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Assessment of severity of bottle gourd anthracnose in Konkan region of Maharashtra

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Abstract

The anthracnose of bottle gourd incited by *Colletotrichum lagenarium* (Syn. *C. orbiculare* Berk. & Mont.) Arx is emerging as a major disease of bottle gourd in Konkan region. The genus *Colletotrichum* has a mainly tropical and sub-tropical distribution, although there are high profile species affecting temperate crops also. As a plant pathogen, the members of the genus *Colletotrichum* causes anthracnose of many fruit and vegetable crops. *C. lagenarium* the anthracnose fungus can survive on seed, wild cucurbitaceous hosts and plant remains which serve as sources of primary inoculum. Spores are dispersed from diseased leaves by splashing rains and overhead irrigation. Spore production, germination and infection are favoured by high relative humidity and water film on leaf surfaces. The pathogen is seed borne in nature but its spread largely depends upon the environmental factors. The disease appeared in the form minute, irregular yellow spots on leaves. These spots enlarged into brown necrotic lesions surrounded by yellow halo. A roving survey was conducted to record the severity of anthracnose of bottle gourd in both Kharif and Rabi season in four districts of Konkan. Amongst all the four districts, the highest mean disease intensity (55.56%) was observed in Dapoli followed by Mandangad (40.59%) from Ratnagiri district.

Keywords: Bottle gourd, anthracnose, survey, *Colletotrichum*, Konkan

Introduction

Bottle gourd [*Lagenaria siceraria* (Mol.) Standal.], belonging to family Cucurbitaceae is fruit vegetable. The crop is considered to be a native of tropical Africa. Its cultivation dates back to at least 4000 years by the Egyptians. It is one of the chief culinary vegetables in many tropical and temperate regions around the world. Bottle gourd is also known as calabash, white flowered gourd, long melon, New Guinea bean and Tasmania bean in different parts of world. It is called as *doodhi*, *ghiya* or *lauki* in India. *L. siceraria* is cultivated in India, Japan, Sri Lanka, China and Thailand for its kitchen use.

Bottle gourd is grown throughout the year, but it cannot tolerate high cold and frost. It is highly sensitive to photoperiod. It requires minimum 18° C temperature for seed germination and 20-30° C for growth and development (Rai and Yadav, 2005) [10].

Major bottle gourd growing states of India are Bihar, U.P., Haryana, Madhya Pradesh, Chhattisgarh, Orissa and Punjab. In India about 153 thousand ha area is under the cultivation of bottle gourd with an annual production of 2529 thousand MT and productivity of 16.52 tons per ha. Production wise, Bihar is the leading state (631.60 thousand tonnes) with a share of 25.70 per cent followed by Uttar Pradesh and Haryana (Anonymous, 2018) [1].

In Konkan region this crop is basically grown on large scale in Raigad and Thane districts. Bottle gourd is one of the kitchen garden crops in Ratnagiri district.

The crop succumbs to various diseases reported from different areas all over the world viz., Powdery mildew, Downy mildew, Anthracnose, Gummy stem blight, *Cercospora* leaf spot, *Alternaria* leaf blight, Scab, *Septoria* leaf spot, *Verticillium* wilt, Root rot, fruit and crown rot, *Myrothecium* leaf spot, bacterial leaf spot, Cucumber mosaic, Squash mosaic and watermelon mosaic. The severe incidence of *Colletotrichum lagenarium* results in reducing the photosynthetic area up to 29–42% leading to premature plant death consequently resulting in yield losses of about 6–48% (Chen and Dai, 2012) [3]. This pathogen causes heavy losses in bittergourd, both in *Kharif* and *Rabi* seasons in Konkan region (Potphode, 2011) [9].

Initially the anthracnose generally appears on leaves as small circular to irregular yellow spots. These spots later enlarge and get transformed in to brown or black necrotic patches. Water-soaked, circular lesions later turning into sunken black spots are observed on fruits. These spots later coalesce and cover larger area on fruits.

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Old lesions turn brown to black and get covered with pink spore masses, especially in moist weather (Gupta *et al.* 2009) [5].

Spore-bearing structures (acervuli) break through the host surface and produce tremendous numbers of one-celled, hyaline spores (conidia) which exude from the acervuli in moist weather.

This disease was first recorded by Gardner (1918) [4] from USA. In India the disease was reported by Mundkur (1937) on bottle gourd and cucumber. The pathogen is known to affect the leaves as well as the fruit, thus causing losses.

This disease was also recorded as one of the important diseases of bottle gourd in *Konkan* region of Maharashtra (Shinde, 1993) [11]. Hot and humid climate of the *Konkan* region is highly congenial for disease development. As the bottle gourd crop is commercially cultivated in North *Konkan* region for local and metropolitan markets, it is necessary to assess the severity of the disease in order to reduce the qualitative and quantitative losses in strategic manner.

Materials and Method

A roving survey was conducted during *Kharif* and *Rabi*, 2018-19 in bottle gourd growing pockets of Ratnagiri, Raigad, Thane and Palghar districts of *Konkan* region. Four tahsils were surveyed from Ratnagiri district including Dapoli, Khed, Mandangad and Guhagar. Two villages from all the tahsil were selected to record the severity of anthracnose. Five tahsils were surveyed from Raigad district including Mahad (Mahad, Dasgaon), Roha (Kolad, Nagothane), Alibaug (Rule, Pavele), Pali (Pali, Parali) and Panvel (Ajivali, Palaspe). Village Atgaon and Asangaon from Shahapur were surveyed which belonged to Thane district. Kelave and Mahim from Palghar district were surveyed.

Visual observations were recorded by random selection of five plants from plant population under natural conditions and the per cent disease intensity was calculated.

The anthracnose was recorded by following 0-4 scale given by Chauhan (2002) [12].

Scale

Category	Description
0	No spots on leaves or fruits
1	1-10 spots/ leaf or fruit
2	11-20 spots/ leaf or fruit
3	21-50 spots/ leaf or fruit
4	More than 50 spots/ leaf or fruit

Per cent Disease Index (PDI) was calculated using formula given by Wheeler (1969) [12].

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

Results and Discussion

Bottle gourd is one of the chief culinary vegetables in many tropical and temperate regions of the world. It is available round the year for consumption. In India its juice is consumed by the health conscious people. In *Konkan* region in addition to downy and powdery mildew, the crop is susceptible to anthracnose disease. The genus *Colletotrichum* is devastating as it has biotrophic, hemibiotrophic, necrotrophic, endophytic and quiescent lifestyles.

It is revealed from the results presented in Table 1 that during

Kharif season in Ratnagiri District, the highest intensity of bottle gourd anthracnose (60.38%) was recorded in Pangari village followed by Wakavali (55.32%) in Dapoli tahasil at 65 days after sowing. While the lowest intensity, was observed in Talavali (28.36%) and Guhagar (30.54%) villages in Guhagar tahsil. In Mandangad and Khed tahsils of this district, the mean disease intensity at two locations was 48.91 and 44.86 per cent, respectively. In Raigad district, the highest intensity of bottle gourd anthracnose (45.36%) was recorded in Palaspe village in Panvel tahasil while the lowest (11.36%) was observed in Rule in Alibaug tahasil at 45 DAS. In Thane district, the highest intensity (25.36%) was recorded in Atgaon village at 45 DAS and the lowest (22.35%) was recorded in Asangaon village in Shahapur tahasil at 50 DAS. In Palghar district, the highest intensity (48.35%) was recorded in Mahim village at 55 DAS and the lowest (45.35%) was recorded in Kelave village at 50 DAS in Palghar tahasil. The mean disease intensity at all locations in *kharif* season ranged between 11.36 to 60.38 per cent.

The data from Table 2 depict the disease intensity in *Rabi* season. In this season also, in Ratnagiri district, Pangari (54.31%) and Wakawali (52.25%) recorded more than 50 per cent disease intensity. The lowest intensity was observed in Shiravali (25.07%) from Khed. Mandangad and Guhagar recorded mean disease intensity to the tune of 32.27 per cent and 28.10 per cent respectively. In Raigad district, maximum intensity (40.64%) was recorded from Pali followed by Kolad (40.11%) in Roha tahsil. The lowest (10.89%) was recorded from Rule in Alibaug. In Thane district, 23.57 per cent intensity was recorded from Atgaon; while it was 20.38 per cent at Asangaon in Shahapur tahasil. In Palghar district, the maximum intensity (35%) was recorded from Kelave while in Mahim it was 32.34 per cent. The mean disease intensity at all locations in *Rabi* season ranged between 10.89 to 54.31 per cent.

The data presented in Table 3 illustrates that among the four districts the highest mean disease intensity (55.56%) was observed in Dapoli followed by Mandangad (40.59%) from Ratnagiri district. Palghar recorded 40.26 per cent followed by Mahad (39.72%) in Raigad district. Alibaug tahsil recorded least (13.77%) disease intensity followed by Shahapur (22.91%). This indicates that *Kharif* season conditions were conducive for development and spread of the disease. Studies conducted by Potphode (2011) [9] revealed that highest intensity (55.86%) of bitter gourd anthracnose was recorded in Pen followed by Roha (51.80%) from Raigad district whereas Bhiwandi from Thane district recorded an intensity of 44.75 per cent. The results of present study are in agreement with those of Potphode (2011) [9] in respect to maximum disease intensity of anthracnose of cucurbitaceous crops. Least disease intensity (27.83%) was recorded in Shahapur tahsil which was similar to the present work. During the survey it was noticed that cucurbits are highly remunerative crops in Raigad and Thane districts. Therefore even small and marginal farmers cultivate them in fields acquired on lease basis. Obviously the crop with maximum economic returns is cultivated in successive crop seasons. This intensive cultivation eventually leads to increase in pathogen inoculum in a particular field/area. The higher disease intensity may also be due to the use of infected seed and mono cropping. The disease intensity was higher in *Kharif* season than *Rabi*. This is probably due easy dissemination of pathogen propagules through rain splashes. These results are in confirmation with the findings of

Potphode (2011)^[9], Narmadhavathy *et al.* (2016) from Kerala reported that the disease intensity of musk melon anthracnose was up to 70 per cent. Chauhan (2002)^[2] and Kumar (2017)^[7] reported that the disease intensity of bottle gourd anthracnose

in Ambala district of Harayana was more than 75 per cent. The maximum (100%) was noticed by Kim *et al.* (2015)^[6] on bitter gourd leaves.

Table 1: Survey of anthracnose of bottle gourd to record its severity in Konkan region during *Kharif*, 2018.

No.	District	Taluka	Village	Stage of crop (DAS)	PDI (%)
1.	Ratnagiri	Dapoli	Wakavali	65	55.32
			Pangari	65	60.38
			Mean		57.85
		Khed	Shiravali	80	42.36
			Sakhroli	65	47.37
			Mean		44.86
		Mandangad	Adkhal	65	47.36
			Shipole	60	50.47
			Mean		48.91
		Guhagar	Guhagar	50	30.54
			Talavali	45	28.36
			Mean		29.45
2.	Raigad	Mahad	Mahad	55	42.35
			Dasgaon	45	38.95
			Mean		40.65
		Roha	Kolad	50	31.25
			Nagothane	45	36.54
			Mean		33.89
		Alibaug	Pavele	60	17.38
			Rule	45	11.36
			Mean		14.37
		Pali	Pali	60	35.64
			Parali	65	22.47
			Mean		29.05
Panvel	Ajivali	50	34.17		
	Palaspe	50	45.36		
	Mean		39.76		
3.	Thane	Shahapur	Atgaon	45	25.36
			Asangaon	50	22.35
			Mean		23.85
4.	Palghar	Palghar	Kelave	45	45.35
			Mahim	55	48.35
			Mean		46.85

Table 2: Survey of anthracnose of bottle gourd to record its severity in Konkan region during *Rabi*, 2018-19.

No.	District	Taluka	Village	Stage of crop (DAS)	PDI (%)
1.	Ratnagiri	Dapoli	Wakavali	55	52.25
			Pangari	55	54.31
			Mean		53.28
		Khed	Shiravali	55	25.07
			Sakhroli	60	29.34
			Mean		27.02
		Mandangad	Adkhal	65	30.47
			Shipole	60	34.07
			Mean		32.27
		Guhagar	Guhagar	55	28.34
			Talavali	45	27.87
			Mean		28.10
2.	Raigad	Mahad	Mahad	50	40.34
			Dasgaon	45	37.25
			Mean		38.79
		Roha	Kolad	50	40.11
			Nagothane	45	36.54
			Mean		38.32
		Alibaug	Pavele	60	15.46
			Rule	45	10.89
			Mean		13.17
		Pali	Pali	45	40.64
			Parali	45	25.36
			Mean		33.00

		Panvel	Ajivali	50	23.54
			Palaspe	50	26.34
				Mean	24.94
3.	Thane	Shahapur	Atgaon	45	23.57
			Asangaon	50	20.38
				Mean	21.97
4.	Palghar	Palghar	Kelave	65	35.00
			Mahim	60	32.34
				Mean	33.67

Table 3: Cumulative Disease Intensity of bottle gourd anthracnose in Ratnagiri, Raigad, Thane and Palghar districts.

No.	District	Taluka	PDI (%)		
			Kharif	Rabi	Average
1.	Ratnagiri	Dapoli	57.85	53.28	55.56
		Khed	44.86	27.02	35.94
		Mandangad	48.91	32.27	40.59
		Guhagar	29.45	28.10	28.77
2.	Raigad	Mahad	40.65	38.79	39.72
		Roha	33.89	38.32	36.10
		Alibaug	14.37	13.17	13.77
		Pali	29.05	33.00	31.02
		Panvel	39.76	29.94	34.85
3.	Thane	Shahapur	23.85	21.97	22.91
4.	Palghar	Palghar	46.85	33.67	40.26
Grand Mean			41.67	31.77	34.49

Conclusion

Anthracnose of bottle gourd incited by *Colletotrichum lagenarium* (Syn. *C. orbiculare*) is emerging as a major disease of bottle gourd in Konkan Region. The intensity of this disease is more in Kharif season owing to high humidity accompanied by wind currents which enable quick dissemination of infective propagules. A roving survey was carried out in Konkan region to record the severity of bottle gourd anthracnose. The mean disease intensity at all locations in kharif season 2018-19 ranged between 11.36 to 60.38 per cent. The mean disease intensity at all locations in rabi season ranged between 10.89 to 54.31 per cent. Among the four districts the highest mean disease intensity (55.56%) was observed in Dapoli followed by Mandangad (40.59%) in Ratnagiri district. Palghar recorded 40.26 per cent followed by Mahad (39.72%) in Raigad district. Alibaug tahsil recorded the least (13.77%) disease intensity followed by Shahapur (22.91%).

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