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## Studying the incidence and distribution of the grape powdery mildew disease in Maharashtra state's primary grape-growing regions

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### Abstract

The Grapes powdery mildew disease was found prevalent during 2020-21 and 2021-22 in all five districts Nashik, Ahmednagar, Pune, Solapur, and Sangli, of Western Maharashtra's According to the survey data of the vineyards in these areas, the severity of the disease showed a nearly consistent pattern across the different surveyed districts. In Sangli district the highest disease severity was noticed 35.08% followed by Solapur 34.55%. Nashik district has the lowest disease severity upto 19.05%. In this Nashik district, the village of Khedgaon (15.20%) had the lowest disease severity, In Ahmednagar district the village of Belapur Tal Rahuri had the highest disease severity upto 33.10 percent, while Sonai village of the same tehsil had the lowest upto 27.42 percent. The disease severity in the Pune district ranged from 17.30 to 27.20% with an average of 21.09%. Kasegaon from tehsil Pandharpur had the lowest disease severity 33.00% and Tembhorni from Pandharpur tehsil had the highest i.e. 35.40%. The disease severity in Solapur ranged from 33.00% to 35.40%, with an average of 34, 50%. Manerajuri from Tasgaon tehsil 38.22% and Daphalapur from Jath tehsil 32.32% villages had the maximum and lowest disease severity, respectively. In Sangli district the severity of the disease varied among locations from 32.32 to 38.22 percent.

**Keywords:** Grape, powdery mildew, *Erysiphe necator*, survey

### 1. Introduction

Grapes (*Vitis vinifera* L.) is the most important temperate fruit crop that has acclimatized to the subtropical and tropical agro-climatic conditions. Grape is known for its cultural dualism between subsistence-oriented growers and export oriented large corporate growers in India. It has become the most remunerative commercial farming enterprise and as such, India exports a large quantity of fresh grapes The refreshing grape is high in sugars and vitamins, especially vitamin C. Grape is a deciduous crop that thrives in a temperate climate (Chadha, 2002) [2]. However, grapes are grown in India under two distinct climatic conditions; the sub-tropical climatic conditions of the north, where winter temperatures rarely reach freezing point and vines go dormant in the winter and the tropical climatic conditions of the peninsular India, where the winters are mild and vines do not go dormant and remain evergreen throughout the year. Grapes are commercially grown in 89 different nations throughout the world. In Maharashtra, Nashik and Sangli districts are at forefront in the state. Apart from these, grapes are also grown in the district of Ahmednagar, Pune, Satara, Solapur and Osmanabad. However, Nashik and Sangli districts are ahead in the production of grapes in a scientific manner with advanced technologies. The important grapevine diseases are anthracnose, downy mildew, powdery mildew, dead arm, gray mold or bunch rot, black rot, crown gall and bacterial leaf spot. Different fungicides are used to manage diseases of grapevine. Powdery mildew, caused by the pathogenic parasite *Uncinula necator* (Schw.) Burr. is one of the most important fungal diseases of grapevines all over the world and causes significant economic damage in terms of yield and quality deterioration of grape berries.

### 2. Material and Methods

#### 2.1 Survey for the severity of Powdery mildew of grape in major growing areas

A rapid roving survey for assessment of powdery mildew of grapes were conducted during in peak period of disease year 2020-2021 and 2021-22, in five districts of western Maharashtra viz., Nashik, Ahmednagar, Pune, Solapur and Sangli during the month of December to February (peak period of disease).

Two to three tehsils per district, two-three villages per tehsil and two plots per village location and five vines per plot were selected randomly and marked to record the severity of disease.

## 2.2 Disease intensity

### 2.2.1 Disease severity

The disease severity was recorded by visual observations using 0-4 scale (Horsfall and Heuberger, 1942) as detailed below.

Disease severity

Rating	Description (percent leaf area infected)
0	Nil
1	Trace to 25 percent leaf area infected
2	26 to 50 percent leaf area infected
3	51 to 75 percent leaf area infected
4	More than 75 percent leaf area infected

Further these scales were converted to percent disease intensity using formula given by Wheeler (1969) [10],

$$\text{Percent Disease intensity (PDI)} = \frac{\text{Sum of all numerical ratings}}{\text{Number of leaves examined} \times \text{Maximum grade}} \times 100$$

## 3. Result and discussion

### 3.1 Tehsil wise survey of downy mildew disease intensity in major grape growing areas of Maharashtra State 2020-21

Result interpreted from in Table 1 indicates the details of survey in 45 villages from 11 tehsils were surveyed across 5 districts of western Maharashtra. Disease intensity of surveyed areas was calculated as described in methodology. The downy mildew disease was noticed in all surveyed tehsils during both years. The geographical position of all surveyed areas is presented in Table 1.

The data interpreted in Table 1 and photographs showed in, it was revealed that, in 2020-21 occurrence of grape downy mildew disease in Maharashtra State was ranged from 11.22 to 45.00 percent. Dindori tehsil from Nashik district lowest disease percent intensity 12.40 was noticed while in Tasgaon tehsil from Sangli district highest disease intensity 31.40 was noticed.

A survey is a tool used for data collection, results interpretation and information gathering. Disease monitoring and the observation of disease symptoms in a specific area are the major goals of disease surveys, which aim to learn about the prevalence of diseases there. The results of the survey show the existing status of that specific disease as well as the occurrence of new diseases in the chosen targeted area. Every year, the powdery mildew disease results in significant losses to the global grape crop as a result. Keeping this view in mind roving surveys on the powdery mildew disease of grapes were conducted in the grape-growing regions of Maharashtra State in the month of January – February during the year 2020-21 and 2021-22 in Nashik, Pune, Ahmednagar, Sangli and Solapur district of Western Maharashtra State. During the survey percent disease incidence was recorded along with the, GPS locations of the locations were recorded and samples of the powdery mildew disease were collected for further research. The results on the prevalence of powdery mildew of grapes reported during the survey are shown in Table 1.

### 3.2 Tehsil wise survey of powdery mildew disease severity in major grape growing areas of Maharashtra state 2020-21

In the grape-growing regions of Maharashtra State, powdery mildew disease of grapes is a common disease that occurs every year. In Maharashtra State grape cultivation, and cultural practices vary from tehsil to tehsil. Due to these varied farming techniques, the severity of the common diseases also varies from tehsil to tehsil. Taking into account this scenario, tehsil-level critical survey studies for powdery mildew disease intensity on grape were conducted to ascertain the status of the disease. Results interpreted in table 1 to revealed that 51 villages from 13 tehsils were surveyed across 5 districts of Western Maharashtra, and the disease intensity of the surveyed areas was determined in accordance with the methodology. During both years, the powdery mildew disease was observed in all of the tehsils that were surveyed.

According to the data interpreted in Table 1, the prevalence of grape powdery mildew disease average severity in Maharashtra State was ranged from 11.56 to 33.67 percent in the year 2020–21. Minimum percent disease intensity i.e. 12.40 was found in Dindori Tehsil of Nashik District, while highest 31.40 in Tasgaon Tehsil of Sangli District.

**Table 1:** Survey of Powdery mildew disease severity in major grape growing areas of Maharashtra State during 2020-21 and 2021-22.

District	Tehsil	Locations	GPS location		Variety	PDI (%)		
			N	E		2020-21	2021-22	
Nashik	Niphad	Ozar	20°07'41.4"	73°56'16.8"	Sharad seedless	13.12	15.75	
		Pimpalgaon B.	20°10'56.2"	73°59'42.8"	Thompson	13.35	16.30	
		Nandur Madhmeshwar	20°03'65.5"	74°10'39.1"	Thompson	16.35	18.46	
		Niphad	20°08'00.1"	74°10'93.2"	Thompson	12.56	16.32	
		Chandwad	20°32'71.3"	74°24'73.6"	Sharad seedless	16.23	20.36	
	Dindori	Khedgaon	20°13'14.1"	73°59'28.2"	Thompson	14.15	15.20	
		Dhamanwadi	20°12'03.7"	73°53'29.3"	Thompson	12.21	15.74	
		Materewadi	20°12'08.1"	73°54'04.1"	Nana Purple	15.45	17.42	
		Mohadi	20°08'44.4"	73°53'43.2"	Thompson	11.56	15.26	
		Palkhed	20°10'15.1"	74°53'60.1"	Sharad seedless	18.34	23.40	
		Mhatori	20°75'19.8"	74°28'15.6"	Sonaka	17.45	21.20	
		Rajapur	20°13'43.8"	74°53'13.3"	Flame seedless	15.56	22.31	
		Khedgaon	20°14'42.4"	74°56'52.7"	Thompson	16.34	18.50	
		Bopegaon	20°18'23.1"	73°55'25.1"	Thompson	18.21	21.64	
		Kasbe Vani	20°20'36.1"	73°53'17.9"	Thompson	17.31	15.24	
		Sinnar	Kundewadi	19°83'67.1"	74°07'42.1"	Thomson	20.10	20.44
			Bhatwadi	19°82'34.8"	73°98'55.8"	Thompson	19.38	24.15

		Musalgaon	19°82'72.1"	74°05'69.2"	Sharad seedless	20.56	25.16	
		Average of Nashik district					16.01	19.05
A. nagar	Shrirampur	Haregaon	19°66'85.1"	74°71'07.1"	Sonaka	28.78	31.02	
		Belapur	19°57'54.8"	74°64'66.9"	Thompson	25.56	33.10	
		Chandegaon	19°55'45.3"	74°66'81.7"	Jumbo	26.67	27.46	
	Rahuri	MPKV	19°35'03.4"	74°65'19.0"	Thompson	25.56	28.00	
		Sonai	19°40'70.1"	74°82'28.2"	Sharad seedless	25.34	27.42	
		Vambhori	19°28'61.2"	74°73'46.2"	Sonaka	28.56	30.42	
	Shrigonda	Shrigonda	18°61'21.1"	74°68'88.1"	Thomson	27.56	29.02	
		Pargaon	18°66'37.6"	74°63'94.8"	Sharad seedless	26.89	31.30	
		Loni Vyanknath	18°67'05.6"	74°62'29.9"	Thomson	25.67	28.20	
		Average of A. nagar district					26.73	29.55
Pune	Ambegaon	Manchar	19°00'71.8"	74°96'14.8"	Nana purple	18.67	17.30	
		Kalamb	19°04'96.1"	74°95'44.4"	Jumbo	20.87	21.02	
		Chandoli Khurd	19°01'35.9"	73°98'03.8"	Thompson	22.56	25.40	
	Junnar	Rajuri	19°14'40.1"	74°13'61.1"	Jumbo	20.56	23.10	
		Golegaon	19°21'18.2"	73°88'92.5"	Thompson	23.54	26.30	
		Ozar	19°19'37.9"	73°96'41.5"	Sharad seedless	20.97	27.20	
		Bhorwadi	19°21'07.6"	73°97'58.2"	Thompson	19.56	24.00	
	Narayangaon	19°11'02.5"	73°97'83.8"	Thompson	21.98	20.26		
		Average of Pune district					21.09	23.07
Solapur	Malshiras	Paniv	17°83'96.3"	74°96'04.7"	Super sonaka	30.67	33.40	
		Bhamburdi	17°85'20.3"	74°85'82.4"	Thompson	32.54	35.10	
		Natepute	17°89'71.3"	74°74'60.1"	Super sonaka	33.59	35.20	
	Pandharpur	Khamgaon	18°23'33.0"	75°81'09.0"	Sonaka	30.12	35.20	
		Kasegaon	17°61'24.7"	75°32'97.3"	Manikchaman	32.89	33.00	
		Tembhurni	18°04'53.7"	75°17'10.1"	Thomson	30.39	35.40	
		Average of Solapur district					31.70	34.55
Sangli	Tasgaon	Tasgaon	16°92'90.9"	74°62'27.7"	Super Sonaka	32.45	35.44	
		Kumthe	16°96'17.6"	74°65'70.1"	Manikchaman	33.56	35.12	
		Chinchani	17°05'36.1"	74°64'38.2"	Super sonaka	32.78	36.10	
		Punadi	17°08'78.1"	74°63'73.6"	Sonaka	31.56	35.00	
		Manerajuri	17°02'61.4"	74°69'21.6"	Sonaka	33.67	38.22	
	Miraj	Takali	16°83'26.3"	74°69'64.7"	Sonaka	32.53	35.24	
		Bolwad	16°79'62.2"	74°68'83.9"	Super sonaka	31.91	34.22	
		Mhaisal	16°75'18.2"	74°69'99.2"	Manikchaman	30.78	33.42	
	Jath	Daphalapur	16°98'54.9"	75°06'24.1"	Manikchaman	31.89	32.32	
		Jath	17°03'41.7"	75°23'00.1"	Super Sonaka	30.92	35.78	
			Average of Sangli district					32.20

### 3.3 District wise survey of percent disease intensity of downy mildew disease of grape in major grape growing areas of Maharashtra State.

According to the data condensed and compiled for the years 2020–21, the maximum percent disease intensity was recorded in the district of Sangli (32.20%), followed by Solapur (31.70%), Ahmednagar (26.73%), and Pune (21.09%) and the lowest in Nashik (16.01%). However, next years (2021–22) the highest percent disease intensity was observed in the Sangli district (35.08%) followed by Solapur district

(34.55%), Pune district (23.07%) and Ahmednagar district (29.55%) and lowest in Nashik district (19.05%).

It is revealed from Table 4.2 showed that the average mean powdery mildew disease severity (PDI) in Western Maharashtra's in five major districts for the of 2020-21 and 2021-22. It is summarized in Table 4.2 Sangali district (33.64%) had the greatest overall mean disease severity, followed by Solapur (33.12%), Ahmednagar (28.14%), Pune (22.08%) and Nashik (17.53%) with. an average 26.37% disease severity.

**Table 2:** District-wise average Percent Disease Intensity of downy mildew disease of grape during October pruning 2020 and 2021 in major growing areas of Maharashtra State.

Sr. No.	District	Percent Disease Intensity		Average PDI (%)
		2020	2021	
1	Nashik	16.01	19.05	17.53
2	Ahmednagar	26.73	29.55	28.14
3	Pune	21.09	23.07	22.08
4	Solapur	31.70	34.55	33.12
5	Sangali	32.20	35.08	33.64
	Pooled Average PDI	25.55	28.26	26.90

Very few literatures on disease survey information is available regarding the severity of grape powdery mildew in the various areas of Western Maharashtra. Sonawane *et al.* (2013) [9] surveyed and examined in Latur and Osmanabad, districts of Marathawada (MS), and found that powdery

mildew disease was prevalent there with varying degrees of severity. Kushare *et al.* (2019) [6] reported that survey of the vineyards in the districts Nashik, Ahmednagar, Pune, Solapur and Sangli revealed prevalence of powdery mildew disease in all of these five districts of Western Maharashtra. Amongst

the various districts surveyed, the disease severity exhibited almost a similar trend. The highest disease severity was reported in Nashik district (33.48%) followed by Sangli (31.98%). The least disease severity of 24.87% was noticed in district Ahmednagar. Reports from other parts of India were examined, nevertheless. The findings of the current survey are consistent with those of earlier researchers like Sohi (1983)<sup>[8]</sup> from South India, who estimated losses from this disease to range from 0 to 50%. Four districts in Northern Karnataka were examined by Narayana *et al.* (2006)<sup>[7]</sup>, and observed that the intensity of powdery mildew was varied. According to field surveys conducted by Devi *et al.* (2013)<sup>[3]</sup> in the three main grapevine-growing districts of Coimbatore, Theni, and Dindugal in Tamil Nadu, Cumbum of Theni had the highest incidence of powdery mildew on leaves, inflorescence, and fruits, with records of 65.49, 63.56 and 61.23%, respectively.

#### 4. Conclusion

Grape Powdery Mildew is a very common disease that has affected nearly all of Western Maharashtra grape-growing regions. The disease severity varies slightly from locality to locality, which may be related to the regional varying weather and cultivation practices.

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