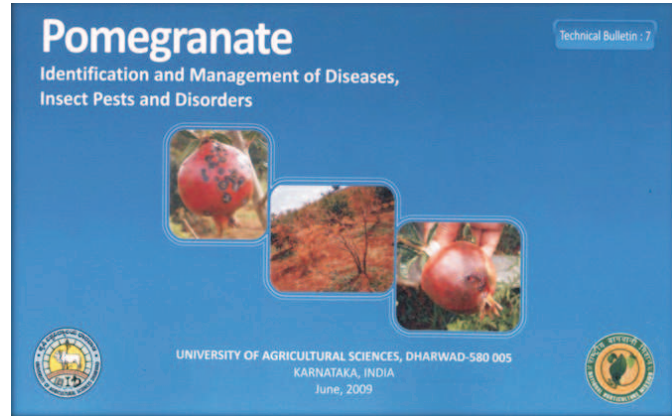


Plate 22 :Training manual and other publications by UAS Dharward



Plate 23: On farm and on campus training programmes conducted by UAS Dharwad

Table 30 : Trainings conducted by UAS Dharwad

S.No.	Date	Venue	No of farmers attended
1.	18/08/2008	Shirkanhalli, (Tq. Indi) Dist: Bijapur	104
2.	19/09/2008	KVK Bijapur Tq: (Bijapur) Dist: Bijapur	85
3.	26/09/2008	Govinkoppa Tq: Bagalkot Dist: Bagalkot	53
4.	26/09/2008	Chiksaunshi Tq: Bagalkot Dist: Bagalkot	64
5.	27/09/2008	Hiremanappur Tq. Kustagi Dist: Koppal	105
6.	10/11/2008	UAS Dharwad for adopted orchard progressive growers and training helpers	21
7.	18/12/2008	Chinchkanddi B.K Tq: mudhool Dis t: Bagalkot	82
8.	10/01/2009	Bandi Tq: Yelburga Dist: Koppal	165
9.	23/01/2009	H. B Halli Tq: H.B. Halli Dist: Bellary	115
10.	24/01/2009	Kundkur	156
Total: 10			929

IIHR Bangalore

Training programme for farmers

Two training programmes for farmers were organized (Table 31), the first programme at Sira, Tumkur district and the second programme at Jagalur (Plate 24), Davanagere district. In addition to the growers, owners of adopted orchard, the programme was attended by dignitaries from state departments and growers associations- Mr. Vishwanath Gowda, Assistant Director Horticulture, Department of Horticulture, Sira Taluka, Mr. Pandurangappa, Assistant Director Horticulture, Department of Horticulture, Jagalur

Taluka, Mr. Madava President, Krishi Sanga, Mr. Shivakumar, Member All India Pomegranate growers Association, Reddy, President, Fruit Growers' Association, Jagalur Taluka.

The growers were imparted technical know-how on all aspects of pomegranate cultivation practices, nursery raising, disease and pest identification and orchard health management with special reference to bacterial blight. They were also provided with relevant literatures in Kannada. The training programme for State officers and University teachers will be organized in the first fortnight of October, 2009.

Table 31 : Trainings conducted by IIHR Bangalore

S.No.	Date	Venue	No of Growers attended
1.	July 26, 2009	Sira, Tumkur	150
2.	Aug. 2, 2009	Bennehalli, Jagalur, Davanagere	80



Sira



Jagalur



Plate 24: Training programmes at Sira and Jagalur by IIHR Bangalore

APHU Ananantpur

Training programmes were organized for the farmers to impart them practical knowledge on integrated management practices against bacterial blight in particular and health of orchard in general (Plate 25 - 27). Two training programmes were organized by the Project

Coordinator (Table 32) and eleven training programmes organized by Department of Horticulture wherein, Project Coordinator participated as a resource person. The organization brought out a pamphlet in Telugu on 'Management of Bacterial Blight of Pomegranate'

దానిమ్మ

బాక్టీరియా తెగులు - సమగ్ర నివారణ



ఆంధ్రప్రదేశ్ ఉద్యాన విశ్వవిద్యాలయం
ఉద్యాన పరిశోధనాస్థానము, అనంతపురం.

వాణిజ్య పరంగా పెండించే పళ్ళలో దానిమ్మ ముఖ్యమైనది అత్యంత ఔషధ విలువలతో పాటు, సేద దీర్చే రసాన్ని దానిమ్మ పండ్ల నుండి పొందవచ్చు. పండ్లవర్గం, రసం, అకులు మరియు చేర్చు అనేక రకాలైన ఆయుర్వేద మందుల తయారీకి ఉపయోగిస్తారు. ఈ పంటను కరువు ప్రాంతాలలో విజయవంతంగా సాగు చేయవచ్చు.

మన రాష్ట్రంలో దానిమ్మను అనంతపురం మరియు మహబూబ్ నగర్ జిల్లాల్లో ఎక్కువగా సాగు చేస్తున్నారు. దానిమ్మను అతిమ తెగుళ్ళలో బాక్టీరియా తెగులు అధిక సమృద్ధి కలుగజేస్తున్నది. రైతులు ఈ రోగ నివారణకై ఎన్నో మందులను వాడినా ఈ తెగులును అరికట్టలేక తోటలనే తొలగిస్తున్నారు. అయితే సమగ్ర నివారణపద్ధతులను రైతాంగము సామూహికంగా పాటిస్తే ఈ తెగులును అదుపులో ఉంచవచ్చు.

రోగ లక్షణాలు :

బాక్టీరియా దానిమ్మ అకులను, కొమ్మలను, కాండము మరియు పండ్లను ఆశిస్తుంది. అకులపై అక్షయకర్మద నీటిలో తడిచిన చిన్నచిన్న మచ్చలు ఏర్పడి, మచ్చల చుట్టూ పసుపు రంగు పలయము ఏర్పడుతుంది క్రమేపీ మచ్చలు ఒక కానితో ఒకటి కలిసి పెద్దవై ఈ అకులు రావిపోతాయి. నీటిలో తడిచిన మచ్చలు, కొమ్మలపైన కాండము పైన మరియు కాండాలపైన గమనించవచ్చును. కొమ్మలు, కాండములపై ఏర్పడిన మచ్చలు ఒక దానిలో ఒకటి కలిసి పెద్ద మచ్చలుగా ఏర్పడి అక్కడి కణజాలం కుళ్ళి విరిగి పోతాయి.



కాయలపై అనేక సంఖ్యలో నీటిలో తడిచిన మచ్చలు ఏర్పడి క్రమేపీ ఒక కానితో ఒకటి కలిసి పెద్దమచ్చలుగా ఏర్పడుతాయి ఈ మచ్చలపై '+' అకారంలో కానీ 'Y' అకారంలో గానీ లేదా పెద్ద చీలికలు ఏర్పడి కాయలు పగ్గిపోతాయి.



రోగ కారకము మరియు వ్యాప్తి :

ఈ రోగము 'కాంట్రిబాక్టెరియా ఆక్సినోఫోరెన్స్. పి.వి. ఫుజే' అనే బాక్టీరియా నుంచి కలుగుచున్నది. అరిచిన అండ్లమొక్కల ద్వారా, కత్తిరింపులకు ఉపయోగించు కత్తెల ద్వారా, గాలిలో కూడిన వర్షాల ద్వారా అరిచిన మొక్కల నుండి ఆరోగ్యంగా ఉన్న మొక్కలకు వ్యాప్తిస్తుంది. అరిచిన కాండము మరియు కొమ్మలలో బాక్టీరియా నెలల కొద్దీ జీవిస్తుంది.

గాలితో కూడిన వర్షాలు అధిక ఉష్ణోగ్రత (30-35°C) తెగులు తీవ్రతకు మరియు వ్యాప్తికి దోహదపడతాయి.

సమగ్రయోజమాన్య పద్ధతులు :

- 1 కొత్తగా దానిమ్మ తోటలు నాటి రైతులు రోగ రహిత మొక్కలనే ఎంచుకొని నాటవలెను.
- 2 మొక్కలను 4 x 4 మీటర్ల దూరంలో నాటుకుంటే తెగులు వ్యాప్తి తగ్గుతుంది.
- 3 కత్తిరింపులకు ఉపయోగించే కత్తెలను డెట్రల్ / స్పిరిట్ / సోడియం హైపోక్లోరైడ్ (1%) లో ముంచి ఉపయోగించాలి.
- 4 తెగులు సోకిన కొమ్మలను తెగులు సోకిన భాగం నుండి 2 ఇంచులు త్రిండు కత్తిరించాలి. కత్తిరించిన భాగాలకు బోర్డోపేస్టు పూయాలి
- 5 కత్తిరింపులకు ముందు అకురాలదానికి 5% యూరియా (50 గ్రాములు లీటరు నీటికి) లేదా ఇథ్రల్ (2.0 నుండి 2.5 మిల్లీ లీటర్లు ఒక లీటరు నీటికి) కలిపి పిచికారి చేయాలి.



- 1 నేలపై రానిన అకులను, తెగులు సోకిన కొమ్మలను, కాయలను తీసి కాల్చివేయాలి.
- 2 చెట్ల పాదాలలో థీరింగ్ పొడరును (8-10 కేజీలు ఎకరాకు) చచ్చుల వలన రానిన అకులలో ఉన్న బాక్టీరియా నశిస్తుంది.
- 3 కత్తిరింపులు అయిన వెంటనే 1% బోర్డో మిశ్రమము, పిచికారి చేయాలి.
- 4 కత్తిరింపులు తరువాత వచ్చిన కొత్త చిగుళ్లపైన, వాతావరణపరిస్థితులు అనుకూలంగా అనగా ఆకాశము మేఘావృతమై అడపాదడపా వర్షాలు పడుతున్నప్పుడు మరియు రోగ లక్షణాలు కనిపించిన వెంటనే కాఫరాక్సీక్లోరైడ్ 30 గ్రాములు, ప్రొథిక్స్ ప్రెక్స్ / కె. ప్రెక్స్ / పొషా మైసిన్ 5 గ్రాములు 10 లీటర్ల నీటిలో కలిపి 10 రోజులు వ్యవధిలో రెండుసార్లు పిచికారి చేయాలి.
- 5 పూత సమయంలో కాపరాక్సీక్లోరైడ్ కు బదులుగా కార్బండిజిమ్ (1 గ్రాము 1 లీటరు నీటికి) కలిపి పిచికారి చేయాలి.
- 6 సెప్టెంబర్ - అక్టోబర్ నెలలో కత్తిరింపులు చేసే పంటకు డీసెంబరు - జనవరి నెలలలో ఉష్ణోగ్రత తక్కువ వుండి తెగులు తీవ్రత తక్కువగా వుంటుంది.
- 7 ప్రతి పంట తర్వాత 4 నుండి 5 నెలలు విశ్రాంతి నివ్వాలి. విశ్రాంతి సమయంలో కూడా మొక్కలపై 1% బోర్డో మిశ్రమం పిచికారి చేయాలి. దీని వల్ల రోగ తీవ్రతను తగ్గించవచ్చును.
- 8 సిఫాయ్ చేసిన రసాయన ఎరువులను (సత్రజని, భాస్కరం, ఫాలాడ్) పశువుల ఎరువుతో కలిపి వాడాలి. దీనికి తోడు సూక్ష్మపోషకాలైన జింక్ సల్ఫేట్ 2 గ్రాము, ఫెర్రస్ సల్ఫేట్ 2 గ్రాము,

మేగ్నీషియం సల్ఫేట్ 2 గ్రాము, బోరిక్ యాసిడ్ 1 గ్రాము లీటరునీటికి కలిపి చెట్లపై పిచికారి చేయడం వలన చెట్లలో రోగ నిరోధక శక్తి పెరుగుతుంది.

- 1 దానిమ్మకు నీటి అవసరం తక్కువ కనుక తగుమాత్రమే నీరుఅందించాలి. ఎక్కువ నీరు ఇవ్వడం వలన కొత్త చిగుర్లు ఎక్కువగా వచ్చి బాక్టీరియాకు అనుకూలమైన వాతావరణ పరిస్థితులు ఏర్పడుతాయి.

గమనిక :

రైతులందరూ దానిమ్మ తోటలను శుభ్రముగా ఉంచుకొని, సామూహికంగా ఈ సమగ్ర పద్ధతులను పాటించినట్లయితే తెగులు తీవ్రతను తగ్గించవచ్చు.

డా॥ కె. సుబ్రహ్మణ్యం

సీనియర్ శాస్త్రవేత్త (పాథాలజీ)
ప్రాజెక్ట్ కో-ఆర్డినేటర్
ఉద్యాన పరిశోధనాస్థానం
అనంతపురం - 515 001.

ఫోన్ : 08554-261388, సెల్ : 9490695704

జాతీయ ఉద్యాన యినిస్
Netwrok Project for Mitigating the Bacterial Blight
Disease of Pomegranate in Andhra Pradesh
చాం
ఆర్థిక సహాయంతో ఈ కవచిత్రం ముద్రించబడినది.



Ammalladinne



Sankargall



Madakasira



Kanekal cross



Nidragatta



Godiselapalli



Plate 26: Training programmes conducted by APHU in association with dept. of Hort. Anantpur in different villages



Settyatmakur



Anantapur

Plate 27: Training programmes arranged by APHU Anantapur

Table 32 : Training programmes conducted by APHU, Anantapur

S.No	Date	Conducted at	Mandal	District	No. of farmers attended
1.		Setty atmakur	Gadwal	Mehaboobnagar	30
2.		Anantapur	Anantapur	Anantapur	40

V. NURSERY INSPECTION

Nursery inspections need to be carried out at the time, when bacterial blight severity is maximum. Identification of disease free nurseries in different areas will help in preventing the spread of blight pathogen in newer areas/orchards. The proforma for nursery inspection (Annexure 27) has been finalized and distributed to all the participating organizations. All State Horticulture Missions have been requested to supply the addresses of authorized nurseries in respective states for carrying out inspections. The Maharashtra State and Horticultural and Medicinal Plant Board, Pune has provided addresses of authorized nurseries in

Maharashtra. The NRCP will conduct inspection of nurseries in Solapur, Sangli, Pune; MAU Parbhani will inspect nurseries in Aurangabad, Jalana, Latur, Osmanabad and Parbhani and MPKV in Ahemadnagar, Dhule, Jalgaon and Nashik.

Monitoring of Nurseries by APHU

The nurseries located at Chigicherla farm of Department of Horticulture (Plate 28) were visited regularly and monitored for disease incidence and development of bacterial blight. The inspected nurseries had incidence of bacterial blight < 5%.



Plate 28: Monitoring of nurseries by the coordinator at Chigicherla farm of Department of Horticulture, Anantpur

VI. EXPENDITURE STATEMENT

The Govt. of India had sanctioned a budget outlay of Rs 360.71 lakhs, vide letter No.F.No.33-10/2007-hort, Dept. Agri. & Cooperation, Govt. of India, New Delhi, on March 3, 2008 and revalidated the same on May 13, 2008, for the three states, Maharashtra, Karnataka and Andhra Pradesh. The National Horticultural Mission, Karnataka released the entire budget of 15.99 and 34.84 lakhs respectively for IIHR, Bangalore and UAS, Dharwad, during the first year, out of which the expenditure reported was 8.8 and 15.58 lakhs respectively. The NHM, Andhra Pradesh released 11.42 lakhs and expenditure was 8.64 lakhs. The

budget sanctioned by MSHMPB, Pune for Maharashtra was Rs 59.5, 41.92 and 24.34 lakhs respectively for NRCP, Solapur, MPKV, Rahuri and MAU, Parbhani, for the first year, out of which budget released to respective organizations was 42.1, 10.35 and 7.5 lakhs and total expenditure was 39.24, 6.20 and 4.78 lakhs respectively. The component -wise budget sanctioned, released and utilized in 2008-09 is summarized in Table 33a and summary of latest budget position including that of 2009-10, as provided by different organization till printing of the report is given in Table 33b.

Table 33a: Component Wise Budget Position (Rs. in Lakhs) under the Network Project April -2008 to March 2009

Head	MAHARASHTRA									KARNATAKA						ANDHRA PRADESH					
	NRCP			MPKV			MAU			IIHR			UAS			APHU					
	S	R	E	S	R	E#	S	R	E	S	R	E	S	R	E	S	R	E			
Training	17.4	-	8.18	26.22	-	0	11.14	-	1.70	6.76	6.76	1.67	11.64	11.64	5.53	9.64	4.82	4.18			
Demonstrations	6.10	6.10	3.52	8.60	5.00	0	6.1	2.50	1.50	5.10	5.1	1.05	6.10	6.10	3.89	6.1	3.05	3.05			
Survey & surveillance	12.0	12.0	0.78	1.10	0.50	0	1.1	0.50	0.20	1.80	1.8	0.19	1.10	1.10	0.22	1.1	0.55	0.55			
Contingencies	20.0	20.0	2.09	2.00	0.85	0	2.0	0.50	1.13	2.0	2.0	0.15	2.00	2.00	1.93	2.0	1.0	1.00			
Disease forecasting facilities	4.00	4.00	4.13	4.00	4.00	0	4.0	4.00	0.00	0.0	0.0	0.00	4.00	4.00	4.00	4.0	2.0	0.00			
TOTAL	59.5	42.10	18.71	41.92	10.35	0	24.34	7.5	4.52	15.66	15.66	3.053	24.84	24.84	15.67	22.84	11.42	8.78			
S:Sanctioned for 1 st R: Released E: Expenditure																					
# MPKV Could not utilize funds in previous year due to late permission from the university																					

Table 33b: Summary of Budget Position (Rs. in Lakhs) under the Network Project in 2008-09 and 2009-10

Budget Position (Rs. in Lakhs) April 2008- March 09						
Budget	Maharashtra			Karnataka		AP
	NRCP	MPKV	MAU	IIHR	UAS	APHU
Sanctioned for 2008-09	59.50	41.92	24.34	15.66	24.84	22.84
Released	42.10	10.35	7.5	15.66	24.84	11.42
Expenditure	18.71	#0.00	4.52	3.05	15.67	8.78
Unspent Balance	23.39	10.35	2.92	12.61	9.17	2.64
Received in April	-	-	-	-	-	6.00
Budget Position (Rs. in Lakhs) April 2009- Oct. 09 for NRCP/Nov. for UAS Dharwad/Aug for others						
Revalidated Balance of 2008	23.39	10.35	2.92	12.61	9.17	8.78
Sanctioned for 2009-10	61.02	41.68	22.35	17.20	22.90	20.7
Released from 2 nd Year budget	0.00	0.00	0.00	0.00	22.90	0.00
Total available Balance	23.39	10.35	2.92	12.61	32.07	8.78
Expenditure	24.42	6.20	0.20	5.83	11.23	6.95
Unspent Balance	-1.03	4.15	2.72	6.78	20.84	1.83



VII. WORKSHOPS AND MEETINGS

Four workshops and meetings (Plates 29-32) were organized during the first year of the project at

NRCP Solapur to finalize the action plan and review the work (Table 34).



Plate 29: Technical workshop on
May 17, 2008



Plate 30: Network project meeting on
Dec 17, 2008



Plate 31: Co-ordinators and Additional
Co-ordinators of network project at
NRCP Farm Kegaon, Solapur



Table 32: Co-ordinators and Additional
Co-ordinators of network project in farmers
field at Hiraj, Solapur

Table 34 : Workers of Network Project in Farmer's Field at Hiraj, Solapur

S.No.	Venue and Date	Title	Purpose
1.	NRC on Pomegranate, Solapur, May17, 2008	Network Project on Mitigating the Bacterial Blight of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh Technical Workshop (proceedings in Annexure 28)	To finalize action plan for mitigating bacterial blight disease of pomegranate, in the states of Maharashtra, Karnataka and Andhra Pradesh, along with finalization of administrative, financial and technical details.
2.	NRC on Pomegranate, Solapur, July 26, 2008	Meting on Implementation of package for the control of bacterial blight and wilt diseases of pomegranate and Network Project on 'Mitigating Bacterial Blight Disease of Pomegranate in the sate of Maharashtra' (proceedings in Annexure 29)	To discuss the changes if any in the package for the control of bacterial blight and finalize package for wilt diseases of pomegranate (Package in Annexure 30)
3.	NRC on Pomegranate, Solapur, Dec. 16-17, 2008	Workshop on Network Project on Mitigating the Bacterial Blight of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh (proceedings in Annexure 31)	To review physical and financial targets and achievements during the six months of implementation of the network project
4.	NRC on Pomegranate, Solapur, Sept.. 10, 2009	Annual review Meeting of Network Project on Mitigating the Bacterial Blight of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh (proceedings in Annexure 32)	To review physical and financial targets and achievements during the one year of implementation of the network project



ANNEXURE

Annexure 1: Incidence of Bacterial Blight in Pomegranate growing areas of Bijapur district

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)							Per cent wilt
							Leaf		Fruit		Stem		Severity on Tree	
							I	S	I	S	I	S		
1	Bijapur	Utnal	Sharanappa Kakamari	3	10	Ganesh	20	8	-	-	20	6.6	2.1	4.4
2	Bijapur	Jumnal	M.B. Ullagaddi	6	5	Ganesh	-	-	-	-	10	3.3	0.6	2.7
3	Indi	Baradol	Dundappa P Navi	2	4	Kesar, Ganesh	20	4	60	30	60	20	25.4	2.0
4	Bijapur	Hitnalli	Mallappa S Kokatnal	2	6	Araktha	40	24	40	26.7	60	40	29.0	14.0
5	Bijapur	Atharga	Razzaq Atthar	3	3	Araktha	2	0.4	-	-	30	15	3.4	-
6	Indi	Bardol	Bhimanna Ranagatti	2	5	Ganesh	90	72	-	-	90	60	19	-
7	Indi	Bardol	Parasappa Ranagatti	1	4	Ganesh Kesar	80	48	-	-	80	40	12.8	-
8	Indi	Bardol	Apparay S. Pujari	2	5	Ganesh	95	76	-	-	100	66	20.9	10.0
9	Indi	Bardol	Shrisail M. Jalageri	2	5	Ganesh	75	45	-	-	90	45	13.5	10.0
10	Indi	Bardol	Mahadev R. Narale	2.5	5	Ganesh Kesar	95	57	-	-	100	50	15.7	-
11	Indi	Bardol	Kallappa B. Navi	1	1	Kesar	-	-	-	-	-	-	-	-
12	Indi	Bardol	Tukaram Koli	1	4	Ganesh	100	60	40	20	80	26.6	25.3	-
13	Indi	Bardol	Hanamanth S. Metri	3.5	8	Ganesh	80	48	40	13.3	90	30	20.1	-
Continued on next page														

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)						Per cent wilt	
							Leaf		Fruit		Stem			Severity on Tree
							I	S	I	S	I	S		
14	Indi	Bardol	Ramesh B. Navi	1.5	4	Ganesh	90	54	60	20	60	20	23.4	-
15	Indi	Bardol	Shivanada B. Navi	3	4	Ganesh	85	51	40	13.3	90	45	23.4	-
16	Bijapur	Jumanal	Hanumanth D. Jamakandi	2.5	7	Ganesh Kesar	90	54	60	20	70	23.3	24.0	15.0
17	Bijapur	Jumanal	Suresh Teli	4	7	Ganesh	95	76	40	20	90	45	30.6	10.0
18	Bijapur	Jumanal	Shreeshail Sankangouda	3	7	Ganesh	90	54	50	16.6	90	30	23.1	15.0
19	Bijapur	Jumanal	Vishwanath Sonkagond	1	5	Ganesh	95	76	-	-	100	50	17.6	5.0
20	Bijapur	Jumanal	Yallappa Bhusari	3	6	Ganesh	90	72	50	25	100	50	34.7	-
21	Bijapur	Jumanal	Nagappa Dinni	3.5	6	Ganesh	85	51	50	25	60	20	26.6	10.0
22	Bijapur	Jumanal	Ramappa C. Wagamadi	4	6	Ganesh	90	54	40	20	60	30	25.4	-
23	Bijapur	Jumanal	Sidhu Dengi	1	6	Ganesh	90	72	-	-	90	60	19.2	-
24	Bijapur	Jumanal	Hanumanth D. Jamakandi	2.5	7	Ganesh Kesar	90	54	60	20	70	23.3	24.0	15.0
Mean							47.4	11.6			33.8	19.6	3.5	

Period of Survey : 23-08-08 to 22-09-08

Annexure 2: Survey of Bacterial Blight in Pomegranate growing areas of Koppal district

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)						Per cent wilt		
							Leaf		Fruit		Stem				
							I	S	I	S	I	S			
1	Kustigi	Kustagi	Umesh Mangalore	6	2	Kesar	30	18	-	-	40	20	5.8	-	
2	Kustigi	Hiremannapura	Shivayya B. Hiremath	8	3	Kesar	70	70	-	-	40	20	27	-	
3	Kustigi	Hiremannapura	Doddayya A. Goddadki	8	4	Kesar	100	100	-	-	100	100	30	1.60	
4	Kustigi	Hiremannapura	Veeranagowda	30	3	Kesar	100	100	-	-	100	100	30	-	
5	Kustigi	Hiremannapura	Sharanappa T. Koudhi	8	3.5	Kesar	100	100	-	-	100	83.3	26.6	-	
6	Kustigi	Hiremannapura	Veeresh M. Sudi	6.2	3	Kesar	100	100	-	-	100	100	30	13.60	
7	Yelburga	Bandi	Sharanappa Arakeri	3	3.5	Kesar	30	12	20	6.6	40	6.6	7.2	-	
8	Yelburga	Tumbar guddi	Veeranna Agadi	2	6	Arakta	Traces								-
				3	5	Kesar	Traces								-
9	Yalaburga	Shirura	Virupakshagouda B Halikeri	6	12	Ganesh	-	-	-	-	-	-	-	-	
				7	1	Kesar	37	14.8	-	-	-	-	1.4	-	
10	Gangavati	Kanakagiri	K.T.Prasada	19	1	Kesar	66	39.6	-	-	100	50	13.9	-	
11	Gangavati	Nagalapur	Murali Krishna Choudari	18	0.8	Kesar	-	-	-	-	-	-	-	-	
12	Gangavati	Nagalapur	K.T.Prasada	10	1	Kesar	-	-	-	-	-	-	-	-	
Continued on next page															

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)						Per cent wilt	
							Leaf		Fruit		Stem			Severity on Tree
							I	S	I	S	I	S		
13	Kustagi	Madalagattti	Shivanagouda R.	4.2	2	Kesar	-	-	-	-	-	-	-	
14	Kustagi	Madalagattti	Mahadevappa	3	4	Kesar	60	24	80	40	90	45	39.4	-
15	Gangavati	Kanakagiri	Channabasayya Swami	5	1	Kesar	-	-	-	-	-	-	-	-
16	Kustagi	Kanakagiri	Gangadhar S.	11	3	Kesar	65	26	-	-	40	13.3	5.2	-
17	Kustagi	Kanakagiri	Virupakshappa B.	10	2	Kesar	50	20	-	-	-	-	2.0	-
18	Kustagi	Kanakagiri	Basanagoudha P.	8	1	Kesar	70	28	90	30	80	40	31.8	-
19	Kustagi	Kanakagiri	Sheshagiri	10	2	Kesar	70	28	-	-	-	-	2.8	-
20	Kustagi	Kanakagiri	Sunkar Ramesh	2	2	Kesar	55	22	-	-	-	-	2.2	-
Mean							35.1	3.8			28.9	13.5	0.8	

Period of Survey : 19-07-08 to 25-09-08

Annexure 3: Survey of Bacterial Blight of Pomegranate in pomegranate growing areas of Bagalkot district

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)						Per cent wilt	
							Leaf		Fruit		Stem			
							I	S	I	S	I	S		
1	Badami	Kulageri Cross	Ravishankar, H. Udagatti	14	18	Ganesh	40	24	100	83.3	100	100	82.3	-
				8	4	Kesar	-	-	-	-	-	-	-	33.3
2	Bagalkot	Govinkoppa	Vishwanath V. Purohit	2.5	5	Sindhoor	80	40	100	100	100	83.3	82.3	20.0
3	Bagalkot	Govinkoppa	Shekappa S. Hosamani	2.5	4	Sindhoor	80	64	100	100	100	83.3	93.0	7.1
4	Bagalkot	Kaladagi	Soudaghar	*		Sindhoor	40	24	100	83.3	100	83.3	77.4	-
5	Bagalkot	Kaladagi	R. Kistappa Shilpi	4	4	Sindhoor	30	12	100	67.7	100	83.3	65.3	-
6	Bagalkot	Kaladagi	Anandwagh	8	5	Sindhoor	40	24	80	66.6	100	83.3	65.7	-
7	Bagalkot	Kaladagi	Abdul Razzaq	2.05	4	Sindhoor	60	48	100	100	100	100	94.8	4.8
8	Mudhol	Hebbala	Rajappa N. Talawar	2.5	6	Ganesh, Arakta, Kesar	60	24	100	100	100	83.3	89.0	9.3
9	Mudhol	Hebbala	Gadyappa Barikar	7	6	Arakta	90	90	100	100	100	100	99	-
10	Hungund	Ramthal	Ramanagowda L. Gowdar	6	2	Kesar	50	40	90	75	70	46.6	65.8	-
11	Bagalkot	Chikkasounshi	Nagappa Dinni	3.5	6	Sindhoor	85	51	50	25	60	20	26.6	10
12	Bagalkot	Chikkasounshi	Ramappa C. Wagamadi	4	6	Sindhoor	90	54	40	20	60	30	25.4	-
							Mean	38.1	70.9	69.0	66.7	6.5		

Period of Survey : 18-07-08 to 12-09-08

Annexure 4: Survey of Bacterial Blight in Pomegranate growing areas of Bellary district

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)						Per cent wilt	
							Leaf		Fruit		Stem			Severity on Tree
							I	S	I	S	I	S		
1	H.B.Halli	Shivanada Nagar	Hari Raju	7	6	Bhagwa (Kesar)	40	16	-	-	80	83.3	18.2	28.6
2	H.B.Halli	Vallabha pura	M.P.Rudramba	5	7	Bhagwa (Kesar)	60	60	-	-	80	53.3	16.6	3.5
3	H.B.Halli	Vallabha pura	M.P.Prakash	10	8	Bhagwa (Kesar)	30	12	-	-	70	35	8.2	8.1
				20	2	Mrudula	-	-	-	-	-	-	-	
4	H.B.Halli	G. Kodihalli	Bangar Raju	4	4	Bhagwa (Kesar)	20	8	-	-	30	5	1.8	12.5
5	H.B.Halli	Bysigideri	Anjaneya Reddy	15	4	Bhagwa (Kesar)	60	36	-	-	40	26.6	8.9	0.1
6	H.B.Halli	Vatamanahalli	Vinayaka Jain	7	7	Bhagwa (Kesar)	45	27	-	-	60	20	6.7	15.5
				7	7	Ganga	-	-	-	-	-	-	-	-
				6	7	Mrudhula	-	-	-	-	-	-	-	-
7	H.Hadgalli	Govindpur Tanda	Nand kumar	2	6	Kesar, Ganesh	87	52.2	-	-	70	35	12.2	5.8
8	H.Hadgalli	Kodihalli	Pedaraju	3	3	Kesar	75	45	-	-	80	40	12.5	2
9	H.Hadgalli	Kodihalli	Satyanarayana Raju	3	4	Kesar	85	51	60	30	100	50	36.1	9
10	H.Hadgalli	Shivapura	Komya Naik	2	3	Kesar	83	49.8	80	40	100	50	42.9	12
11	H.Hadgalli	Basapura	Ramaraju	1	3	Kesar, Rubi	73	43.8	60	30	90	45	34.3	5
Continued on next page														

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)						Per cent wilt	
							Leaf		Fruit		Stem			Severity on Tree
							I	S	I	S	I	S		
12	H.Hadgalli	Govindapura	Honna Naik	2	3	Kesar	90	36	-	-	80	40	11.6	2
13	H.B Halli	moragiri	Gavididappa	1	5	Kesar	97	58.2	-	-	100	50	15.8	-
14	H.B Halli	H.B Halli	Prabuawamy	2	4	Kesar	95	57	50	95	80	26.6	28.2	7
15	H.B Halli	Bannigol	K Subhash	3	5	Kesar	90	54	40	13.3	100	33.3	21.4	
16	H.B Halli	Chingoad	M Gonibasappa	1	6	Kesar	98	58.8	-	-	100	50	15.8	3.5
17	H.B Halli	Chingoad	L lokesh	2	5	Ganesh Kesar	95	57	60	30	100	50	36.7	1
18	H.B Halli	H.B Halli	Mehaboob H	1.5	5	Kesar	95	76	-	-	100	50	17.6	-
19	H.B Halli	Kadlle ballu	Sanaulla	1	6	Kesar	95	57	50	25	90	45	32.2	11
20	H.B Halli	Kadlle ballu	I Muchalaraju	2	4	Kesar	100	60	40	20	60	20	24	7
21	H.B Halli	Bannigol	Mohan Reddy	5	6	Ganesh	95	57	50	25	100	50	33.2	13
22	H.B Halli	Yengi basapura	Ramaraju G	2.5	4	Kesar	95	76	-	-	90	45	16.6	-
23	H.B Halli	Chingoad	U Sangappa	4	6	Kesar	95	57	50	25	80	26.6	28.5	7
24	H.B Halli	nandipura	Suresh K	1	6	Kesar	85	51	40	13.3	80	26.6	19.7	-
25	H.B Halli	nandipura	Doadbasappa B	3	6	Kesar	95	57	50	25	70	23.3	27.8	5
26	H.B Halli	nandipura	Karimsab T.P	1	6	Kesar	95	57	40	20	100	50	29.7	25
							Mean	43.8	13.5		35.5	19.2	6.56	

Period of Survey : 02-08-08 to 15-09-09

Annexure 5: Survey of Bacterial Blight in Pomegranate growing areas of Chitradurga district

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)						Per cent wilt	
							Leaf		Fruit		Stem			Severity on Tree
							I	S	I	S	I	S		
01	Hiriyur	Mangasuvalli	Jayaramappa Veeranna	4	4	Bhagwa	-	-	-	-	80	40	8	-
02	Hiriyur	Mangasuvalli	Narendrappa Veeranna	3	4	Bhagwa	66	39.6	-	-	80	40	11.6	-
03	Hiriyur	Shravanagere	Shreeprada Gouda	2	5	Bhagwa	95	57	-	-	100	50	15.7	1
04	Hiriyur	Shravanagere	Tippeswamy Ganganna	8	5	Bhagwa	80	48	-	-	80	40	12.8	-
05	Hiriyur	Mangasuvalli	Arvindappa Veeranna	4	4	Bhagwa	65	39.6	-	-	80	40	11.9	-
06	Hiriyur	Mangasuvalli	Veerpakshappa Basappa	3	4	Bhagwa	66	38.6	-	-	90	45	18.3	-
07	Hiriyur	Shravanagere	Tippeswamy Santimappa	4	5	Bhagwa	100	60	60	30	80	40	35	-
08	Hiriyur	Mudappura	Ramachandrappa Mallappa	5	5	Bhagwa, Kesar	66	39.6	50	30	80	40	30.9	-
09	Hiriyur	Hariyabbe	Tippeswamy Veerana	5	4	Bhagwa, kesar	65	39	-	-	90	45	12.9	-
10	Hiriyur	Shravanagere	Shankar Murthy	4	5	Bhagwa	70	42	60	30	80	40	33.2	-
11	Hiriyur	Shrava nagere	Hanumantraya Timmana	3	5	Bhagwa	96	57.6	60	30	100	50	36.76	-
12	Hiriyur	Hariyabbe	Sainath v	5	6	Bhagwa	90	54	60	20	70	23.3	24.06	15
							Mean	47.54	14		41.38	23.16	1.6	

Period of Survey : 1-10-08 to 2-10-08

Annexure 6: Survey of Bacterial Blight in Pomegranate growing areas of Gadag district

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)										Per cent wilt
							Leaf		Fruit		Stem		Severity on Tree				
							I	S	I	S	I	S					
1	Ron	Kotabal	Mailarappa B. Angadi	5	3	Kesar	60	60	90	90	80	80	85.0	0.5			
2	Ron	Kotabal	S.S. Mudgal	3.2	3	Kesar	Traces							3.0			
3	Ron	Kotabal	S.K. Umachagi	3	3	Kesar	60	48	100	100	100	100	94.8	1.0			
4	Ron	Kotabal	Shivappa Bhagavati	4	3	Kesar	70	42	100	100	100	100	94.2	-			
5	Ron	Rajur	Eranna Chinnur	2	3	Kesar	30	18	80	66.6	80	80	64.4	2.0			
6	Ron	Rajur	Mirajsab M.Soudagar	5	3.5	Kesar	30	12	-	-	80	50	11.2	1.0			
7	Ron	Rajur	Sangappa Revdi	4	3	Kesar	50	20	-	-	100	50	12	4.0			
8	Ron	Rajur	Eshappa Revdi	4	3	Kesar	70	28	-	-	100	50	12.8	1.0			
9	Ron	Rajur	Vinayak Varnekar	8	3	Kesar	50	30	50	25	70	35	27.5	1.0			
10	Ron	Kuntoji	Muttusab S. Moolimani	8	2	Kesar	60	24	30	15	80	40	20.9	2.0			
11	Ron	Matrangi	Hanumanth Kambar	4	3	Kesar	70	56	70	58.3	90	90	64.4	-			
12	Ron	Matrangi	Neelappa R Gurikar	5	3	Kesar	60	48	70	70	60	60	65.8	1.0			
13	Ron	Matrangi	Erappa B.Kambali	5	4.8	Kesar	80	64	80	66.6	60	50	63.0	3.0			
14	Ron	Balootagi	Erangouda P.Patil	7	4	Kesar	90	90	100	100	100	100	99.0	2.0			
Continued on next page																	

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)								Per cent wilt
							Leaf		Fruit		Stem		Severity on Tree		
							I	S	I	S	I	S			
15	Ron	Nellur	Shantayya E Baligar	3	2	Kesar	60	48	80	80	100	100	80.8	1.0	
16	Ron	Nellur	Virupakshaya Totad	4	2	Kesar	80	80	80	66.6	100	100	74.6	-	
17	Ron	Mushigeri	Ningappa Bevinamarad	10	1	Kesar	60	48	80	80	70	58.3	72.4	2.0	
18	Ron	Nellur	Kanakappa Madivalar	2	2	Kesar	80	64	90	75	100	100	78.9	-	
19	Ron	Chilgeri	Sharnappa Uppar	2	3	Kesar	93	55.8	60	30	90	45	35.5	-	
20	Ron	Kodaganur	Imamsab Hiremani	3	1	Kesar	73	43.8	-	-	80	40	12.3	-	
21	Ron	Kotbal	Shivappa Bhagavatti	5	3	Kesar	57	34.2	70	35	90	45	36.9	5	
22	Ron	Kotbal	Ningappa	2	6	Kesar	96	57	60	30	100	50	36.76	-	
23	Ron	Matrangi	Irappa Kanvali	4.5	4	Kesar	53	31.8	60	30	80	40	32.1	3	
							Mean	62.2	48.6		63.6		51.1	1.4	

Period of Survey : 19-08-08 to 11-02-09

Annexure 7: Survey of Bacterial Blight of Pomegranate in pomegranate growing areas of Belgaum district

S. No.	Taluk	Village	Name of the farmer	Area (Ac)	Age (Yr)	Varieties	(Incidence (I) in per cent & Severity (S) in per cent)						Per cent wilt	
							Leaf		Fruit		Stem			Severity on Tree
							I	S	I	S	I	S		
1	Gokak	Gulganji koppa	Ramanna K. Arenad	3	3	Sindhoor	30	18	-	-	60	30	7.8	-
2	Gokak	Tavargere	Vikram T Aprad	3	3	Arakta, Ganesh	15	6	-	-	60	20	4.6	-
3	Gokak	Yadwad	S. Mathad	4	4	Arakta	85	51	40	13.3	80	26.6	19.7	5.0
4	Gokak	Yadwad	Ittannavar	4	4	Arakta	65	39.6	-	-	80	40	11.9	3.0
5	Ramdurg	Chikkoppa	Chikkoppa	15	2	Sindhoor	--	--	--	--	--	--	--	--
Mean							22.92	2.6			23.3	8.8	1.6	

Date of Survey : 05-07-08

Annexure 8: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of November, 2008.

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	November, 2008						% Severity on a tree
							Incidence			Severity			
							Leaf	Stem	Fruit	Leaf	Stem	Fruit	
1.	G. Siva Narayana	Ammaladinne	Bhagwa	2.5			80.0	55.7	57.0	40.5	28.3	35.4	34.5
2.	G. Venkatasivareddy	Naminanka palli	Bhagwa	2.0			68.5	65.8	--	31.3	18.3	--	6.8
3.	N. Lakshminarayana	Naminanka palli	Bhagwa	1.5	peddapappur		78.0	61.5	72.5	40.3	26.5	30.6	30.7
4.	Sri. Raghavareddy	Naminanka palli	Ganesh	5.0			61.7	61.8	--	30.5	26.2	--	8.3
5.	Sri. Venkatesh	Kanekal cross	Bhagwa	5.0			59.7	79.5	82.5	18.4	20.6	40.3	34.2
6.	Sri. Jayachandra	Kanekal cross	Bhagwa	5.0			62.5	88.5	--	20.6	31.2	--	8.3
7.	Sri. Thimmappa	Kanekal cross	Bhagwa	5.0	Kanekal	Anantapur	38.5	79.5	--	11.3	21.8	--	5.5
8.	Sri. Tayanna	Alur	Bhagwa	5.0			69.5	81.6	90.5	20.7	29.5	36.1	33.2
9.	Sri. Chikkanna	Alur	Bhagwa	5.0			71.5	81.5	85.5	20.2	26.6	25.8	25.4
10.	G. Sreenivasulu	L.B. Nagar	Bhagwa	5.0			78.5	73.5	68.5	38.2	26.3	29.6	29.8
11.	K. Dhanunjaya	L. B. Nagar	Ganesh	10.0	Bommanhall		68.5	79.8	48.5	37.4	22.5	14.2	18.9
12.	C. Bhaskar Naidu	L. B. Nagar	Ganesh	10.0			70.5	76.7	52.5	33.6	27.2	18.6	21.8
13.	Sri. P. Ampa Reddy	S.R. Kota	Ganesh	10.0	D. Heerehall		57.5	71.5	85.5	22.7	26.7	38.9	24.8
14.	Sri.. Bhemireddy	Godiselapalli	Ganesh	5.0			76.0	81.5	91.5	26.3	39.1	32.4	33.1
15.	Sri. Balanjaneyulu	Settyatmakur	Bhagwa	10.0	Gadwal	Mahaboob Nagar	36.5	56.0	--	9.1	23.5	--	5.6
16.	Ramesh setty	Settyatmakur	Bhagwa	5.0			45.5	62.5	--	16.3	23.2	--	6.3
17.	Janardhagupta	Gundumala	Mrudula	4.0	Madakasira	Anantapur	--	10.5	--	--	2.1	--	2.1
18.	Jagganna	Kotulaguta	Mrudula	5.0			73.5	66.0	--	43.4	19.2	--	8.2
19.	Abbas	Madakasira	Bhagwa	5.0			78.5	75.0	--	43.1.	18.3	--	8.0
Mean:							65.3	68.9	73.5	27.1	24.1	30.2	18.2

Period of Survey : 8-11-08 to 25-11-08

Annexure 9: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of December, 2008.

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	December, 2008						% Severity on a tree
							Incidence			Severity			
							Leaf	Stem	Fruit	Leaf	Stem	Fruit	
1.	G. Siva Narayana	Ammaladinne	Bhagwa	2.5			84.2	51.5	57.0	45.9	24.0	53.4	46.8
2.	G. Venkatasivareddy	Naminanka palli	Bhagwa	2.0			76.0	72.0	--	35.0	12.6	--	6.1
3.	N. Lakshminarayana	Naminanka palli	Bhagwa	1.5	peddapappur		83.0	66.5	77.4	45.5	27.3	35.8	33.1
4.	Sri. Raghavareddy	Naminanka palli	Ganesh	5.0			65.8	64.0	--	32.7	28.0	--	8.9
5.	Sri. Venkatesh	Kanekal cross	Bhagwa	5.0			55.7	88.7	96.0	15.1	21.9	43.2	36.1
6.	Sri. Jayachandra	Kanekal cross	Bhagwa	5.0			58.8	86.0	--	16.4	28.1	--	7.3
7.	Sri. Thimmappa	Kanekal cross	Bhagwa	5.0	Kanekal	Anantapur	36.8	83.5	--	9.2	22.9	--	5.5
8.	Sri. Tayanna	Alur	Bhagwa	5.0			73.0	93.0	92.4	21.8	32.3	37.4	35.0
9.	Sri. Chikkanna	Alur	Bhagwa	5.0			75.4	86.0	90.0	22.9	28.0	27.9	27.4
10.	G. Sreenivasulu	L.B. Nagar	Bhagwa	5.0			75.2	76.3	61.0	33.5	28.2	24.2	26.0
11.	K. Dhanunjaya	L. B. Nagar	Ganesh	10.0	Bommanhall		79.3	83.0	57.8	41.1	26.4	18.5	22.4
12.	C. Bhaskar Naidu	L. B. Nagar	Ganesh	10.0			75.5	84.0	64.3	35.2	29.3	22.4	25.1
13.	Sri. P. Ampa Reddy	S.R. Kota	Ganesh	10.0	D. Heerehall		68.2	87.5	92.0	27.6	29.7	41.8	38.0
14.	Sri.. Bhemireddy	Godiselapalli	Ganesh	5.0			80.5	88.5	95.0	27.3	42.6	34.3	35.3
15.	Sri. Balanjaneyulu	Settyatmakur	Bhagwa	10.0	Gadwal	Mahaboob Nagar	40.0	55.5	--	9.4	23.9	--	5.7
16.	Ramesh setty	Settyatmakur	Bhagwa	5.0		Anantapur	40.0	55.8	--	8.2	17.3	--	4.3
17.	Janardhagupta	Gundumala	Mrudula	4.0	Madakasira		5.0	2.0	--	1.9	0.5	--	0.3
18.	Jagganna	Kotulaguta	Mrudula	5.0			68.8	67.3	--	41.6	16.5	--	7.5
19.	Abbas	Madakasira	Bhagwa	5.0			75.3	73.5	--	41.6	15.0	--	7.2
Mean:							64.0	71.8	78.3	26.9	23.9	33.9	19.9

Period of Survey : 12-11-08 to 25-12-08

Annexure 10: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of January, 2009

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	January, 2009						% Severity on a tree
							Incidence			Severity			
							Leaf	Stem	Fruit	Leaf	Stem	Fruit	
1.	G. Siva Narayana	Ammaladinne	Bhagwa	2.5			75.0	49.5	42.5	40.1	26.7	32.5	32.1
2.	G. Venkatasivareddy	Naminanka palli	Bhagwa	2.0			64.5	61.2	58.6	28.0	31.2	26.0	32.1
3.	N. Lakshminarayana	Naminanka palli	Bhagwa	1.5	peddapappur		85.5	68.5	80.3	47.3	28.8	39.7	38.3
4.	Sri. Raghavareddy	Naminanka palli	Ganesh	5.0			59.5	65.5	49.5	28.7	29.7	16.3	20.2
5.	Sri. Venkatesh	Kanekal cross	Bhagwa	5.0			49.2	73.5	61.3	10.0	24.5	11.0	13.6
6.	Sri. Jayachandra	Kanekal cross	Bhagwa	5.0			50.0	70.5	82.0	10.0	12.0	13.5	12.9
7.	Sri. Thimmappa	Kanekal cross	Bhagwa	5.0	Kanekal	Anantapur	42.5	79.5	48.5	13.3	21.4	19.2	19.1
8.	Sri. Tayanna	Alur	Bhagwa	5.0			64.5	79.1	64.0	13.0	18.0	10.5	12.3
9.	Sri. Chikkanna	Alur	Bhagwa	5.0			61.0	93.5	67.5	11.0	15.5	11.2	12.0
10.	G. Sreenivasulu	L.B. Nagar	Bhagwa	5.0			66.5	77.5	64.8	29.2	26.6	24.7	25.5
11.	K. Dhanunjaya	L. B. Nagar	Ganesh	10.0	Bommanhall		73.0	73.0	68.0	27.6	24.0	23.6	24.1
12.	C. Bhaskar Naidu	L. B. Nagar	Ganesh	10.0			74.0	76.0	76.0	25.0	27.0	27.0	27.0
13.	Sri. P. Ampa Reddy	S.R. Kota	Ganesh	10.0	D. Heerhall		63.0	65.0	52.5	20.3	16.6	15.0	16.0
14.	Sri.. Bhemireddy	Godiselapalli	Ganesh	5.0			72.1	77.0	77.2	26.2	25.0	20.4	21.9
15.	Sri. Balanjaneyulu	Settyatmakur	Bhagwa	10.0	Gadwal	Mahaboob Nagar	62.2	71.0	61.2	19.1	18.1	15.3	16.2
16.	Ramesh setty	Settyatmakur	Bhagwa	5.0		Anantapur	44.0	58.0	--	10.3	11.5	--	3.3
17.	Janardhagupta	Gundumala	Mrudula	4.0	Madakasira		15.5	9.5	--	4.8	3.1	--	1.1
18.	Jagganna	Kotulaguta	Mrudula	5.0			--	61.0	--	--	17.6	--	3.5
19.	Abbas	Madakasira	Bhagwa	5.0			--	69.0	--	--	16.2	--	3.2
Mean:							60.1	67.3	63.6	21.4	20.7	20.4	17.6

Period of Survey : 08-01-09 to 25-01-09

Annexure 11: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of February, 2009

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	February, 2009						% Severity on a tree
							Incidence			Severity			
							Leaf	Stem	Fruit	Leaf	Stem	Fruit	
1.	G. Siva Narayana	Ammaladinne	Bhagwa	2.5	Peddapappur	Anantapur	80.2	49.0	58.0	45.1	23.2	54.0	47.0
2.	G. Venkatasivareddy	Naminanka palli	Bhagwa	2.0			75.4	71.2	28.0	34.1	12.1	9.2	12.3
3.	N. Lakshminarayana	Naminanka palli	Bhagwa	1.5			81.0	62.5	75.3	42.4	25.8	35.1	34.0
4.	Sri. Raghavareddy	Naminanka palli	Ganesh	5.0			62.6	63.4	36.0	31.4	27.4	10.3	15.8
5.	Sri. Venkatesh	Kanekal cross	Bhagwa	5.0			20.1	25.0	21.0	5.4	5.1	4.9	5.0
6.	Sri. Jayachandra	Kanekal cross	Bhagwa	5.0			47.8	77.6	36.4	14.3	26.9	15.8	17.9
7.	Sri. Thimmappa	Kanekal cross	Bhagwa	5.0			34.7	78.4	26.9	9.8	21.7	11.4	13.3
8.	Sri. Tayanna	Alur	Bhagwa	5.0	Kanekal		12.7	28.5	22.1	3.4	6.4	9.7	5.2
9.	Sri. Chikkanna	Alur	Bhagwa	5.0			25.8	73.5	24.0	11.5	22.4	9.7	12.4
10.	G. Sreenivasulu	L.B. Nagar	Bhagwa	5.0	Bommanhall		17.2	28.0	28.1	4.6	6.6	6.8	6.5
11.	K. Dhanunjaya	L. B. Nagar	Ganesh	10.0			52.5	50.5	43.3	18.3	18.9	16.3	17.0
12.	C. Bhaskar Naidu	L. B. Nagar	Ganesh	10.0			53.0	46.0	57.6	18.5	23.3	21.0	21.2
13.	Sri. P. Ampa Reddy	S.R. Kota	Ganesh	10.0			54.2	40.0	37.9	18.8	18.1	12.5	14.2
14.	Sri.. Bhemireddy	Godiselapalli	Ganesh	5.0	Gadwal	Mahaboob Nagar	72.0	85.0	80.0	26.9	30.7	24.8	26.2
15.	Sri. Balanjaneyulu	Settyatmakur	Bhagwa	10.0			56.3	68.0	63.0	19.0	17.0	15.0	15.8
16.	Ramesh setty	Settyatmakur	Bhagwa	5.0			36.0	52.5	34.3	9.3	11.1	8.1	8.8
17.	Janardhagupta	Gundumala	Mrudula	4.0			39.5	42.0	34.3	11.3	9.3	9.1	9.4
18.	Jagganna	Kotulaguta	Mrudula	5.0	Madakasira	Anantapur	8.6	14.3	19.8	3.6	4.9	8.4	7.2
19.	Abbas	Madakasira	Bhagwa	5.0			46.7	54.7	23.4	13.7	21.3	11.2	13.5
Mean:							46.1	53.2	39.4	18.0	17.5	15.4	15.9

Period of Survey : 09-02-09 to 25-02-09

Annexure 12: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of March, 2009

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	March, 2009						% Severity on a tree
							Incidence			Severity			
							Leaf	Stem	Fruit	Leaf	Stem	Fruit	
1.	G. Siva Narayana	Ammaladinne	Bhagwa	2.5		Anantapur	58.0	65.0	48.3	19.3	21.0	17.0	18.0
2.	G. Venkatasivareddy	Naminanka palli	Bhagwa	2.0			55.0	48.0	52.0	16.5	23.0	19.0	19.5
3.	N. Lakshminarayana	Naminanka palli	Bhagwa	1.5	Peddapappur		31.5	35.2	30.0	15.3	8.6	6.6	7.8
4.	Sri. Raghavareddy	Naminanka palli	Ganesh	5.0			48.0	33.5	42.6	16.0	22.0	20.0	20.0
5.	Sri. Venkatesh	Kanekal cross	Bhagwa	5.0			23.1	26.2	20.1	6.0	6.3	5.0	5.4
6.	Sri. Jayachandra	Kanekal cross	Bhagwa	5.0			26.0	22.0	25.0	4.0	3.0	5.0	4.5
7.	Sri. Thimmappa	Kanekal cross	Bhagwa	5.0	Kanekal		70.5	63.5	37.0	22.0	17.0	18.0	18.2
8.	Sri. Tayanna	Alur	Bhagwa	5.0			59.1	71.5	73.5	22.0	23.2	18.6	19.9
9.	Sri. Chikkanna	Alur	Bhagwa	5.0			26.1	28.5	37.0	4.1	4.3	3.5	3.7
10.	G. Sreenivasulu	L.B. Nagar	Bhagwa	5.0			15.1	21.0	25.0	4.1	6.1	6.0	5.9
11.	K. Dhanunjaya	L. B. Nagar	Ganesh	10.0			25.2	22.5	28.2	9.5	5.6	8.0	7.7
12.	C. Bhaskar Naidu	L. B. Nagar	Ganesh	10.0			31.0	33.5	25.0	12.2	18.0	7.6	10.2
13.	Sri. P. Ampa Reddy	S.R. Kota	Ganesh	10.0	Bommanhall		31.5	33.5	31.0	11.0	9.5	10.2	10.1
14.	Sri.. Bhemireddy	Godiselapalli	Ganesh	5.0			71.5	0	0	22.0	17.0	18.0	19.1
15.	Sri. Balanjaneyulu	Settyatmakur	Bhagwa	10.0			31.0	51.0	34.5	13.1	18.0	15.2	15.5
16.	Ramesh setty	Settyatmakur	Bhagwa	5.0			30.0	48.0	30.0	13.1	16.0	13.2	13.7
17.	Janardhagupta	Gundumala	Mrudula	4.0			59.0	58.0	--	16.0	14.0	--	4.4
18.	Jagganna	Kotulaguta	Mrudula	5.0	Madakasira		63.0	58.5	--	20.3	15.0	--	5.0
19.	Abbas	Madakasira	Bhagwa	5.0			41.5	52.0	21.7	11.8	18.9	10.3	12.2
Mean:							41.9	40.6	33.0	13.6	14.0	11.8	11.6

Period of Survey : 09-03-09 to 25-03-09

Annexure 13: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of April, 2009

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	April, 2009						% Severity on a tree	
							Incidence			Severity				
							Leaf	Stem	Fruit	Leaf	Stem	Fruit		
1.	G. Siva Narayana	Ammaladinne	Bhagwa	2.5		Anantapur	48.5	47.2	56.3	21.2	18.3	22.7	21.7	
2.	G. Venkatasivareddy	Naminanka palli	Bhagwa	2.0			39.5	65.4	34.2	16.3	23.5	12.3	14.9	
3.	N. Lakshminarayana	Naminanka palli	Bhagwa	1.5	Peddapappur		63.5	67.3	59.6	28.1	28.2	31.5	30.5	
4.	Sri. Raghavareddy	Naminanka palli	Ganesh	5.0			68.7	69.5	59.3	26.3	25.2	35.4	32.5	
5.	Sri. Venkatesh	Kanekal cross	Bhagwa	5.0			48.3	26.0	22.0	10.5	9.3	7.5	8.2	
6.	Sri. Jayachandra	Kanekal cross	Bhagwa	5.0			53.5	71.2	42.3	17.3	28.5	12.5	16.2	
7.	Sri. Thimmappa	Kanekal cross	Bhagwa	5.0	Kanekal		38.6	71.5	45.9	12.4	20.6	16.3	16.8	
8.	Sri. Tayanna	Alur	Bhagwa	5.0			20.2	30.4	24.5	6.9	6.7	9.6	8.7	
9.	Sri. Chikkanna	Alur	Bhagwa	5.0			30.2	65.8	32.1	11.1	20.4	11.6	13.3	
10.	G. Sreenivasulu	L.B. Nagar	Bhagwa	5.0			21.5	30.8	35.1	6.5	7.5	12.5	10.3	
11.	K. Dhanunjaya	L. B. Nagar	Ganesh	10.0			52.5	48.2	45.2	18.2	16.3	18.1	17.7	
12.	C. Bhaskar Naidu	L. B. Nagar	Ganesh	10.0	Bommanhall		53.0	46.2	57.6	18.5	23.5	21.0	21.3	
13.	Sri. P. Ampa Reddy	S.R. Kota	Ganesh	10.0			54.2	42.0	39.2	18.8	18.7	14.2	15.5	
14.	Sri.. Bhemireddy	Godiselapalli	Ganesh	5.0	D. Heerehall		68.2	80.2	69.5	23.5	29.1	23.8	14.8	
15.	Sri. Balanjaneyulu	Settyatmakur	Bhagwa	10.0			56.5	67.3	62.0	19.1	18.1	16.3	16.9	
16.	Ramesh setty	Settyatmakur	Bhagwa	5.0			38.5	50.5	39.6	10.2	12.1	12.5	12.2	
17.	Janardhagupta	Gundumala	Mrudula	4.0	Gadwal		Mahaboob Nagar	48.2	64.0	61.0	12.2	15.3	9.8	11.2
18.	Jagganna	Kotulaguta	Mrudula	5.0				50.7	56.5	56.4	13.9	11.6	11.9	12.0
19.	Abbas	Madakasira	Bhagwa	5.0				44.7	48.0	60.2	12.5	10.6	14.1	13.2
Mean:							47.3	55.2	47.5	16.0	18.1	16.5	16.2	

Period of Survey :08-04-09 to 27-04-09

Annexure 14: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of May, 2009

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	May, 2009						% Severity on a tree	
							Incidence			Severity				
							Leaf	Stem	Fruit	Leaf	Stem	Fruit		
1.	G. Siva Narayana	Ammaladinne	Bhagwa	2.5		Anantapur	45.6	49.5	56.2	23.8	19.3	23.1	22.4	
2.	G. Venkatasivareddy	Naminanka palli	Bhagwa	2.0			42.1	48.8	39.8	19.3	19.4	16.5	17.4	
3.	N. Lakshminarayana	Naminanka palli	Bhagwa	1.5	Peddapappur		67.3	66.8	60.2	18.8	28.0	28.4	27.4	
4.	Sri. Raghavareddy	Naminanka palli	Ganesh	5.0			72.3	68.4	65.3	29.5	28.3	29.3	29.1	
5.	Sri. Venkatesh	Kanekal cross	Bhagwa	5.0			43.2	25.6	25.3	11.3	8.7	10.3	10.1	
6.	Sri. Jayachandra	Kanekal cross	Bhagwa	5.0			55.7	65.8	49.3	23.4	24.8	16.5	18.8	
7.	Sri. Thimmappa	Kanekal cross	Bhagwa	5.0	Kanekal		42.1	72.3	49.0	13.4	21.0	16.7	17.2	
8.	Sri. Tayanna	Alur	Bhagwa	5.0			28.1	32.5	37.8	9.2	9.6	12.1	11.3	
9.	Sri. Chikkanna	Alur	Bhagwa	5.0			32.6	68.2	37.4	11.5	21.7	17.4	17.7	
10.	G. Sreenivasulu	L.B. Nagar	Bhagwa	5.0			28.1	33.6	38.2	9.8	9.5	13.0	12.0	
11.	K. Dhanunjaya	L. B. Nagar	Ganesh	10.0			56.3	50.2	48.3	19.0	16.5	20.3	19.4	
12.	C. Bhaskar Naidu	L. B. Nagar	Ganesh	10.0	Bommanhall		58.5	48.3	43.5	19.2	22.7	19.8	20.3	
13.	Sri. P. Ampa Reddy	S.R. Kota	Ganesh	10.0			59.2	43.6	43.5	19.7	19.2	14.5	16.0	
14.	Sri.. Bhemireddy	Godiselapalli	Ganesh	5.0	D. Heerehall		70.1	81.5	73.2	24.2	30.0	26.0	26.6	
15.	Sri. Balanjaneyulu	Settyatmakur	Bhagwa	10.0			59.3	68.0	65.2	21.2	19.5	18.6	19.0	
16.	Ramesh setty	Settyatmakur	Bhagwa	5.0			43.8	54.2	48.6	12.5	16.3	14.8	14.9	
17.	Janardhagupta	Gundumala	Mrudula	4.0	Gadwal		Mahaboob Nagar	52.1	47.6	49.4	12.3	10.5	11.5	11.4
18.	Jagganna	Kotulaguta	Mrudula	5.0				46.9	48.0	51.6	11.9	10.9	12.1	11.8
19.	Abbas	Madakasira	Bhagwa	5.0				53.1	52.8	48.6	10.5	11.8	11.1	11.2
Mean:							50.3	54.0	49.0	16.9	18.3	17.5	17.6	

Period of Survey :08-05-09 to 27-05-09

Annexure 15: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of June, 2009

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	June, 2009						% Severity on a tree
							Incidence			Severity			
							Leaf	Stem	Fruit	Leaf	Stem	Fruit	
1.	G. Siva Narayana	Ammaladinne	Bhagwa	2.5			39.0	48.0	--	13.2	18.5	--	5.0
2.	G. Venkatasivareddy	Naminanka palli	Bhagwa	2.0			35.0	35.0	27.0	11.0	18.0	14.6	15.0
3.	N. Lakshminarayana	Naminanka palli	Bhagwa	1.5	Peddapappur		46.0	44.0	40.0	16.8	14.0	11.5	12.5
4.	Sri. Raghavareddy	Naminanka palli	Ganesh	5.0			43.0	46.0	41.0	14.0	14.0	16.5	15.8
5.	Sri. Venkatesh	Kanekal cross	Bhagwa	5.0			27.0	16.0	33.0	7.3	4.0	8.8	7.7
6.	Sri. Jayachandra	Kanekal cross	Bhagwa	5.0			51.5	62.7	--	20.3	25.0	--	7.0
7.	Sri. Thimmappa	Kanekal cross	Bhagwa	5.0	Kanekal	Anantapur	40.0	65.0	--	13.7	19.4	--	5.3
8.	Sri. Tayanna	Alur	Bhagwa	5.0			22.0	17.0	18.5	6.0	3.7	8.5	7.3
9.	Sri. Chikkanna	Alur	Bhagwa	5.0			25.5	16.0	24.0	6.8	3.8	6.7	6.0
10.	G. Sreenivasulu	L.B. Nagar	Bhagwa	5.0			28.0	13.0	27.0	7.4	3.2	7.2	6.5
11.	K. Dhanunjaya	L. B. Nagar	Ganesh	10.0			24.0	21.5	25.6	7.8	7.6	7.4	7.5
12.	C. Bhaskar Naidu	L. B. Nagar	Ganesh	10.0	Bommanhall		19.1	21.0	--	8.2	8.1	--	2.5
13.	Sri. P. Ampa Reddy	S.R. Kota	Ganesh	10.0			22.2	19.5	--	7.7	7.4	--	2.3
14.	Sri.. Bhemireddy	Godiselapalli	Ganesh	5.0	D. Heerehall		65.0	73.5	--	21.5	28.5	--	7.9
15.	Sri. Balanjaneyulu	Settyatmakur	Bhagwa	10.0			18.5	28.0	--	6.7	10.3	--	2.7
16.	Ramesh setty	Settyatmakur	Bhagwa	5.0			20.5	34.0	--	6.9	9.6	--	2.6s
17.	Janardhagupta	Gundumala	Mrudula	4.0	Gadwal	Mahaboob Nagar	48.7	68.5	44.8	12.1	14.5	9.1	10.5
18.	Jagganna	Kotulaguta	Mrudula	5.0			44.2	66.5	60.8	18.8	15.5	13.7	14.6
19.	Abbas	Madakasira	Bhagwa	5.0			65.5	63.0	44.4	10.0	13.5	10.0	10.7
Mean:							36.0	39.9	35.1	11.4	12.6	10.4	8.2

Period of Survey : 08-06-09 to 27-06-09

Annexure 16: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of July, 2009

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	July, 2009						% Severity on a tree
							Incidence			Severity			
							Leaf	Stem	Fruit	Leaf	Stem	Fruit	
1.	G. Siva Narayana	Ammaladinne	Bhagwa	2.5			40.5	40.0	—	10.5	11.5	—	3.35
2.	G. Venkatasivareddy	Naminanka palli	Bhagwa	2.0			31.5	35.0	—	8.5	8.6	—	20.57
3.	N. Lakshminarayana	Naminanka palli	Bhagwa	1.5	Peddapappur		41.0	42.0	—	14.6	13.5	—	4.16
4.	Sri. Raghavareddy	Naminanka palli	Ganesh	5.0			35.0	36.0	—	9.6	9.5	—	2.86
5.	Sri. Venkatesh	Kanekal cross	Bhagwa	5.0			29.5	34.0	—	5.4	4.3	—	1.40
6.	Sri. Jayachandra	Kanekal cross	Bhagwa	5.0			42.5	51.7	—	13.3	15.0	—	4.33
7.	Sri. Thimmappa	Kanekal cross	Bhagwa	5.0	Kanekal	Anantapur	36.0	56.0	—	12.4	13.4	—	3.92
8.	Sri. Tayanna	Alur	Bhagwa	5.0			28.0	33.0	—	4.7	4.3	—	1.33
9.	Sri. Chikkanna	Alur	Bhagwa	5.0			34.0	30.0	—	5.5	4.3	—	1.41
10.	G. Sreenivasulu	L.B. Nagar	Bhagwa	5.0			27.0	23.5	—	9.2	7.0	—	2.32
11.	K. Dhanunjaya	L. B. Nagar	Ganesh	10.0			25.0	20.5	—	9.5	7.7	—	2.49
12.	C. Bhaskar Naidu	L. B. Nagar	Ganesh	10.0	Bommanhall		22.5	21.5	—	7.5	6.6	—	2.07
13.	Sri. P. Ampa Reddy	S.R. Kota	Ganesh	10.0			20.5	17.5	—	7.1	7.2	—	2.15
14.	Sri.. Bhemireddy	Godiselapalli	Ganesh	5.0	D. Heerehall		48.5	63.5	—	12.1	23.5	—	5.91
15.	Sri. Balanjaneyulu	Settyatmakur	Bhagwa	10.0			36.5	39.0	—	12.4	14.1	—	4.06
16.	Ramesh setty	Settyatmakur	Bhagwa	5.0			34.0	36.0	—	10.1	10.5	—	3.11
17.	Janardhagupta	Gundumala	Mrudula	4.0	Gadwal	Mahaboob Nagar	39.5	59.5	26.7	9.4	12.5	6.4	5.92
18.	Jagganna	Kotulaguta	Mrudula	5.0			37.5	53.5	—	14.8	13.6	—	4.2
19.	Abbas	Madakasira	Bhagwa	5.0			49.5	57.0	—	9.7	11.5	—	3.27
Mean:							59.29	37.57	26.70	9.52	10.21	6.40	111.33

Period of Survey : 8-07-09 to 27-07-09

Annexure 17: Incidence and severity of Bacterial Blight Disease of Pomegranate in Anantapur and Mahaboob Nagar Districts of Andhra Pradesh, during the month of August, 2009

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	August, 2009						% Severity on a tree
							Incidence			Severity			
							Leaf	Stem	Fruit	Leaf	Stem	Fruit	
1.	N.Venkatasivareddy	Naminankapalli	Bhagwa	2.0	Peddapappur	ANANTAPUR	--	41.0	--	--	10.8	--	2.16
2.	Lakshminarayanareddy	"	"	1.0	"		--	40.0	--	--	12.4	--	2.48
3.	P.Venkatasivareddy	Chikkepalli	"	3.0	"		--	40.5	--	--	11.6	--	2.32
4.	N.Suryanarayana	Kottapalli	"	3.0	"		--	39.0	--	--	8.1	--	1.62
5.	Sri. Nagendra	"	"	3.0	"		--	47.5	--	--	13.3	--	2.66
6.	Sri. Obulesu	Nayanapalli	"	1.0	Narpala		21.0	49.5	--	5.6	9.3	--	2.42
7.	Sri. Pullaiah	Kesepalli	"	1.5	Narpala		19.0	48.0	--	5.7	16.5	--	3.87
8.	Sri. Rangaiah	Nayanapalli cross	"	1.0	Narpala		--	45.0	--	--	11.9	--	2.38
9.	Sri. Tayanna	Aluru	"	5.0	Kanekal		--	22.7	--	--	5.5	--	1.1
10.	Sri. Venkatesh	Kanekal cross	Ganesh	5.0	"		--	23.0	--	--	6.9	--	1.38
11.	Sri. Venkataramireddy	Kottapalli	Genesh	3.0	"		--	28.0	--	--	6.3	--	1.26
12.	Sri. Venkatareddy	Yerraguntla	Genesh	3.0	"		--	19.5	--	--	4.7	--	1.0
13.	Sri. Chikkanna	Nallampalli	"	3.0	"		--	23.0	--	--	5.5	--	1.1
14.	Sri. Tippa Reddy	Pulacherla	"	2.0	"		25.3	17.5	--	8.2	5.1	--	1.84
15.	Sri. Vanna Reddy	Kottapalli	"	4.0	"		--	26.5	--	--	6.1	--	1.22
16.	Sri. Sreenivasulu	Seedargatta	"		Bommanhall		--	34.5	--	--	11.1	--	2.22
17.	Sri. Erriswamy	Ganigeri Gate	"	2.5	"		38.0	35.0	30.5	15.5	10.2	9.5	10.24
18.	Sri. Lakshmana	Krishnapuram	"	3.5	"		--	33.2	--	--	12.3	--	2.46
19.	Sri. Ranga Reddy	Gonehall	"	5.0	"		--	34.0	--	--	11.7	--	2.34
20.	Sri. Ramanjaneyulu	Rangapuram	Ganesh	3.0	"		--	41.0	--	--	13.6	--	2.72
Continued on next page													

Continued on next page

S. No.	Farmer name	Village	Variety	Area in acre	Mandal	District	August,2009						% Severity on a tree
							Incidence			Severity			
							Leaf	Stem	Fruit	Leaf	Stem	Fruit	
21.	C. Bhaskar Naidu	LB Nagar	"	10.0	"	ANANTAPUR	--	40.0	--	--	10.2	--	2.54
22.	Sri. Chakrapani	LB Nagar	"	8.0	"		--	35.5	--	--	10.8	--	2.16
23.	Sri. Jayarami Reddy	Cherlopalli	"	7.0	D.Heerhall		36.0	47.0	--	13.6	13.8	--	4.12
24.	Sri.Hanumanthareddy	Somalapuram	"	10.0	"		29.5	36.5	--	11.4	11.8	--	3.5
25.	Sri. Mukkanna	Hanumapuram	"	3.0	"		49.2	49.8	53.3	24.7	18.8	23.2	22.47
26.	Sri. Lokanath Reddy	Godiselapalli	"	2.5	"		41.7	39.5	37.2	16.9	11.2	14.3	6.79
27.	Sri. Prakash Reddy	S.R.Kota	"	2.5	"		--	43.2	--	--	15.2	--	3.04
28.	Sri. Bheemalingappa	Godiselapalli	"	2.5	"		--	34.7	--	--	10.6	--	2.12
29.	Sri. Ramana	"	"	2.5	"		39.7	39.0	--	14.5	9.5	--	3.35
30.	Sri.Balanjaneyulu	Settyatmakur	Bhagwa	10.0	Gadwal	MAHABOBB NAGAR	15.8	21.0	--	4.2	5.2	--	1.46
31.	Sri. Saleemkhaleem	Gadwal rural	"	12.0	Gadwal		13.5	18.5	--	3.3	6.8	--	1.69
32.	Sri. Badrinath	Gattuanantapur	"	40.0	Gadwal		9.3	22.0	--	2.5	9.6	--	2.17
33.	Sri. Radhakrishnareddy	Gilledadinne	"	9.0	Gadwal		8.5	11.0	--	2.4	3.4	--	0.92

Period of Survey : 09-08-09 to 31-08-09

Annexure 18: The Incidence of Pomegranate Bacterial Blight Disease (PDI) in Adopted and Non-adopted Orchards in Sira (Tumkur dist.), Hiriyur (Chitradurga dist.) and Jagalur (Davanagere dist.) - Monthly Progress

Pomegranate orchard	Name of the farmer	Oct. 2008	Nov. 2008	Dec. 2008	Jan. 2009	Feb. 2009	Mar. 2009	April 2009	May 2009
Sira, Tumkur district									
Adopted	Chickkananjappa Yemmerahalli	4.36	2.69	1.80	1.40	0.00	0.62	0.30	0.00
Non-adopted	Babu John Kalkote	10.4	13.1	24.4	25.6	25.7	27.80	28.40	30.70
Hiriyur, Chitradurga district									
Adopted	B.G.Thimma Reddy Metikurke	4.23	2.23	2.00	1.81	3.90	2.70	1.82	4.60
Non-adopted	E. Sharadhamma Babur	5.40	8.50	19.9	25.4	28.5	29.9	22.2	27.2
Jagalur, Davanagere district									
Adopted	J.S. Manjunath Dyamalingavahalli	4.50	2.52	1.20	0.30	0.00	0.00	0.30	0.20
Non-adopted	Madhava Reddy Hiremallanahole	6.60	8.20	12.6	16.2	26.6	28.9	31.9	35.9

Annexure 19: Incidence and severity of Bacterial Blight Disease of Pomegranate in demonstration and Non demonstration plot at Ammalladine, dist. Anantpur from November, 2008 to June, 2009.

During the month	Demonstrations									Non Demonstrations					% Severity on tree		Fruit yield Kg/ha
	Incidence			Severity			Incidence			Severity			Fruit	Stem	Leaf	Demonstration	Non Demonstration
	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit					
November, 2008	56.8	69.2	45.3	19.2	28.6	16.2	58.2	71.8	47.1	21.2	27.9	18.4	18.98	20.58	--	--	--
December, 2008	64.2	64.8	50.0	32.5	22.3	23.2	67.3	65.1	53.6	36.3	23.0	24.5	23.95	25.38	--	--	--
January, 2009	64.5	58.3	66.5	25.75	18.5	24.6	67.2	60.4	68.3	27.5	19.5	25.0	23.51	24.15	--	--	--
February, 2009	60.5	54.6	53.0	24.0	20.1	22.2	63.2	58.6	55.8	25.1	22.3	24.1	21.9	23.84	--	--	--
March, 2009	48.5	55.0	76.2	16.5	23.0	15.6	45.7	57.1	73.1	13.8	24.0	18.9	17.17	19.41	--	--	--
April, 2009	23.5	49.0	35.5	8.7	24.3	13.5	34.5	48.6	44.3	16.9	15.3	22.8	15.18	20.71	3800	2300	2300
May, 2009	28.2	47.0	33.5	13.6	15.5	14.6	37.5	37.5	43.0	22.9	16.1	23.8	14.68	22.17	4390	2650	2650
June, 2009	29.0	43.0	32.0	10.1	13.5	13.5	33.5	45.3	37.5	10.9	15.3	14.6	13.5	14.4	6985	6639	6639
Mean:	46.9	55.1	49.0	18.8	20.0	17.9	50.9	55.6	52.8	21.8	20.4	21.5	18.6	21.3	15175*	11589	11589
* indicates total fruit yield																	

Annexure 20: Incidence and severity of Bacterial Blight Disease and fruit yield of Pomegranate in demonstration and Non demonstration plot at Naminankapalli, dist. Anantpur, from November, 2008 to June, 2009

Demonstrations				Non Demonstrations									% Severity on tree		Fruit yield Kg/ha	
During the month	Incidence			Severity			Incidence			Severity			Demonstration	Non Demonstration		
	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit				
November,2008	68.2	63.4	69.8	19.8	23.7	21.6	68.5	64.8	70.0	20.1	23.9	22.6	21.84	22.61	--	--
December, 2008	45.8	59.5	34.0	32.6	23.4	11.4	47.1	61.3	37.4	33.0	24.1	15.2	16.2	18.76	--	--
January, 2009	61.0	72.2	65.0	26.3	22.0	24.5	63.5	73.5	68.3	27.2	24.1	25.6	24.18	25.46	--	--
February, 2009	55.0	58.0	37.5	25.5	19.3	19.3	59.1	61.0	39.5	27.2	22.3	20.9	19.92	21.81	--	--
March, 2009	31.5	35.2	30.0	15.3	8.6	6.6	32.6	34.1	35.0	15.8	9.8	6.9	7.87	8.37	--	--
April, 2009	28.5	28.0	30.7	8.0	14.2	12.5	38.3	32.1	37.9	19.3	15.0	19.7	12.39	18.72	1850	1560
May, 2009	19.0	18.0	10.5	3.7	4.8	3.5	29.2	15.4	19.8	6.9	4.3	7.4	3.78	6.73	2233	1823
June, 2009	21.5	25.0	24.3	8.0	7.3	05.2	23.5	28.0	28.0	9.1	8.3	5.5	5.9	6.4	3322	3483
Mean:	41.3	44.9	37.7	17.4	15.4	13.1	45.2	46.3	42.0	19.8	16.5	15.5	14.0	16.1	7405*	6866
* indicates total fruit yield																

Annexure 21: Incidence and severity of Bacterial Blight Disease and fruit yield of Pomegranate in demonstration and Non demonstration plot at Kanekal, dist. Anantpur, from November, 2008 to June, 2009

During the month	Demonstrations						Non Demonstrations						% Severity on tree		Fruit yield Kg/ha	
	Incidence			Severity			Incidence			Severity			Demonstration	Non Demonstration	Demonstration	Non Demonstration
	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit				
November, 2008	87.9	78.4	99.0	37.4	29.8	51.1	88.7	79.5	99.0	38.0	30.1	56.1	45.47	49.90	--	--
December, 2008	85.0	79.6	**	37.2	21.7	**	91.2	82.1	**	39.2	23.6	**	8.06	8.68	--	--
January, 2009	52.0	62.0	44.0	8.0	7.0	6.0	57.9	62.9	47.1	13.3	11.8	9.7	6.4	10.48	--	--
February, 2009	10.8	26.5	14.2	3.0	5.8	3.0	15.2	32.4	19.7	6.3	9.7	7.2	3.56	7.61	--	--
March, 2009	30.0	29.0	29.2	3.0	3.3	4.2	29.0	30.2	28.6	2.9	6.3	4.3	3.9	4.56	--	--
April, 2009	21.2	16.0	28.1	7.5	6.2	7.1	33.3	15.8	39.2	14.5	6.0	11.6	6.96	10.77	2900	2406
May, 2009	28.1	27.9	32.1	10.2	11.6	9.8	37.3	28.0	39.5	18.0	15.9	18.3	10.20	17.79	2300	1750
June, 2009	26.0	21.5	26.5	7.0	4.3	5.7	25.0	21.0	23.5	8.2	7.5	8.0	5.5	7.9	8450	7244
Mean:	42.6	42.6	39.0	14.2	11.2	12.4	47.2	44.0	42.4	17.6	13.9	16.5	11.3	14.7	13650*	11400
* indicates total fruit yield																
** The infected fruits were remove during November last week																

Annexure 22: Incidence and severity of Bacterial Blight Disease and fruit yield of Pomegranate in demonstration and Non demonstration plot at LB Nagar, dist. Anantpur, from November, 2008 to June, 2009

During the month	Demonstrations						Non Demonstrations						% Severity on tree		Fruit yield Kg/ha	
	Incidence			Severity			Incidence			Severity			Demonstration	Non Demonstration	Demonstration	Non Demonstration
	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit				
November, 2008	68.4	59.8	61.7	24.9	21.3	23.5	69.5	60.2	63.5	25.6	22.0	24.2	23.2	23.9	--	--
December, 2008	81.0	70.1	55.8	37.0	26.7	29.0	85.0	73.2	59.2	39.3	27.5	31.2	29.34	31.27	--	--
January, 2009	66.5	77.5	64.8	29.3	26.6	25.0	66.9	79.8	65.3	29.9	28.3	26.1	25.75	26.92	--	--
February, 2009	57.1	45.1	40.5	24.7	25.2	23.3	60.3	47.5	46.2	25.1	27.4	25.0	23.8	25.49	--	--
March, 2009	29.2	23.0	26.5	11.0	7.2	9.0	32.1	22.1	28.4	11.6	6.9	9.9	8.84	9.47	--	--
April, 2009	28.8	24.0	28.1	11.6	12.1	10.3	37.3	23.4	39.2	19.7	11.9	19.2	10.79	17.79	850	750
May, 2009	22.0	20.8	20.0	9.9	10.1	7.6	31.7	24.3	32.5	13.1	11.8	11.2	8.33	11.51	1075	813
June, 2009	28.0	23.0	29.0	11.0	10.5	10.6	27.0	23.5	23.2	9.0	9.5	7.8	10.6	8.2	1925	1937
Mean:	47.6	42.9	40.8	19.9	17.5	17.3	51.2	44.3	44.7	21.7	18.2	19.3	17.6	193	3850*	3500
* indicates total fruit yield																

Annexure 23: Incidence and severity of Bacterial Blight Disease and fruit yield of Pomegranate in demonstration and Non demonstration plots at Gudiselapalli, dist. Anantpur, from November, 2008 to June, 2009

During the month	Demonstrations						Non Demonstrations						% Severity on tree		Fruit yield Kg/ha	
	Incidence			Severity			Incidence			Severity			Demonstration	Non Demonstration	Demonstration	Non Demonstration
	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit				
November, 2008	86.7	69.8	--	32.4	29.8	--	88.2	70.2	--	34.3	30.6	--	9.2	9.55	--	--
December, 2008	80.2	84.8	--	31.9	24.9	--	83.5	84.1	--	32.1	26.5	--	8.17	8.51	--	--
January, 2009	72.2	72.0	--	25.5	19.5	--	74.5	78.0	--	27.6	22.5	--	6.45	7.26	--	--
February, 2009	71.4	74.8	76.0	29.8	31.2	33.5	75.8	76.2	78.4	33.7	33.1	35.2	32.67	34.63	--	--
March, 2009	70.0	72.0	75.0	24.1	20.5	24.2	76.4	70.6	75.9	28.7	20.0	23.9	23.45	23.6	--	--
April, 2009	49.1	52.3	45.6	14.0	14.5	12.0	58.3	51.6	54.5	23.8	14.1	22.5	12.70	20.95	1870	1250
May, 2009	52.2	51.5	42.7	15.2	14.2	13.6	67.5	58.0	51.6	24.3	16.7	19.8	13.88	19.63	2213	1900
June, 2009	28.5	30.0	--	9.0	9.6	--	26.5	28.0	--	10.4	12.6	--	2.8	3.6	2500	2100
Mean:	63.8	63.4	59.8	22.7	20.5	20.8	68.8	64.6	65.1	26.9	22.0	25.4	13.7	16.0	6583*	5250
* indicates total fruit yield																

Annexure 24: Incidence and severity of Bacterial Blight Disease and fruit yield of Pomegranate in demonstration and Non demonstration plots at Kondampalli dist. Anantpur , from November, 2008 to June, 2009.

During the month	Demonstrations						Non Demonstrations						% Severity on tree		Fruit yield Kg/ha	
	Incidence			Severity			Incidence			Severity			Demonstration	Non Demonstration	Non Demonstration	
	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit				
November,2008	5.8	5.3	--	1.6	1.0	--	6.7	6.3	--	1.6	1.2	--	0.36	0.40	--	--
December, 2008	5.3	4.0	--	2.0	0.9	--	6.1	5.8	--	2.1	1.2	--	0.38	0.45	--	--
January, 2009	7.3	3.8	--	1.3	1.0	--	9.2	4.7	--	2.1	1.1	--	0.33	0.43	--	--
February, 2009	5.0	3.4	--	1.9	0.8	--	7.2	5.6	--	2.0	1.0	--	0.35	0.40	--	--
March, 2009	5.6	9.0	--	1.2	1.6	--	5.5	9.2	--	1.2	1.8	--	0.44	0.48	--	--
April, 2009	6.5	8.1	6.3	1.0	2.9	1.6	10.5	10.3	9.3	2.1	2.6	2.4	1.80	2.41	--	--
May, 2009	8.2	8.6	6.9	1.1	2.4	1.0	12.1	9.2	11.3	2.3	2.1	1.9	1.29	1.98	--	--
June, 2009	10.5	9.0	14.5	2.0	2.8	3.7	15.5	13.5	21.0	4.2	3.3	5.1	1.8	4.6	--	--
Mean:	6.8	6.4	9.2	1.5	1.7	2.1	9.1	8.1	13.9	2.2	1.8	3.1	0.8	1.4	*	--
* Under progress																

Annexure 25: Incidence and severity of Bacterial Blight Disease and fruit yield of Pomegranate in demonstration and Non demonstration plots at Gundumala, dist. Anantpur , from November, 2008 to June, 2009

During the month	Demonstrations						Non Demonstrations						% Severity on tree		Fruit yield Kg/ha	
	Incidence			Severity			Incidence			Severity			Demonstration	Non Demonstration	Demonstration	Non Demonstration
	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit				
November, 2008	88.2	68.3	--	31.4	23.7	--	89.3	70.3	--	33.0	25.2	--	7.88	8.34	--	--
December, 2008	62.8	70.5	--	36.8	26.8	--	67.8	73.3	--	37.2	28.7	--	9.04	9.46	--	--
January, 2009	74.3	71.5	--	26.8	25.7	--	77.3	78.1	--	29.2	28.8	--	7.82	8.68	--	--
February, 2009	68.7	69.4	--	28.2	26.0	--	70.4	72.	--	30.2	29.0	--	8.02	8.82	--	--
March, 2009	52.0	65.0	32.5	16.0	16.0	11.8	58.6	65.0	37.2	18.3	16.9	13.8	13.06	14.87	--	--
April, 2009	42.2	43.3	44.7	11.3	14.9	12.1	51.3	47.2	55.2	20.7	16.9	20.6	12.58	19.87	--	--
May, 2009	45.3	62.5	52.0	15.5	15.8	20.2	56.3	63.0	63.4	25.1	16.0	29.3	18.85	26.22	--	--
June, 2009	85.5	73.5	93.5	43.2	36.5	50.5	91.5	76.0	94.0	44.0	39.5	40.2	47.0	40.44	--	--
Mean:	64.9	65.5	55.7	26.2	23.2	23.7	70.3	68.1	62.5	29.7	25.1	26.0	15.5	17.1	*	--
* Under progress																

Annexure 26: Incidence and severity of Bacterial Blight Disease and fruit yield of Pomegranate in demonstration and Non demonstration plots at Settyamakur, dist. mahaboobnagar from November, 2008 to June, 2009

During the month	Demonstrations						Non Demonstrations						% Severity on tree		Fruit yield Kg/ha	
	Incidence			Severity			Incidence			Severity			Demonstration	Non Demonstration		
	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit				
November,2008	45.2	69.4	--	13.0	23.1	--	48.2	70.8	--	14.1	25.2	--	5.92	6.45	--	--
December,2008	38.7	62.0	--	8.5	39.3	--	39.2	63.7	--	12.3	37.8	--	8.75	8.79	--	--
January,2009	51.0	59.0	47.5	15.0	18.0	9.16	53.8	62.1	49.8	16.7	19.3	11.7	11.51	13.72	--	--
February,2009	42.6	72.5	33.0	13.9	19.5	8.1	47.2	75.2	37.1	15.1	22.3	11.2	10.9	13.81	--	--
March,2009	31.0	42.0	29.0	10.2	21.6	10.1	29.6	44.8	28.2	9.8	20.9	11.0	12.41	12.86	--	---
April,2009	22.1	51.3	20.7	6.7	23.4	5.9	33.7	59.2	29.9	15.8	12.9	12.6	9.48	12.98	1350	1100
May,2009	14.8	56.4	25.9	4.1	26.9	8.4	23.7	63.6	25.0	8.2	16.2	13.7	11.67	13.65	1815	1570
June,2009	19.0	34.0	20.5	7.7	10.8	7.1	21.5	38.0	21.5	8.5	11.5	8.3	7.9	9.0	5835	5530
Mean:	33.1	56.5	29.4	9.9	22.8	8.1	37.1	59.7	31.9	12.6	20.8	11.4	9.8	11.4	9000*	8200
* indicates total fruit yield																

Proforma for Inspection of Pomegranate Nurseries

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Name of the Organization

Sr.No.	Date of Survey
1.	Name of Nursery
2.	Govt. License Holder Yes/No. If Yes then name of govt. official issued License, license no. & Validity etc.
3.	Name of Owner and Correspondence Address
	Taluka
	District
	Contact No.
4.	Area under Nursery / No. of air layers/ cuttings raised / year
5.	Varieties being supplied / multiplied
6.	Period of supply (Months)
7.	Areas where Material supplied
8.	Rate: (i) Gootee direct from plant (ii) Full grown seedling in bag
9.	Information on Procedure for preparation of planting material
10.	Source of Mother Plants
11.	Type of planting Material (Air layering / Hardwood cutting)
12.	Age of wood from which prepared (between 6 to 18 months preferable)
13.	Date of gootee / cutting preparation
14.	Treatment used for rooting if any (IBA/any other with conc.)

15.	Packing material used (moss/coconut coir etc.for gootee.)
16.	Age at which gootee removed from mother plant
17.	Age of Saplings in bags (at least 4 months)
18.	Potting mixture used (sand soil compost @ 1:1:1)
19.	If any bioagents used in compost/planting material (Trichoderma viridae, T.herzianum, Pseudomonas fluorescence, Neem cake, VAM etc. and at what concentration)
20.	Was soil sterilized / solarised etc.
21.	Specification of Bags used – Transparent / Black Polythylene Guage – (at least 200 preferred) Size – (4"x 6"x 2" preferred)
22.	Pesticide Treatment Used Was Bordeaux paste used on cut ends of mother plants / cuttings Were roots of air layers treated with COC (0.25%) or any other pesticides Sprays used during growth period in bags e.g. Mancozeb (0.25%), chlorothalonil (0.25%) or any other

Health Status				
		Mother plant		Planting material
		Current year	Previous year/s	Current year
Bacterial Blight	Incidence (%)			
Status	Severity ((%)			
Fungal Fruit	Incidence (%)			
/Leaf/spots and cankers if any	Severity ((%)			
Major insect pests	Incidence (%)			
	Severity ((%)			
General Health Condition	Visible Nutrient Deficiency if any /greenery etc.			
	Av. Height and spread of plant			

Signature
Name and Designation of Person Collecting Data

Network Project on Mitigating the Bacterial Blight of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh

Technical Workshop (May 17, 2008)

PROCEEDINGS

The 'Technical Workshop' on the 'Network Project on Mitigating the Bacterial Blight of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh' began under the Chairmanship of Dr. V.T. Jadhav, Director, NRCP, Solapur on 17.05.2008 at 10.00 am in the Director's Chamber of National Research Centre on Pomegranate, Solapur. The following officials from the participating institutes attended the workshop.

1. Dr.V.T.Jadhav, Director, NRCP, Solapur
2. Dr.C.Gopalakrishnan, Principal Scientist (Pathology), IIHR, Bangalore
3. Dr.V.I.Benagi, Prof.and Head (Pathology), UAS, Dharwad
4. Dr.M.R.Ravikumar, Associate Professor (Pathology), KVK, Sirsi, Uttar Kannada
5. Dr.U.G.Kulkarni, Associate Dean and Principal, COA, Osmanabad
6. Dr.V.G.Mulekar, Associate Professor (Pathology), COA, Osmanabad
7. Dr.C.V.Ambadkar, Assistant Professor (Pathology), ARS, Tuljapur
8. Dr.Kiran Raghuvanshi, Junior Pathologist, AICRP on Arid Zone Fruits, MPKV, Rahuri
9. Dr.K.Subramanyam, Sr.Scientist (Pathology), ARS, Anantapur
10. Dr.Ram Chandra, Pr.Scientist, (Hort.- Fruit Science), NRCP, Solapur
11. Dr.K.K.Sharma, Senior Scientist (Pathology), NRCP, Solapur
12. Dr.(Mrs.) Jyotsana Sharma, Senior Scientist (Pathology), NRCP, Solapur
13. Dr.R.A.Marathe, Senior Scientist (Soil Science), NRCP, Solapur
14. Dr.K.Dhinesh Babu, Scientist (Hort.- Fruit Science), NRCP, Solapur.
15. .Dr.Ashish Maity, Scientist, (Soil Science), NRCP, Solapur
16. Dr.S.P.Raut, Head (Plant pathology) from KKV, Dapoli

Dr. VT Jadhav, the Project Director welcomed all the coordinators and additional coordinators from participating organisations to the workshop and deliberated upon the importance of the network project sanctioned by the Govt.of India, in the light of current scenario of bacterial blight in the three states.

Dr.(Mrs.) Jyotsana Sharma briefed the participants with the elements of the project and expenditure details.. She explained the criterion for selection of the orchard for adoption under the project, survey and surveillance methodology and Disease Assessment Keys. This was followed by discussions and clarification of doubts by the participants. She also presented the 'Format of the Agreement' which was approved by all.

On the request of participants, Dr. K. K. Sharma shared his experiences on the adoption of orchard by NRCP,

Solapur for mitigating the bacterial blight during 2007-08. Dr. C. Gopalakrishnan demonstrated the operation of Automatically Disinfecting Secateur, available with Mr. Sanju Mathew, KASB Agro solutions 51/27, Swamy Towers, First Floor, D. Nakkundi, Outer Ring Road, Marathalli, Bangalore 560 037, Ph. No. 08025237887

The Meeting ended at 16:30 hours with the vote of thanks by Dr.KK Sharma.

The final recommendations of the meeting are:

1. All were asked to take 'Pre-Hasta Bahar 'for 1st.year demonstrations,and to Venture for Mrig Bahar in the next year.
2. For demonstrations, when orchard of 1 ha area is not available for adoption, Orchards of 0.5 ha/1acre can be adopted in two adjacent orchards.
3. All were asked to conduct surveys in and around their areas so that disease mapping may be done for the three states.
4. MPKV, Rahuri will take up demonstrations in Ahmednagar, Nashik, Pune, Solapur and Sangli districts.
5. Looking into the large number of demonstrations and trainings to be undertaken by MPKV,Rahuri, it was decided that the university authorities may be requested to nominate more additional coordinators,for better execution of the project work.
6. It is mandatory to undertake the agreement / MOU in the prescribed form with the owner of the orchard for a period of 2 years (April 2008- March 2010) in non-judicial stamp paper of atleast Rs 20/-,for adoption of orchard and demonstration of OHMS.A copy of the 'Agreement Format' was given to all the participants.
7. Two training manuals (one for State Govt.Officers and other for farmers) already prepared by NRCP, Solapur, will be printed in English and Marathi and supplied in requisite number to the participating organizations as per their demand (given below).

Organization	Requirements	
	Training Manuals for Officers (English)	Training Manuals for Farmers (in Marathi)
MAU, Parbhani	5	750
MPKV, Rahuri	20	2000
UAS, Dharwad	20	Nil
ANGRAU, AP	20	Nil
IIHR, Bangalore	50	Nil

8. The participating organizations from Karnataka and Andhara Pradesh, were provided the final draft of the 'Training Manuals for Farmers' in English, for preparing manuals in respective local languages.

9. For purchase of items of non recurring nature for this project, the centres should get approval from NRCP Solapur.
10. The participants should send the proposals for purchase of equipments, inputs etc, hiring of vehicles as well as appointments of Training Associates and Training Helpers as per their requirement but within the specified budget, for approval to Director, NRCP, Solapur.
11. It was unanimously decided by the house, that NRCP, Solapur will process the purchase of Disease Forecasting Units and send a copy to participating organizations so that they can process on the same lines.
12. The Disease Forecasting Units will be installed at a bacterial blight hot spot area in the respective regions under the jurisdiction of the organization and that the organization will be responsible for the safety of the unit..
13. For financial sanction they may follow the norms of their respective organization.
14. The powers of revalidation of unspent amount will be with NRCP, Solapur/DAC, New Delhi
15. The Nodal Agency, NRCP, Solapur will co-ordinate the technical programme of this project and may issue the guidelines as and when required for better output of the project.
16. Coordinators from respective organizations will submit Quarterly Progress Reports (Physical and Fiscal) of the Network Project to the Project Director, NRCP, Solapur for review and further transmission to Ministry of Agriculture, Govt. of India, N. Delhi.

VT Jadhav
(Chairman)

**Minutes of the Meeting on Implementation of Package for
the Control of Bacterial Blight and Wilt Diseases of Pomegranate
and Network Project on Mitigating the Bacterial Blight of
Pomegranate in Maharashtra**

(July 26, 2008)

The meeting to discuss implementation of package for the control of bacterial blight and wilt diseases of pomegranate and Network Project on 'Mitigating Bacterial Blight Disease of Pomegranate in the state of Maharashtra' began under the Chairmanship of Dr. V.T. Jadhav, Director, NRCP, Solapur on July 26, 2008, in the Director's Chamber at National Research Centre on Pomegranate, Solapur. The following officials from the MPKV, Rahuri, MAU, Parbhani and NRCP, Solapur attended the meeting

1. Dr. VT Jadhav, Director, NRCP, Solapur
2. Dr. SG Borkar, HOD, Pathology, MPKV Rahuri
3. Dr. AG Chande, Head Entomology, MPKV, Rahuri
4. Dr. UG. Kulkarni, Associate Dean and Principal, COA, Osmanabad
5. Dr. V.G. Mulekar, Associate Professor (Pathology), COA, Osmanabad
6. Dr. Kiran Raghuvanshi, Junior Pathologist, AICRP on Arid Zone Fruits, MPKV, Rahuri
7. Dr. MB Shete, Asstt. Prof. of Hort., NARP, ZARS, Solapur
8. Dr. SD Masalkar, Horticulturist, MPKV, Rahuri
9. Prof. DR Murumkar, Pathologist, NAARP, ZARS, Solapur
10. Dr. NL Mhase, Nematologist, MPKV, Rahuri
11. Dr. Santosh Kulkarni, scientist I (Ent.), MPKV, Rahuri
12. Dr. Ram Chandra, Pr. Scientist, (Hort.- Fruit Science), NRCP, Solapur
13. Dr. KK Sharma, Senior Scientist (Pathology), NRCP, Solapur
14. Dr. (Mrs.) Jyotsana Sharma, Senior Scientist (Pathology), NRCP, Solapur
15. Dr. RA Marathe, Senior Scientist (Soil Science), NRCP, Solapur
16. Dr. K Dhinesh Babu, Scientist (Hort.- Fruit Science), NRCP, Solapur.
17. Dr. Ashish Maity, Scientist, (Soil Science), NRCP, Solapur
18. Mr. YR Shinde, Training Associate, NRCP, Solapur
19. Mr. Rahul N Madane, Training Associate, NRCP, Solapur
20. Ghuge Kundlik S, Training Associate, NRCP, Solapur
21. AS Lohakare, Training Associate, NRCP, Solapur

Dr. VT Jadhav, the Project Director welcomed all the delegates from both the universities and the centre and apprised the house with the contents of the letters received from Managing Director, Maharashtra State Horticultural and Medicinal Plant Board, Pune and Director of Research, MPKV, Rahuri, because of which this meeting was convened.

The house discussed at length the Orchard Health Management (OHM) Schedule, finalized by Scientists from ICAR and SAUs and representatives of farmers at a meeting in Pune on Feb. 24, 2007, under the Chairmanship of Hon'ble DDG (Hort.), ICAR, New Delhi. After thorough discussions, all present felt that, no changes were required in the OHM schedule and should be implemented as such.

Thereafter the package for pomegranate wilt was discussed. Dr. KK Sharma, Sr. Scientist, NRCP, Solapur, briefed the house about the etiology, predisposing factors and control measures for wilt. He told that the primary cause of wilt was *Ceratocystis fimbriata*, on the basis of association of this fungus in more than 60-65% samples collected from various orchards and pathogenicity which he has convincingly proved in pot culture experiments. Other fungi like *Fusarium*, *Rhizoctonia*, *Macrophomina*, Nematodes and shot hole borers were also found associated in some cases. Dr. Kiran Raghuvanshi, Junior Pathologist, MPKV, Rahuri, informed about the 'Package of Pomegranate Wilt' finalized by MPKV, Rahuri. The Chairman requested him to send a copy so that the final draft could be prepared for the package for wilt management.

The implementation of Network Project on 'Mitigating Bacterial Blight Disease of Pomegranate in the state of Maharashtra' was also discussed. The Project Director informed the house that NRCP, Solapur had finalized the 5 demonstration plots to be adopted by the Centre and is taking flowering in August. He requested Co-ordinators from MPKV, Rahuri and MAU, Parbhani to select the orchards as early as possible and send complete contact details of the selected orchards to this office. The coordinators requested the project Director to ask SHM to release the funds, which have not been released so far, so that the project work is properly executed. The meeting ended with vote of thanks by Dr. (Mrs.) Jyotsana Sharma, Sr. Scientist, NRCP, Solapur.

Recommendations:

1. No changes were required in the OHM schedule for mitigating bacterial blight of pomegranate, and should be implemented as such.
2. Package for wilt was finalized. The recommended package is enclosed, herewith (Annexure 30)
3. Co-ordinators 'Network Project' from MPKV, Rahuri and MAU, Parbhani should select the orchards as early as possible and send complete contact details of the selected orchards to this office.

(VT Jadhav)
Project Director

Annexure 30

Package for Wilt Management finalized in the Meeting on July 26, 2008, at NRCP Solapur

The package for wilt management was finalized by the scientists from NRC on Pomegranate, Solapur, MPKV, Rahuri and MAU Parbhani, in the meeting held at NRCP, Solapur on July, 26, 2008.

- Prefer site having light-medium soil for the orchard with proper drainage.
- Plant orchard with disease free planting material grown in disease free solarized soil.
- Make Pits 1m x 1m x 1m, at a spacing of 4.5m (row-row) x 3.0m (plant-plant). This will accommodate about 740 plants. Disease also spreads through root to root contact hence narrower spacing will aggravate the wilt problem.
- Pits are dug about a month prior to planting and kept open for at least 1 month. So that it is disinfected by intense solar radiation during the day.
- Drench pits with 0.2% Carbendazim in 5L water/pit.
- Carbaryl dust or Chloropyrifos 50g/pit is dusted on the bottom and sides of the pits just before filling pits.
- Pits are also treated with Calcium hypochlorite @ 100g/pit, before filling.
- At pit filling if soil is heavy mix sand:soil in 1:1 ratio. In each pit mix with top soil-

FYM	20Kg,
Vermicompost	2Kg
Neem cake	3Kg
Trichoderma formulation	25g
Phosphate Solubilising bacteria	10Kg/ha (15g/plant)
Azotobacter formulation	10Kg/ha (15g/plant)

- Follow proper soil water management.
- On observing a wilted plant immediately drench soil with Chlorpyrifos (0.25%) + Carbendazim (0.2%) or Propiconazole/Tilt (0.15%) or Hexaconazole (0.15%) @ 5 L solution/tree. Drench at least 2-3 plants on all the four sides around the infected plant/s. Chlorpyrifos will take care of shot hole infestation if any.
- The pathogen propagules are also observed on arial parts. So spray entire orchard with 0.1% Carbendazim.
- Uproot dead wilted dry plants and burn immediately. While removing the wilted plants from the orchard for burning, protect the root zone with cover, as the spores of the pathogen are present abundantly on the roots and may spread to other plants.
- Avoid pruning in spring and early summer which is also insect active period, because insects are attracted to sap produced on pruning wounds and thus help in dissemination of pathogen propagules.
- Protect all pruning wounds, with Bordeaux paste.
- For controlling shot hole borer (*Xyleborus* spp.) which is associated with wilt disease, 10 litres preparation containing Red Soil (4kg) + Chlorpyrifos (20ml) + Copper oxychloride (25 g) can be

applied on plant base from second year onwards. Red soil should be soaked in water overnight and chemicals mixed next day.

- For stem borer control, inject in the holes on the trunk Fenvalerate @5 ml/litre and plug the holes with mud.
- Where nematodes are a problem apply Phorate @ 20Kg/ha or Carbofuran @2Kg a.i. /ha in the plant basin, in a ring near root zone and cover it with soil.
- Plant *Tagetes erecta* (African marigold) between plant to plant space in a row, or in a ring, on the border of plant basin, these help in reducing nematode population. For effective results these should be grown for more than 4-5 months.
- Follow clean cultivation and orchard sanitation measures strictly.

Annexure 31

Minutes of the Workshop to Review the Progress Made in the Network Project on Mitigating Bacterial Blight Disease in Maharashtra, Karnataka and Andhra Pradesh

(Dec 17-18, 2008)

The workshop to review the progress made in the network project on 'Mitigating Bacterial Blight Disease in Maharashtra, Karnataka and Andhra Pradesh' was held at National Research Centre on Pomegranate, Solapur on 17th and 18th December, 2008 under the chairmanship of Dr. VT Jadhav, Project Director & Director, NRCP, Solapur. The workshop was attended by the Coordinators, Additional Coordinators and Training Associates from NRCP and other participating organizations. Dr. Fartade, Programme Coordinator, KVK, Tuljapur and Dr. Ram Chandra, Principal Scientist, NRCP, Solapur were the special invitees to review the progress. The following participants attended the workshop

1. Dr. VT Jadhav, Project Director and Director, NRCP, Solapur
2. Dr. GM Fartade, Programme Coordinator, KVK, Tuljapur Dist. Osmanabad (Special invitee)
3. Dr. Ram Chandra, Pr. Scientist, (Hort.- Fruit Science), NRCP, Solapur (Special invitee)
4. Dr. SG Borkar, Coordinator and HOD, Pathology, MPKV Rahuri
5. Dr. VI Benagi, Coordinator, Prof. and Head (Pathology), UAS, Dharwad
6. Dr. MR Ravikumar, Additional Coordinator and Associate Professor (Pathology), KVK (UAS, Dharwad), Sirsi, Uttara Kannada
7. Dr. C Gopalakrishnan, Coordinator and Principal Scientist (Pathology), IIHR, Bangalore
8. Dr. AK Saxena, Additional Coordinator and Senior Scientist (Pathology), IIHR, Bangalore
9. Dr. K Subramanyam, Coordinator and Sr. Scientist (Pathology), ARS, APHU, Anantapur
10. Dr. VG Mulekar, Additional Coordinator and Associate Professor (Pathology), COA, Osmanabad
11. Dr. CV Ambadkar, Additional Coordinator and Assistant Professor (Pathology), ARS, Tuljapur
12. Dr. (Mrs.) Jyotsana Sharma, Coordinator and Senior Scientist (Pathology), NRCP, Solapur
13. Dr. KK Sharma, Additional Coordinator and Senior Scientist (Pathology), NRCP, Solapur
14. Dr. RA Marathe, Additional Coordinator and Senior Scientist (Soil Science), NRCP, Solapur
15. Dr. K Dhinesh Babu, Additional Coordinator and Scientist (Hort.- Fruit Science), NRCP, Solapur.
16. Mr. MR Ravikumar, Training Associate, UAS, Dharwad
17. Mr. P Ranga Naidu, Training Associate, ARS, APHU, Anantapur
18. Mr. YR Shinde, Training Associate, NRCP, Solapur
19. Mr. Rahul N Madane, Training Associate, NRCP, Solapur
20. Mr. Ghuge Kundlik S, Training Associate, NRCP, Solapur
21. Mr. AS Lohakare, Training Associate, NRCP, Solapur
22. Mr. Om Prakash Shisodia, Training Associate, NRCP, Solapur

In the morning session of the first day of the workshop Dr. VT Jadhav, the Project Director welcomed all the coordinators, additional coordinators and Training Associates from participating organizations to the two

day workshop. Looking into the tremendous losses caused due to bacterial blight during recent years, the Director in his introductory remarks requested all the participants to take the work under the project seriously. He reiterated that the OHM schedule finalized in a high level meeting at Pune needs to be tested at multiple locations under this project, so that recommendation can be put on a sound footing. This was required to built up confidence of the pomegranate growers suffering due to Bacterial Blight Disease (BBD). He also informed the house that NRCP had already successfully implemented the 'Orchard Health Management Schedule (OHM)' in a severely infected pomegranate orchard of a farmer at Hiraj (Solapur) during Hast Bahar (2007-08), and got 16 tons of disease free produce from 1 ha, hence there is no reason, not to get good BBD management with the schedule. He promised full cooperation and support to all the participants for timely release of funds by respective state missions, so that the work does not suffer due to lack of funds. After his introductory remarks he asked all present to introduce themselves.

Dr. SG Borkar, presented progress report for MPKV Rahuri and pointed out that the work cannot be carried out unless and until delegation of financial power is given to Director of Research, MPKV, Rahuri. The Project Director agreed and the letter to this effect was handed over to him for early implementation of project by MPKV. He also asked for slight amendment in the 'Clause 7 of the Agreement for Adoption of Pomegranate Orchard for the Network Project on Mitigating Bacterial Blight of Pomegranate' which was agreed upon. He informed that list a 10 selected orchards has been proposed to Director Research for approval.

Dr. CV Ambadkar, presented the progress of work done by MAU, Parbhani, under the network project. The University has already conducted the surveys and adopted 5 orchards but due to heavy rains during October & November the Hast bahar could not be taken, hence they are now taking Ambe Bahar. He also felt that several farmers were unaware about various aspects of BBD and extension activities were required to create awareness in some areas.

Dr. (Mrs.) Jyotsana Sharma presented progress made under the project by NRCP, Solapur. The Centre had already adopted 5 orchards and the demonstrations are in progress. She informed that the trainings are to be imparted shortly.

The progress report for UAS, Dharwad was presented by Dr. V.I. Benagi. He expressed satisfactory control of the BBD as well as of Wilt in the adopted orchards using Orchard Health Management Schedule. He also mentioned about release of publications viz., technical leaflets and training manual in local language for distribution to farmers, besides publication of articles on BBD in Annadatha Kannada magazine. He also showed photographs of various pomegranate diseases found in Karnataka. He felt that the amount of Rs.50,000/plot was not sufficient for demonstration, hence this should be increased. He also informed that wilt was a severe problem in some orchards and drenching with recommended fungicides and insecticides at proper stage gave effective control of the disease.

Dr. C Gopalakrishnan presented report for IIHR, Bangalore. He informed that the progress of the project was as per schedule and the incidence of fruit borer (*Helicoverpa*) was severe besides other pests viz., thrips, mites, aphids etc. he also expressed satisfaction of the farmers over BBD control using the OHM schedule.

Dr. K Subramanyam while presenting the progress report for APHU, Andhra Pradesh reported adoption of 8 orchards instead of 5. The project Director permitted to take extra demonstrations if these can be carried out within the sanctioned budget. He too expressed satisfaction of the farmers over BBD control using the OHM schedule. He also brought some diseased fruit samples for identification of diseases, which were identified by Dr KK Sharma.

In the post lunch session Dr. Jyotsana Sharma delivered a lecture on 'Disease Diagnosis'. She explained

various diseases and pests of pomegranate and methods to differentiate BBD from other fungal diseases like Cercospora spot using coloured photographs. Dr.KK Sharma presented 'Disease Assessment Scale for BBD of pomegranate for uniform collection of data under the project. Doubts expressed by Dr K Subramanyam were cleared. Dr. RA Marathe gave an informative talk on 'Nutrient Disorders and Role of Nutrients in Disease Development.' Though much was not available on Pomegranate, however related literature on other crops was presented. It was proposed to come out with a pomegranate special micronutrient mixture similar to that of banana special micronutrient developed by IIHR. The project Director requested all to submit progress reports if not submitted and also the expenditure details so that further action could be taken accordingly. Dr. Jyotsana Sharma concluded the sessions with vote of thanks. The session ended at 5.30 PM.

On Dec 17, 2008 a field visit to NRCP Farm, Kegaon and Farmers Orchard at Hiraj was organized. Dr. Ram Chandra highlighted the salient features of the accessions available in the National Germplasm Repository for pomegranate at NRCP, Solapur besides ongoing experiments were shown to the participants. Dr. RA Marathe explained about the water harvesting structure and other farm development works of NRCP, Hiraj farm. In the farmers orchard various diseases were shown and doubts cleared regarding different diseases. Dr. KK Sharma and Dr. Jyotsana Sharma explained the progress of work at the adopted farmers orchard. The participants returned to NRCP at 4.30 PM. Relevant documents required by respective organizations were provided on request for unhindered progress of the project work.

VT Jadhav
(Project Director)

Minutes of the Annual Review Meeting of Network Project on Mitigating Bacterial Blight Disease of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh Held at NRC on Pomegranate, Solapur

(September 10, 2009)

The meeting to review the progress made during first year of implementation of the network project on 'Mitigating Bacterial Blight Disease of pomegranate in Maharashtra, Karnataka and Andhra Pradesh' was held at National Research Centre on Pomegranate, Solapur on September 10, 2009, under the chairmanship of Dr. VT Jadhav, Project Director & Director, NRC, Solapur. The meeting was attended by the Coordinators, Additional Coordinators and Training Associates from NRC and other participating organizations. Dr. Ram Chandra, Principal Scientist and Dr. Ashish Maity, Scientist Soil Science, NRC, Solapur were the special invitees. The following participants attended the workshop

1. Dr. VT Jadhav, Project Director and Director, NRC, Solapur
2. Dr. Ram Chandra, Pr. Scientist, (Hort.- Fruit Science), NRC, Solapur (invitee)
3. Dr. VI Benagi, Coordinator, Prof. and Head (Pathology), UAS, Dharwad
4. Dr. MR Ravikumar, Add. Coordinator and Assoc. Prof. (Path.), KVK (UAS, Dharwad), Sirsi, Uttara Kannada
5. Dr. C Gopalakrishnan, Coordinator and Principal Scientist (Pathology), IIHR, Bangalore
6. Dr. AK Saxena, Additional Coordinator and Senior Scientist (Pathology), IIHR, Bangalore
7. Dr. K Subramanyam, Coordinator and Sr. Scientist (Pathology), ARS, APHU, Anantapur
8. Dr. RA Raghuwanshi, Assoc. Prof., Plant Path., MPKV, Solapur
9. Dr. CS Thakare, Asstt. Prof., AICRP, AZF, MPKV, Rahuri
10. Dr. DV Indi, ADR, ZARS, Solapur
11. Dr. AS Dhawan, Associate Dean and Principal, COA, Osmanabad.
12. Dr. VG Mulekar, Additional Coordinator and Associate Professor (Pathology), COA, Osmanabad
13. Dr. (Mrs.) Jyotsana Sharma, Coordinator and Principal Scientist (Pathology), NRC, Solapur
14. Dr. KK Sharma, Additional Coordinator and Senior Scientist (Pathology), NRC, Solapur
15. Dr. RA Marathe, Additional Coordinator and Senior Scientist (Soil Science), NRC, Solapur
16. Dr. K Dhinesh Babu, Additional Coordinator and Scientist (Hort.- Fruit Science), NRC, Solapur
17. Dr. Nripendra Vikram Singh, Additional Coordinator and Scientist (Hort.- Fruit Science), NRC, Solapur
18. Dr. Ashish Maity, Scientist, Soil Science, NRC, Solapur (invitee)
19. Mr. P Ranga Naidu, Training Associate, ARS, APHU, Anantapur
20. Mr. Basawaraj B. Pawar, Training Associate, UAS, Dharwad
21. Mr. YR Shinde, Training Associate, NRC, Solapur
22. Mr. Rahul N Madane, Training Associate, NRC, Solapur
23. Mr. AS Lohakare, Training Associate, NRC, Solapur

The meeting initiated with the welcome address by the Project Director and Director NRC, Solapur, Dr. VT Jadhav. He welcomed the delegates and briefed about the outcome of the work

done during the first year of implementation of the Network Project and targets of the project that are to be taken in the second year. He also welcomed Dr. AS Dhawan, Associate Dean and Principal, COA, Osmanabad, to join the project as Coordinator for MAU, Parbhani in place of Dr. UG Kulkarni, earlier coordinator, who was transferred as Associate Dean and principal to COA, Latur.

He expressed satisfaction that now farmers are aware that the bacterial blight can be kept low and managed if proper management practices are followed. He also felt that the expenditure by some of the participating organization was low due to their organizational procedures and norms and this needs to be sorted out at their level, however, he also informed that if the project outcome is positive and satisfactory, the savings from this project will be utilized for the third year demonstrations in other orchards after due approval of the Government. He felt that after one year experience in this project, on several trials taken on its control by NRCP and other organizations and on the basis of information and views of the progressive growers who have produced good pomegranate in spite of the blighted orchards in the neighbouring sites some **newer schedules should be developed and tried by all the concerned organizations in the growers orchard. The Director told that the nursery inspection is one of the objectives of the network project, for which proforma has been prepared by NRCP, this should be finalized in this meeting and changes if any should be made, so that inspections can be carried out with the help of state departments.** The director then asked all coordinators to present the work done during first year and requested all to be brief.

Dr. C Gopalakrishnan, Coordinator, IIHR, Bangalore presented the work in brief at adopted orchards in Sira, Hiriyur and Jagalur talukas of Tumkur, Chitradurga and Davanagere districts of South Karnataka. He informed that the farmers were highly satisfied with the management of bacterial blight and expressed regain of confidence in taking pomegranate crop. He also found that tip drying was causing some problems for which studies were required. He also felt that automatically disinfected secateurs can be of great help in reducing spread of the pathogen during pruning operation and hence **government should think about giving subsidy to farmers for its purchase as it costs about Rs 15, 000/-. This was followed by discussions and clarifications by the participants**

Dr. VI Benagi, Coordinator, UAS, Dharwad, highlighted the performance of adopted orchards at Belgaum, Gadag, Chitradurga, Bellary, Bagalkot, Koppal and Bijapur districts of North Karnataka and claimed considerable reduction in bacterial blight severity in adopted demonstration plots. The status of bacterial blight and other diseases in N. Karnataka was also discussed based on his survey. He also said pasting of cankers with Streptocycline and sulphuric acid yielded positive results. He cautioned scientists to create awareness in farmers to get pruning done by skilled pruning team, though it may costlier. He said variability in Xanthomona isolates was observed and that a weed Tridax sp. from compositae family was also a host of the blight pathogen. During the surveys he found bacterial blight was prevalent in 80-100 % of the inspected orchards and that Bellary district was more wilt affected than bacterial blight. He was happy to announce that the farmers in Karnataka are now confident and that area was increasing under pomegranate. He expressed satisfaction over outcome of implemented OHM schedule and its adoption by growers. He however, felt that several farmers left abandoned blight infected orchards for getting packaged, which served as source of infection. Such orchards should either be uprooted or sanitation maintained. He was of the opinion that upto 80% disease control can be achieved through sanitation alone. Dr. K Subramanyam, Coordinator, APHU, Anantapur informed the house about the status of bacterial blight and other diseases in Anantapur and Mahabubnagar districts of Andhra Pradesh and also development of bacterial blight indifferent months. The performance of OHM in adopted orchards was also discussed. He

shared with the participants the feedback gathered from farmers. The pruning period as per the experience of farmers in AP was location specific and in general June July pruning gave better quality than Sept. Oct. Pruning. Among various pests bacterial blight, fungal fruit spots and fruit sucking moths were a major threat in these areas. He said farmers using 1% Bordeaux mixture at flowering reported falling down of flowers and newly set fruits. He was advised that 1% Bordeaux mixture was recommended soon after pruning or rest period whereas, after defoliation and during the crop period till harvest, only 0.5% Bordeaux mixture was recommended. He also informed health status of Dept. Of Hort. nursery at Chigicherla which was inspected by him.

Dr. Ambadkar from College of Agriculture, Osmanabad presented survey work carried out in the districts of Osmanabad, Beed and Latur and informed that respectively, 33.59, 28.81 and 62.36 % area under pomegranate in these districts was affected with bacterial blight. **The project Director asked them to include Jalana and Aurangabad districts in the survey.** He also presented the work done in the demonstration plots and achieved reduction in bacterial blight severity in adopted orchards. **He also informed that some orchard owners did not cooperate and this creates problems in carrying out the operations. To this the Project Director, advised to discontinue such orchards and take new orchard.**

Dr. (Mrs.) Jyotsana Sharma, Coordinator, NRC on Pomegranate while presenting the work carried out by NRCP under the project presented bacterial blight maps of Maharashtra and Solapur. She also reported that since NRCP had already taken the schedule in adopted farmer's orchard prior to initiation of this project and got highly satisfactory results, hence it ventured to evaluate the schedule in mrig bahar (rainy season)- which is the main period for pomegranate in these areas. She reported that in orchards with high bacterial blight severity, disease could not be satisfactorily checked in rainy season / Ambe Bahar crop, however, Hasta Bahar crop when taken in the same orchards gave high disease control. She informed the house that the schedule has to be followed in Hasta bahar, which is also one of the recommendation in the schedule. Out of the 5 adopted orchards she reported discontinuing of one Orchard at Wadgi due to non cooperation of the owner, satisfactory disease control in others with good yield in 3 (>9t/ha) and in one there was 60-70% loss due to cracking one month before harvest due to acute water shortage. She also requested all to go through the proforma prepared for the nursery inspections so that necessary changes be made and distributed to all.

The Project Director then asked Dr. K. Raghuwanshi, Additional Coordinator, MPKV to present the progress. He informed that he had not prepared the presentation however, hard copy of the same has been submitted to NRCP.

Detailed discussion took place on various aspects of tackling pests and diseases in pomegranate. The Director then answered the queries of the participants and requested to reassemble after lunch to finalize the remaining agenda items, as he was to leave for another urgent meeting after lunch and could not attend the post lunch session.

The post lunch session commenced at 3.00PM. As Chairperson DR VT Jadhav had left for another urgent meeting, Dr. (Mrs.) Jyotsana Sharma, requested Dr. AS Dhawan, Associate Dean and Principal, COA, Osmanabad, to chair the session.

As most all the agenda items were over before lunch, Chairperson requested all present to go through the 'Nursery Inspection Proforma' prepared by NRCP and suggest changes, if any. The proforma was found to contain all requisite information to be collected while inspecting nurseries except that, the chairman requested to include query on **mother block source**.

Dr. (Mrs) Jyotsana sharma informed that, DR.VT Jadhav had requested State Horticulture Missions to send list of authorized nurseries in the respective states so that the inspections be carried out with the help of state departments. She also asked the chairperson to decide areas to be covered by participating organizations in Maharashtra, as list of authorized nurseries in Maharashtra as provided by NHMPB, Pune. **It was decided by the chairman that the NRCP, Solapur will conduct inspection of nurseries in Solapur, Sangli, Pune, MAU Parbhani will inspect nurseries in Aurangabad, Jalana, Latur, Osmanabad and Parbhani and MPKV, Rahuri in Ahemadnagar, Dhule, Jalgaon and Nashik.** He also requested all the coordinating partners to document success stories of farmers and see how best their techniques can be integrated in our scientific schedule.

The meeting ended at 5.00 PM with views of Dr.KK Sharma, Additional Coordinator of the Network Project at NRC on Pomegranate, on successful demonstrations by various organizations and vote of thanks.

(VT Jadhav)

Date:.....2009

Annexure 33

Personnel Associated		
Scientists from Various Organizations Associated with the Project		
Sr.No.	Name and Designation	
1.	Dr.VT Jadhav Director,NRC on Pomegranate NH – 9, Bypass Road Shelgi, Solapur – 413 006 (M.S)	Project Director
2.	Dr. (Mrs.) Jyotsana Sharma Pr.Scientist (Plant Pathology) NRC on Pomegranate NH – 9, Bypass Road, Shelgi, Solapur – 413 006 (M.S)	Coordinator
3.	Dr. KK Sharma Sr.Scientist (Plant Pathology) NRC on Pomegranate NH – 9, Bypass Road Shelgi, Solapur – 413 006 (M.S)	Add.Coordinator
4.	Dr. RA Marathe Sr.Scientist (Soil Science) NRC on Pomegranate NH – 9, Bypass Road Shelgi, Solapur – 413 006 (M.S)	Add.Coordinator
5.	Dr. K.Dhinesh Babu Scientist (Horticulture Fruit Science) NRC on Pomegranate NH – 9, Bypass Road Shelgi, Solapur – 413 006 (M.S)	Add.Coordinator
6.	Dr. NV Singh Scientist (Horticulture Fruit Science) NRC on Pomegranate NH – 9, Bypass Road Shelgi, Solapur – 413 006 (M.S)	Add. Coordinator
7.	Dr.SG Borkar Head Department of Plant Pathology and Agriculture Micro-biology MPKV, Rahuri Dist.Ahmednagar	Coordinator
8.	Dr.KS.Raghwanshi Associate Professor Dept. of Plant Pathology MPKV, Rahuri (MS), Dist. Ahmednagar	Add.Coordinator
9.	Prof.MB Shete Assistant Professor of Horticulture NARP (MPKV), Solapur	Add.Coordinator

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10.	Dr. DV Indi Assistant Professor of Microbiology NARP (MPKV), Solapur	Add. Coordinator
11.	Prof. CS Thakare Jr. Plant Pathologist AICRP on AZF, (MPKV), Rahuri. Dist. Ahmednagar	Add. Coordinator
12.	Prof. AL Palande Assistant Professor of Horticulture ARS (MPKV) Pandharpur Dist. Solapur	Add. Coordinator
13.	Dr. VR Joshi Assistant Professor Horticulture AICRP, on AZF, (MPKV), Rahuri Dist. Ahmednagar	Add. Coordinator
14.	Prof. TK Ghure Assistant Professor of plant pathology ARS (MPKV), Pimpalgaon Baswant, Dist. Nasik	Add. Coordinator
15.	Prof. SR Zanzare Associate Professor Plant Pathology ARS (MPKV),, Digraj	Add. Coordinator
16.	Dr. SR Kulkarni Jr. Entomology AICRP, on AZF (MPK V). Rahuri Dist. Ahmednagar	Add. Coordinator
17.	Dr. UG Kulkarni Associate Dean and Principal College of Agriculture Osmanabad (MS)	Coordinator
18.	Dr. VG Mulekar Associate Professor of Plant Pathology College of Agriculture Osmanabad (MS)	Add. Coordinator
19.	Dr. CV Ambadkar Assistant Professor of Plant Pathology Agri. Research Station, Tuljapur Dist. Osmanabad	Add. Coordinator
20.	Dr. C Gopalakrishnan Pr. Scientist, Dept. of Plant Pathology Indian Institute of Horticultural Research PO Hassaraghatta Lake Post Bangalore- 560 089 (Karnataka)	Coordinator
21.	Dr. AK saxena Sr. Scientist, Dept. of Plant Pathology Indian Institute of Horticultural Research	Add. Coordinator

Cont...

22.	Dr. VI Benagi Prof. and Head, De pt. Plant Pathology University of Agricultural Sciences Yettingudda Campus, Krishi Nagar Dharwad – 580 005 (Karnataka)	Coordinator
23.	Dr. MR Ravikumar Associate Prof. of Plant Pathology KVK Building, Banvasi Road Sirsi, Uttar Kannada Karnataka	Add. Coord inator
24.	Dr. K Subramanyam Sr. Scientist (Plant Pathology) Hortl.. Res. Station (APHU) DCMS Buildings, Kamala Nagar Ananatpur (AP) – 515 001	Coordinator

Network Project on Mitigating the Bacterial Blight Disease of Pomegranate in Maharashtra, Karnataka and Andhra Pradesh

(Funded by Ministry of Agriculture, Government of India)

Progress Report

First Year (2008 - 09)

Date

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Signatures of Project Director Network Project

Name and address

VT Jadhav

Director

National Research Centre on Pomegranate

(Indian Council of Agricultural Research)

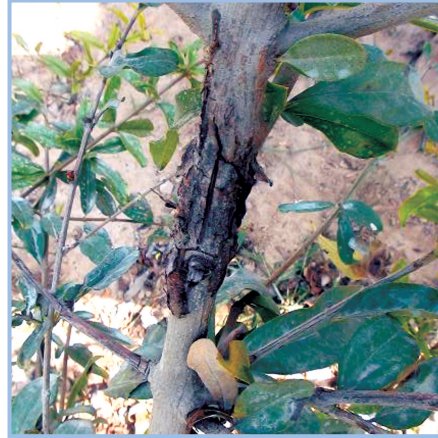
National Highway-9 Bypass Road, Shelgi,

Solapur 413 006 (Maharashtra), India



Bacterial Blight Disease of Pomegranate is Manageable !

*Bacterial blight disease of pomegranate caused by *Xanthomonas axonopodis* pv *punicae*, can be satisfactorily mitigated by following orchard sanitation, clean cultivation, cultural practices and taking recommended spray schedules at proper doses and most important of all switching over to winter season crop (September to March) from rainy season crop (May-October).*



Bacterial blight in Hanumangarh District of Rajasthan, introduced through planting material
A sheer case of negligence and mismanagement



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