



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2020; 8(1): 1795-1799

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Received: 28-11-2019

Accepted: 30-12-2019

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Survey on black spot of papaya in major papaya growing areas of Southern Karnataka

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DOI: <https://doi.org/10.22271/chemi.2020.v8.i1z.8527>

Abstract

Papaya is affected by several diseases like, foot rot, anthracnose, powdery mildew, black spot, brown spot, papaya ring spot, mosaic and leaf curl diseases. Among them black spot disease caused by *Asperisporium caricae* is emerging as an important one in limiting papaya production. A random survey was conducted during September to November months of 2018 in Southern Karnataka for the severity of black spot of papaya caused by *Asperisporium caricae*. Among the different districts surveyed viz., Mandya, Ramanagar, Mysore, Hassan and Chamrajnagar, the per cent disease index (PDI) was ranged from 7.86-38.00 per cent on leaves and 0.00-24.97 per cent on fruits. Highest PDI was recorded in Ramanagar district at Kanakapura taluk on leaves 35 per cent and on fruits 22 per cent. Lowest PDI was recorded in Chamrajnagara district at Yelandur taluk on leaves 7.86 per cent and on fruits 0.71 per cent.

Keywords: Survey, per cent disease index, field key, papaya

Introduction

Papaya (*Carica papaya* L.) is very popular and a vital lozenge fruit of tropical and subtropical countries which grows up to 1,000 m above mean sea level. Papaya belongs to the family *Caricaceae* and it is native to Mexico and Central America (Aravindia *et al.*, 2013) [2]. The fruit is not just delicious and healthy, but whole plant parts like fruits, roots, bark, peel, seeds and pulp are also known to have a good medicinal property. The many benefits of papaya owe due to a good source of ascorbic acid, carotene, riboflavin (Saran and Choudhary, 2013) [3]. The major papaya producing countries in the world are India, Brazil, Indonesia, Nigeria, Mexico, Philippines and Thailand. In India, papaya is grown over an area of about 136,000 hectares, with annual production of 6,108,000 MT and a number that has been continuously increasing over the last few years. In Karnataka, it is grown over an area of about 7700 hectares with the annual production of 5, 27,860 MT and average productivity is 68.55 MT ha⁻¹. India stands first in the production followed by Brazil and Indonesia. Major papaya growing States in India are Gujarat, Andhra Pradesh, Karnataka, Madhya Pradesh and Tamil Nadu. Karnataka stands third in the production (Anonymous, 2017) [1].

Of the biotic constraints low yield of papaya is mainly attributed to the prevalence of several diseases like, foot rot, anthracnose, powdery mildew, black spot, brown spot, papaya ring spot, mosaic and leaf curl diseases. Among them the emerging diseases in papaya is black spot disease caused by *Asperisporium caricae* is highly lethal which affects both leaves and fruits. Leaf spots are visible on both dorsal and ventral surfaces as black, circular or sometimes angular of 1-4mm in diameter, with yellow halo margins. Sometimes these lesions or spots are enclosed by dark blackish masses of fungal spores usually on the lower surface of the leaf. On the fruits, the presence of round spots of watery aspect was observed initially, later the lesions became brown and that may attain up to 5mm of diameter. The spots on the fruits are epidermal and do not reach the pulp of the fruit, causing only a hardening of the skin of the part affected which reduces the market value of the produce (Ventura, 2008) [5].

Though there is a large area under papaya cultivation in Karnataka, the productivity levels are low because of black spot infection. Although, the crop has been suffering a lot due to black spot disease, a limited work has been done on this aspect in Karnataka and less information is available about the disease and management strategies against it. Hence, the present study was conducted to survey the severity of disease in southern Karnataka.

Material and methods**Selection of papaya plants**

A roving survey was made from September – November 2018. The seven to nine-month-old papaya fields were identified and selected for observation in Mandya, Chamarajnagar, Mysore, Ramanagaram and Hassan districts of Karnataka state. Further, the farmers of selected locations were requested and informed not to apply any plant protection measures before the observations.

Calculation of Per cent Disease Index (PDI)

In each identified location, the survey plot area was divided in to four quadrants. In each quadrant 20 plants were selected diagonally for observation. The disease severity was recorded and later the per cent disease severity in each location was converted to 0 to 5 scale. Per cent disease severity was recorded by using field key 0-5 scale (Table 1, Plate 1 & 2) on foliage and fruits these scales were converted to per cent disease index (PDI) using the formula given by Wheeler (1969) [6].

$$\text{PDI} = \frac{\text{Sum of individual disease ratings}}{\text{No. of observations assessed} \times \text{Maximum disease rating}} \times 100$$

Table 1: Disease scoring scale for papaya black spot disease caused by *Asperisporium caricae*

Score	Description
0	No leaves or fruits showing any symptoms
1	1% or less leaves or fruits exhibiting symptom
2	1-10% of leaves or fruits exhibiting symptoms
3	11-20% of leaves or fruits exhibiting symptoms
4	21-50% of leaves or fruits exhibiting symptoms
5	> 51% of leaves or fruits exhibiting symptoms

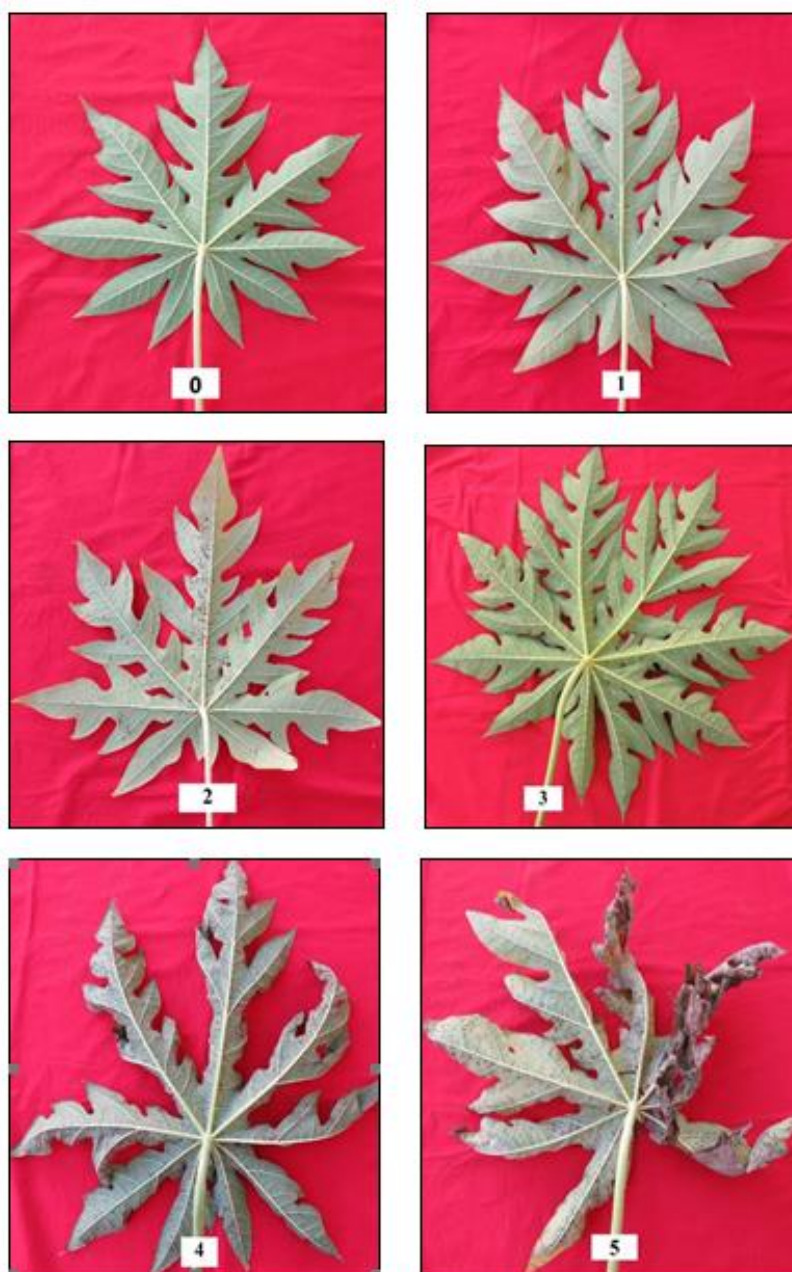


Plate 1: Field key for scoring papaya black spot disease on foliage (0-5 scale)

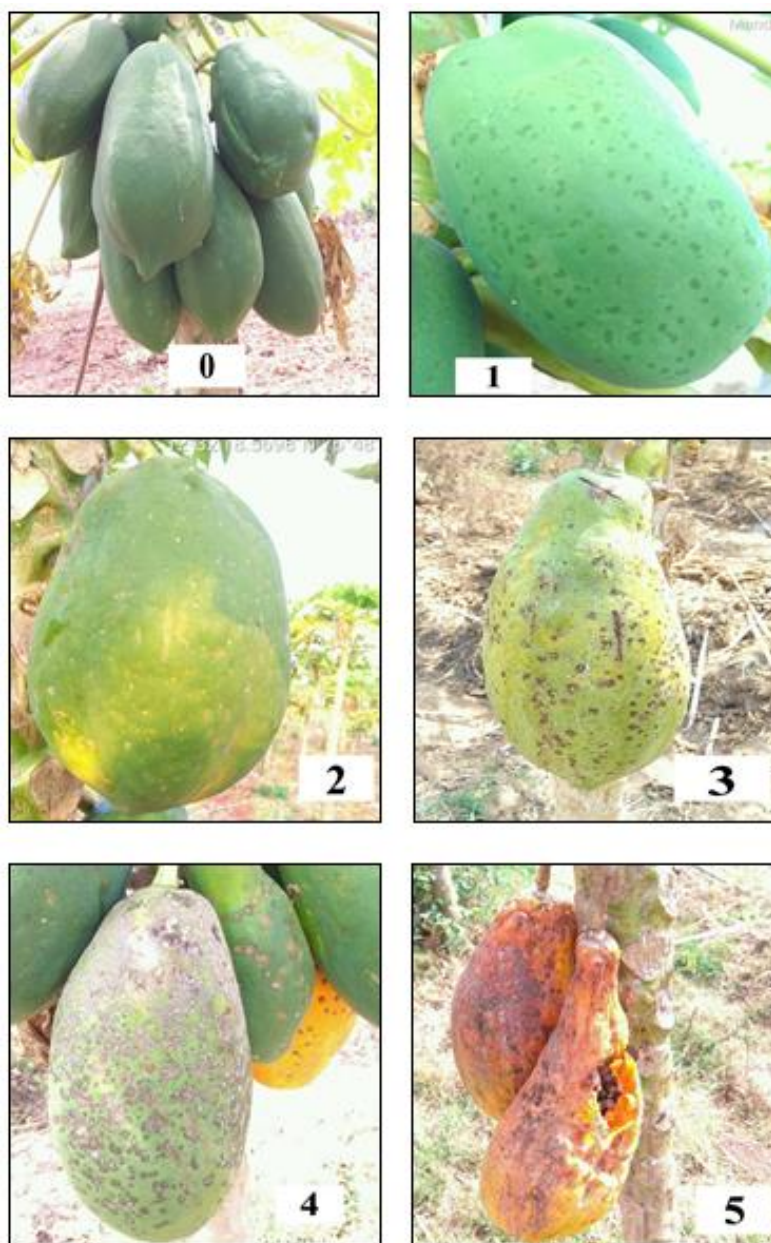


Plate 2: Field key for scoring papaya black spot disease on fruits (0-5 scale)

Results and discussion

The taluk wise disease severity was calculated by using 0-5 scale and these scales were converted to per cent disease index (PDI). The general disease symptoms of the infected plant in the field during the survey were recognized by the presence of black circular or angular spots on the leaves and fruits of papaya plant.

The results revealed that, the papaya black spot disease was prevalent in all the taluks of Mandya, Ramanagar, Mysore, Hassan and Chamrajnagar districts and the taluk wise disease severity on leaves and fruits was ranged from 0-38 and 0-24.57 per cent respectively. In Ramanagar district, the PDI was ranged from 26.66-35.00 and 11.50-22 per cent on leaves and fruits respectively. The highest PDI of 35 and 22 per cent was recorded on leaves and fruits respectively at Kanakpura taluk. 32.75 and 16.25 per cent PDI was observed on the leaves and fruits respectively at Ramanagar. The least PDI was recorded in Channapatna taluk of about 26.66 per cent on leaves and 11.50 per cent on fruits respectively.

In Mandya district, the PDI was ranged from 13.33- 38.00 and 3.33-21.00 per cent on leaves and fruits respectively and the maximum PDI was recorded in Mandya taluk with 38 and on

leaves and 21 per cent on fruits followed by Nagmangla taluk which accounted for 32 per cent on leaves and 11 per cent on fruits. Maddur taluk recorded 29.15 and 10.82 per cent on leaves and fruits respectively and K. R. Pet taluk recorded 32.00 per cent on leaves and 10 per cent on fruits. The lowest PDI of 13.33 per cent on leaves and 3.33 per cent on fruits was observed in Srirangapatna taluk.

In Mysore district, the PDI ranged from 11.40 – 35.75 per cent on leaves and 3.20-24.97 per cent on fruits. The highest PDI was observed at Bannur taluk with 35.75 and 24.97 per cent on leaves and fruits respectively, whereas Mysore taluk accounted for 23.89 on leaves and 8.89 per cent on fruits respectively. Nanjangud taluk recorded 19.16 and 5.22 per cent on leaves and fruits respectively. The lowest PDI of 11.40 and 3.20 per cent on leaves and fruits respectively was recorded at T. Narasipura taluk.

In Hassan district of Channaraypatna taluk, the PDI was 21.38-and 9.17 per cent on leaves and fruits respectively. In Chamarajanagar district, the PDI ranged from 7.86-23.11 and 0.00-7.23 per cent on leaves and fruits respectively. The maximum PDI of 7.23 per cent and 23.11 per cent was recorded on fruits and leaves respectively at Chamarajanagar

taluk followed by Kollegala taluk accounted 5 per cent on fruits and 12.40 on leaves, Hanur taluk recorded 11.27 and 4 per cent on leaves and fruits respectively, at Gundlupet taluk 10 and 0 PDI was recorded on leaves and fruits respectively.

The lowest PDI of 7.86 and 0.71 per cent was recorded at Yelandur taluk on leaves and fruits respectively (Table 2 and Fig. 1).

Table 2: Severity of black spot of Papaya caused by *A. caricae* in major papaya growing areas of southern Karnataka during 2018-19

Districts	Taluka	Average PDI (%) on leaves	Average PDI (%) on fruits
Ramanagara	Ramanagara	32.75	16.25
	Channapatna	26.66	11.50
	Kanakapura	35.00	22.00
District mean		31.47	16.58
Mandya	Mandya	38.00	21.00
	Maddur	29.15	10.82
	K. R. Pet	32.00	10.00
	Nagamangla	32.00	11.00
	Srirangapatna	13.33	3.33
District mean		28.89	11.23
Mysore	Mysore	23.89	8.89
	T. Narasipura	11.40	3.20
	Bannur	35.75	24.97
	Nanjangudu	19.16	5.22
District mean		22.55	10.57
Hassan	Channarayapatna	21.38	9.17
District mean		21.38	9.17
Chamarajanagara	Chamarajanagara	23.11	7.23
	Kollegala	12.40	5.00
	Yelandur	7.86	0.71
	Hanur	11.27	4.00
	Gundlupet	10.00	0.00
District mean		12.92	3.39

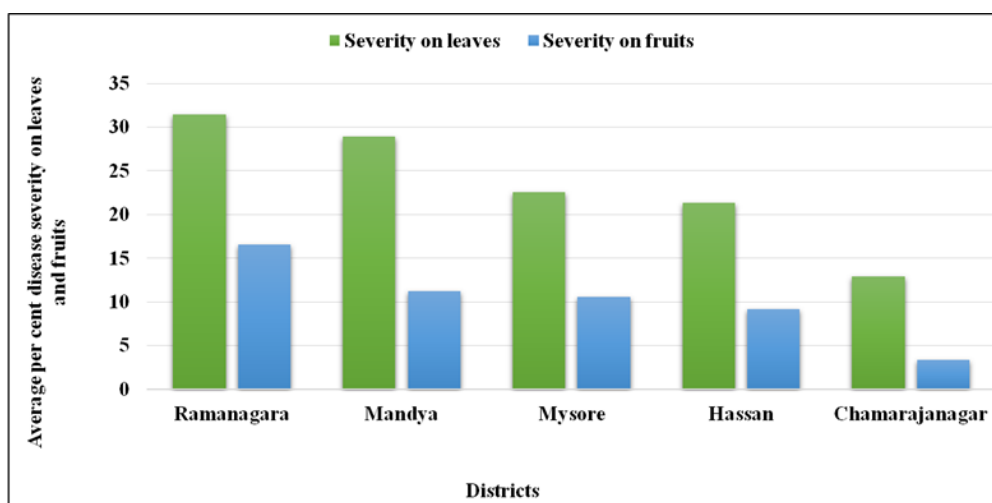


Fig 1: Disease severity of papaya blackspot disease caused by *A. caricae* recorded in different districts of Southern Karnataka

Among the five districts surveyed, the highest PDI of 31.47 and 16.58 per cent was recorded on leaves and fruits respectively in Ramanagar district followed by 11.23 and 28.8 per cent in Mandya district on fruits and leaves respectively, 22.55 and 10.57 per cent was recorded on leaves and fruits respectively in Mysore district and 21.38 and 9.17 per cent was recorded on leaves and fruits respectively in Hassan district. The least PDI of 12.92 per cent on leaves and 3.39 per cent on fruits respectively were recorded in Chamarajanagar district. Further it was observed that the most popular varieties Red lady, Solo and some local varieties were most affected. The Red lady variety which is majorly grown in Mandya, Mysore and Ramanagara district was severally affected by the black spot disease. The disease was completely absent in Agara village of Chamarajanagar district and also severity of disease on fruits was nil in many villages of different districts surveyed. Similar results were recorded

by Shantamma (2012) [4] wherein she reported that the PDI ranged from 41.33 to 69.5 per cent and 18.33 to 36.33 per cent on leaves and fruits respectively in different papaya growing areas of Mandya, Bengaluru rural and urban and Mysore districts.

Conclusion

The intensity of occurrence of disease vary between varieties, might be due to its genetical factors and climatic factors prevailing in that area which is evident by highest disease severity noticed at Ramanagara taluk due to occurrence of high humidity compared to other locations.

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