RESEARCH ARTICLE

EXTENSIVE SURVEY AND SURVEILLANCE OF DISEASE OF NAGPUR MANDARIN (*CITRUS RETICULATA* BLANCO) IN CITRUS BUFFER ZONES

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Abstract: The present investigation was carried out to identify and estimate the disease incidence of citrus (*Citrus* spp.) in Citrus buffer zone. The survey was carried out on major diseases like Gummosis, Sooty mold, Twinge blight, Barak eating caterpillar and Zinc deficiency. By following the methodology of per cent Disease Index, the severity of these diseases that cause considerable yield loss and its incidence were recorded from July 2020 to June 2021. Of all the agricultural diseases that threaten citrus crops, Gummosis and Sooty mold are the most devastating. Severe infections of Gummosis can cause defoliation, blemished fruit, premature fruit drop, twig dieback and general tree decline. Sooty mold induces stunting, stem pitting and low bearing of some varieties. Based on the study, Gummosis and Sooty mold has more incidence of about 61.3 per cent and 55.35 per cent, respectively. On comparing the survey period (*i.e.* from July to June) the disease incidence in the month of January is quite high, and it is due to the climatic factors which favors the easier and faster spread of the pathogens.

Keywords: Per cent disease index, Gummosis, Sooty mold, Biotic / Abiotic factors

INTRODUCTION

Citrus (*Citrus* spp.) is a woody, evergreen, perennial plant cultivated for its non-climacteric, unique berry-like fruit (Kader, 1992 and Rieger, 2006). Citrus fruits are extensively grown in India owing to their medicinal and nutritive values so as to form an industry of importance. Although citrus is essentially a crop of the subtropical regions, it is also grown under favourable conditions of temperate regions. The citrus fruits probably rank third among the subtropical fruits of the world. Next to mango and banana, citrus represents the third most important group of fruits in India (Das, 2003).

In India the chief Citrus growing areas are Tamil Nadu, Madhya Pradesh, Punjab, Karnataka, the southern slopes of Cherra punji, hills of Assam, Northern Orissa, Maharashtra and U.P. The acreage under citrus is almost 10 per cent of the total area under fruit trees. Mandarin oranges, sweet oranges and acid limes are grown extensively in India. Citrus may be grown on a variety of soils under several environmental conditions all over the world (Knorr, 1973). Israel, Egypt, Spain, Morocco, USA, India, Algeria, Australia, Mexico, Brazil, and South Africa are chief growing regions of citrus (Timmer *et al*., 1987). USA contributes almost 40 per cent of world production of citrus. Spain is the largest exporter of fresh fruits followed by USA, Israel and Morocco in descending order.

Considering the above facts, the present study has therefore been under taken with the following objectives:

– To identify the major diseases of citrus (*Citrus* spp.) in Citrus buffer Zones.

– To find out the per cent of disease incidence of major diseases of citrus (*Citrus* spp.) in Citrus buffer Zones.

MATERIALS AND METHODS

Survey was conducted in Chhhindwara District of Madhya Pradesh for assessing the per cent of disease incidence of Citrus (*Citrus* spp.) from July 2020 to June 2021. The entire Citrus buffer zone was divided into 2 blocks. It was be made through the random and fled plot (orchard) basis in Sausar and Pandhurna block of Chhindwara district of Madhya Pradesh. The area is known for quality production of Mandarin oranges and percentage of disease incidence was recorded.

Symptoms of the diseases were studied by visual observation. Sometimes hand lens were used for critical observation of the disease and sometimes a disease was identified based on matching the observed symptoms in the infected plants with the symptoms. Besides, the symptoms of the diseases were recorded following the description of Amador, (2002); Ferguson, (2002) and Reddy and Murti, (1990). Identification of all the fungal diseases was finally confirmed by identification of the associated fungal organisms through isolation.

The per cent disease index was worked out as described by Mc Kinney's (1923).

$$\text{Percent plant infection} = \frac{\text{Number of diseased plants}}{\text{Number of total plants observed}} \text{x} 100$$

RESULT

Incidence in Sausar Block

In Roving orchard survey observations were recorded on the incidence of gummosis in mandarin orchards. The data presented in (Table 01) indicate that in village Sausar the highest gummosis incidence (70.58 %) was recorded from the field of Sausar block and lowest incidence (24.32 %) was recorded

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from the field of Pandhrakhedi village. An average incidence was recorded 47.43 %.In Mohgaon (63.00%). Deoli (52 45%) and Kadia (61.76%) gummosis was severe whereas in Mehrakhapa and Kuddam the disease incidence ranged up to 32.00%. The incidence of Sooty Mould in mandarin orchards at villages during the visit at Sausar Block. Village Haveli the highest Sooty mould incidence (52.38 %) was recorded from the field of Sausar block and lowest incidence (17.72 %) was recorded from the field of Kuddam village. An average incidence was recorded (39.10 %).whereas in Bhuma and Jam the disease incidence ranged up to (48.5%). The incidence of Twing blight / winter tip in mandarin orchards at villages during the visit at Sausar Block. Village Haveli the highest Twing blight / winter tip incidence (77.14 %) was recorded from the field of Sausar block and lowest incidence (27.03 %) was recorded from the field of Pandrakhedi village. An average incidence was recorded (43.59 %).whereas in Mehrakhapa and Pandrakhedi the disease incidence ranged up to (27.00%). The incidence of Bark eating caterpillar in mandarin orchards at villages during the visit at Sausar Block. Village Sausar the highest Bark eating caterpillar incidence (70.58 %) was recorded from the field of Sausar block and lowest incidence (24.32 %) was recorded from the field of Pandrakhedi village. An average incidence was recorded (47.43 %).whereas in Mehrakhapa and Kudam the disease incidence ranged up to (32.00%). The incidence of Zinc (Zn) deficiency in mandarin orchards at villages during the visit at Sausar Block. Village Meherakhapa the highest Zinc (Zn)incidence (67.74 %) was recorded from the field of Sausar block and lowest incidence (23.53 %) was recorded from the field of Sausar village. An average incidence was recorded (43.36 %).whereas in Deoli and Kadia the Zinc (Zn) deficiency incidence ranged up to (40.00%). The incidence of *Citrus Nematodes* in mandarin orchards at villages during the visit at Sausar Block. Village sausar the highest *Citrus Nematodes* incidence (14.1 %) was recorded from the field of Sausar block and lowest incidence (1.82 %) was recorded from the field of jam village. An average incidence was recorded (8.24 %).whereas in Mohgaon and Bhumma the *Citrus Nematodes* incidence ranged up to (6.5 %).

Incidence in Pandurna Block

In Roving orchard survey observations were recorded on the incidence of gummosis in mandarin orchards at villages during the visit at Pandurna Block.The data presented in (Table 02) indicate that in village Pardi the highest gummosis incidence (66.03 %) was recorded followed by (61.90 %) in seoni and (51.00%) in Rajaripipla from the field of pandurna block and lowest incidence (18.46 %) was recorded from the field of Garhkhapa village. An average incidence was recorded 41.63 %.The incidence of gummosis disease was (47. 43%) in Sausar block as compared to (41.63%) in Pandhurna out of 20 villages the disease was minimum in Garhkhapa and Rajna (18%).The incidence of Sooty mold in mandarin orchards at villages during the visit at Pandurna Block. Village Rajaripipla the highest Sooty mould incidence (50.00 %) was recorded followed by (35.88 %) in Garhkhapa and (35.44 %) in Sawajpani from the field of pandurna block and lowest incidence (15.17 %) was recorded from the field of Ridhora village. An average incidence was recorded (31.07 %).The incidence of Sooty mould disease was (39.10 %) in Sausar block as compared to (31.07 %) in Pandhurna out of 20 villages the disease was minimum in Ridhora. The incidence of Twing blight / winter tip in mandarin orchards at villages during the visit at Pandurna Block. Village Rajaripipla the highest Twing blight / winter tipincidence (43.18 %) was recorded followed by (39.62 %) in Pardi and (37.97 %) in Sawajpani from the field of pandurna block and lowest incidence (10.26 %) was recorded from the field of Garhkhapa village. An average incidence was recorded (30.72 %).The incidence of Twing blight / winter tip disease was (43.59 %) in Sausar block as compared to (30.72 %) in Pandhurna out of 20 villages the disease was minimum in Ridhora.The incidence of Bark eating caterpillar in mandarin orchards at villages during the visit at Pandurna Block. Village Pardi the highest Bark eating caterpillarincidence (66.03 %) was recorded followed by (61.90 %) in Seoni and (51.00 %) in Rajaripipla from the field of pandurna block and lowest incidence (18.46 %) was recorded from the field of Garhkhapa village. An average incidence was recorded (41.63 %).The incidence of Bark eating caterpillarwas (47.43 %) in Sausar block as compared to (41.63 %) in Pandhurna out of 20 villages the disease was minimum in Garhkhapa and Rajna.The incidence of Zinc (Zn) deficiency in mandarin orchards at villages during the visit at Pandurna Block. Village Rajna the highest Zinc (Zn) deficiencyincidence (68.05 %) was recorded followed by (57.55 %) in pardi and (49.37 %) in Sawajpani from the field of pandurna block and lowest incidence (15.45 %) was recorded from the field of Rajaripipla village. An average incidence was recorded (40.39 %).The incidence of Zinc (Zn) deficiency was (43.36 %) in Sausar block as compared to (40.39 %) in Pandhurna out of 20 villages the Zinc (Zn)deficiency was minimum in Rajaripipla. The incidence of *Citrus Nematodes* in mandarin orchards at villages during the visit at Pandurna Block. Village Bhuli the highest *Citrus Nematodes*incidence (13.1 %) was recorded followed by (11.00 %) in Redhhora , (10.3 %) in Garhkhapa and (10.00 %) in Rajaripipla from the field of pandurna block and lowest incidence (2.53 %) was recorded from the field of Sawajpani village. An average incidence was recorded (7.43 %).The incidence of *Citrus Nematodes* was (43.36 %).

SUMMERY AND CONCLUSION

Based on the survey which was conducted regarding the diseases of citrus (*Citrus* spp.) the disease incidence of Gummosis / Sooty mold is more when compared to the other diseases and this is due to the climate conditions where temperature is low and the humidity is high and the rain is frequent. Thus current study coincides with the research work done by Whiteside, 1988 regarding the citrus diseases, where the Gummosis / sooty mold is more predominant in their area (Chhindwara District of Madhya Pradesh).

Table 1. Incidence of Diseases on the Nagpur Mandarin in the orchards of Sausar & Pandurna Block

Name of Village	Percent plant infection (PDI)					
	Gumossis	Twing Blight	Sooty Mold	Citrus Nematode	Barak eating Caterpillar	Zinc Deficiency
Sausar	70.58	70.59	58.82	14.1	70.58	23.53
Mohgaon	63.00	45.93	54.88	6.1	63.00	41.87
Bhumma	48.78	43.90	48.77	6.71	48.78	43.90
Deoli	52.45	30.74	28.69	11.1	52.45	40.16
Pandrakhedi	24.32	27.03	22.70	4.86	24.32	49.73
Kadia	61.76	49.41	36.47	8.82	61.76	40.59
Meherakhapa	32.25	27.09	21.29	10.3	32.25	67.74
Kuddam	32.91	20.25	17.72	5.7	32.91	26.58
Jam	45.45	29.09	49.08	1.82	45.45	60.00
Haveli	42.85	77.14	52.38	12.9	42.85	51.13

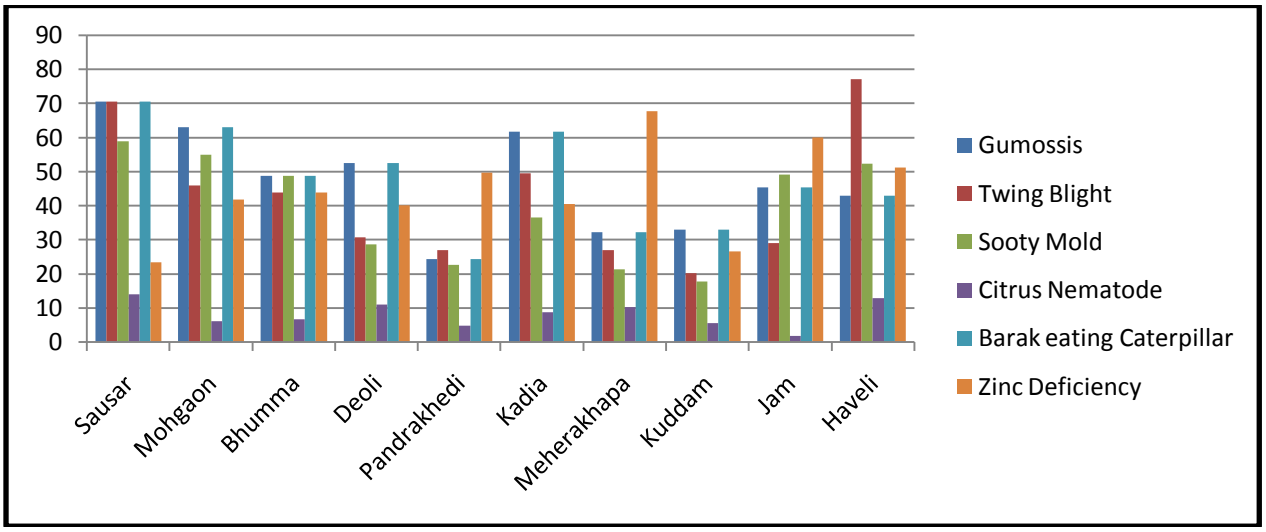
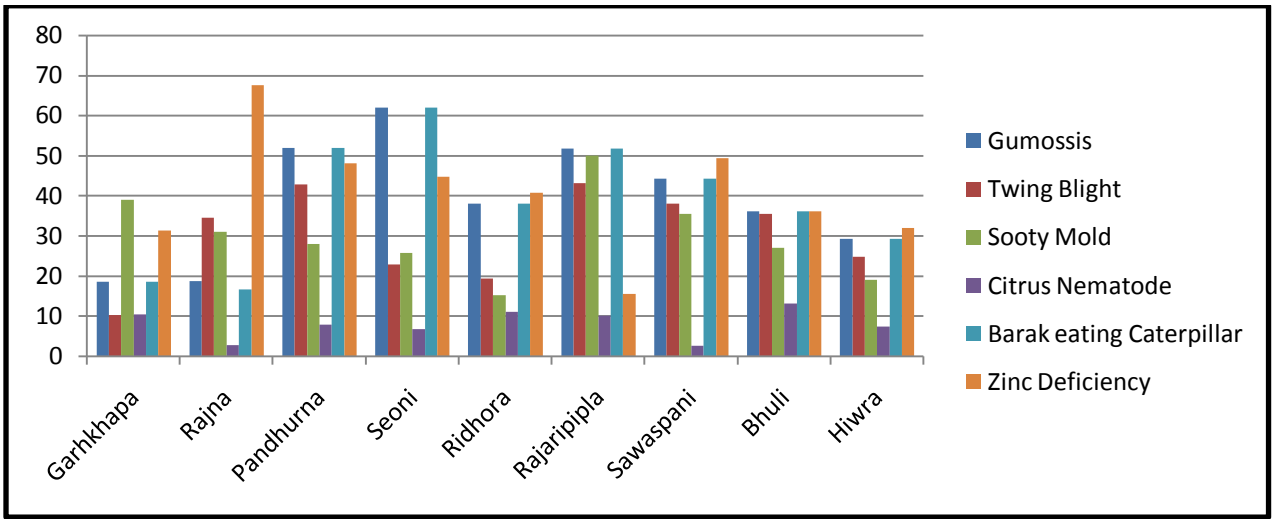


Table 2. Incidence of Diseases on the Nagpur Mandarin in the orchards of Pandurna Block

Name of Village	Percent plant infection (PDI)					
	Gumossis	Twing Blight	Sooty Mold	Citrus Nematode	Barak eating Caterpillar	Zinc Deficiency
Garhkhapa	18.46	10.26	38.89	10.3	18.46	31.28
Rajna	18.62	34.45	31.03	2.76	16.62	67.58
Pandhurna	51.94	42.86	27.92	7.79	51.94	48.05
Seoni	61.90	22.86	25.71	6.73	61.90	44.75
Ridhora	37.93	19.31	15.17	11.0	37.93	40.69
Rajaripipla	51.81	43.18	50.00	10.0	51.81	15.45
Sawaspani	44.30	37.97	35.44	2.53	44.30	49.37
Bhuli	36.15	35.38	26.92	13.1	36.15	36.15
Hiwra	29.19	24.82	18.98	7.3	29.19	31.96
Padrdi	66.03	39.62	32.07	2.83	66.03	57.55



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