

Prevalence of diseases of mandarin orange (*Citrus reticulata*) in hilly region of Darjeeling district and its adjoining areas

A. CHAKRABORTY AND S. K. RAY

Department of Plant Pathology, Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur 741252, Nadia, West Bengal

Survey work (both fixed plot and roving survey) conducted in the hilly areas of Darjeeling district showed that powdery mildew, scab, red rust and sooty mould were present in almost all the locations except extreme winter. Twig blight, gummosis and root rot were recorded mainly during rainy season. No greening and bacterial canker were observed during the survey work.

Key words : Diseases, mandarin orange, Darjeeling district

INTRODUCTION

Mandarin or loose skinned orange (*Citrus reticulata* Balnco) occupies first position with respect to area and production in India (Chadha and Singh, 1990) and is adapted to submountaneous tracts with elevation ranging from 600 to 1100 m and rainfall between 500 to 2750 mm. It occupies 71.7 thousand hectares of land with an annual production of 701.9 thousand tons (Ghosh, 1985). Although the occurrence of various diseases has been reported from different locations of Darjeeling district, there is no systematic study on incidence and severity of these disease. Keeping this view in mind, a thorough survey was conducted during three consecutive years i.e. 1994, 1995 and 1996.

MATERIALS AND METHODS

The survey was conducted in two ways, (i) fixed plot survey and (ii) roving survey. To observe the onset of different diseases, the fixed plot survey was conducted at Regional Research Sub-station, Pedong, UBKV (Erstwhile Bidhan Chandra Krishi Viswavidyalaya). For this survey 30 healthy plants of almost uniform age and volume were selected randomly at different tarrace throughout the orchard. In each plant 10 healthy twigs were tagged

to observe the incidence and intensity of the diseases in different months of the year. Observations of different diseases were recorded at fortnight intervals.

For roving survey 13 locations having an altitude ranged from 1650-5900 ft. (approx.) were selected. Age group of the plants varied from 5-40 years. At each location 3 orchards were surveyed. At each orchard 10 plants and in each plant 4 twigs were observed at random. The survey was conducted during June, July and August of three successive years i.e. from 1994 to 1996.

RESULTS AND DISCUSSION

The observations recorded from fixed plot survey are presented in Table 1. The results presented in Table-1 indicate that powdery mildew started appearing from March in few flushes (14.76%) and gradually increased in intensity (14.76 to 28.87%) up to August-September in second flushes and declined thereafter (9.74 to 5.52%) i.e. in the month of October-November. From December to February powdery mildew symptom was not observed. This may be due to severe winter during these months. Scab (7.95 to 25.97), red rust (6.46 to 17.63%) were present throughout the year except extermie winter

Table 1 : Incidence and intensity of different diseases of mandarin orange in different months of the year based on fixed plot survey

Month	% Disease incidence								
	Powdery mildew	Scab	Red rust	Sooty mould	Bacterial canker	Twig blight	Gummosis	Root rot	Greening
April	15.30	10.43	9.70	10.54	—	—	—	—	—
May	18.92	15.09	12.40	11.71	—	—	—	—	—
June	20.69	18.31	15.35	14.16	—	—	—	—	—
July	23.27	20.18	15.41	17.66	—	11.50	15.08	9.50	—
August	26.28	24.49	17.63	19.61	—	18.43	21.81	10.16	—
September	28.87	25.97	14.41	21.62	—	30.25	33.85	15.25	—
October	9.74	22.40	8.40	12.88	—	31.81	14.50	10.00	—
November	5.52	18.16	5.91	9.06	—	21.66	—	—	—
December	—	—	—	7.36	—	—	—	—	—
January	—	—	—	6.15	—	—	—	—	—
February	—	—	—	4.21	—	—	—	—	—
March	14.76	7.95	6.46	7.53	—	—	—	—	—

Data are the average of three years i.e. 1994, 1995 and 1996 ; '—' = Nil.

Table 2 : Incidence and intensity of different diseases of mandarin orange in different locations of Darjeeling district and its adjoining areas

Locations	% Disease incidence						
	Powdery mildew	Scab	Red rust	Sooty mould	Bacterial canker	Twig blight	Gummosis
Singtam	24.26	—	15.68	35.43	—	—	—
Eachhay Basti	26.00	5.95	25.61	34.96	—	5.25	—
Mongpoo	45.13	3.41	18.75	20.65	—	—	—
Legshep	21.90	—	—	34.32	—	—	—
Deeptin	64.78	20.62	25.91	31.23	—	—	—
Sourini	28.27	—	57.91	—	—	—	—
Rampo	15.33	—	—	—	—	—	—
Simley	31.55	—	—	29.20	—	—	—
Mirik	56.27	—	36.75	25.06	—	8.70	—
Dhojia Basti (1)	60.45	—	—	—	—	8.35	—
Dhojia Basti (2)	34.28	—	6.01	24.58	—	6.00	—
Gaiyabari	34.28	—	—	21.15	—	12.78	—
Bhallukhop (Chhotto)	25.63	13.48	5.40	4.30	—	—	—

Data are the average of three years i.e. 1994, 1995 and 1996 ; '—' = Nil.

months i.e. from December to February. Sooty mould was present in varying intensities (4.21 to 21.62%) all throughout the year. No bacterial canker and greening like symptoms were observed during survey. Root rot (9.50 to 15.25%) and gummosis (14.50 to 33.85%) were found from July to October but these diseases were not observed in other months of the year. Symptom of twig blight was first noticed in the month of July and maximum infection (31.81%) was recorded in the month of October. In November the intensity of the disease declined (21.66%) and from December to June the disease symptom was not observed. From these observations, it can be said that root rot, gummosis and twig blight are favoured by warm

and high humid condition that's why they are mostly present from July to October-November.

The observations recorded during roving survey are presented in Table 2. The results presented in Table-2 indicate that powdery mildew was present in all the locations and the intensity varied from 15.33 to 64.78%. About 3.41 to 20.62% scab was recorded in few orchards. Red rust and sooty mould was also present in all the locations except a few and their intensity varied from 5.40 to 57.91% and 4.30 to 35.43% respectively. Bacterial canker and greening were not observed during the survey. Twig blight (5.25 to 12.78%) was found in few locations.

The results of the survey indicate that the incidence and severity of different disease varied in different locations and also in different months of the year, which may be attributed to varying climatic conditions prevailing throughout the year.

ACKNOWLEDGEMENT

The authors express their gratitude to AICRP on

tropical fruits for financial and technical assistance.

REFERENCES

- Chadha, K. L. and Singh, H. P. 1990. Citriculture Scenario in India. In Citriculture in North-Western India – Causes and Control. *PAU, Ludhiana, Tech. Bull.* P. 97.
- Ghosh, S. P. 1985. Citrus. In Fruits in India : Tropical and Subtropical (Bose, T. K. Ed.) Naya Prakash, Calcutta. pp. 162-218.

(Accepted for publication June 24, 2004)