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SURVEY FOR THE INCIDENCE OF POWDERY MILDEW AND *AMPELOMYCES* SP. IN GROWING DISTRICTS OF CHHATTISGARH INDIA

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ABSTRACT

The survey highlights the widespread incidence of powdery mildew in various crops across Chhattisgarh and the presence of *Ampelomyces* in certain locations. The highest disease incidence was observed on okra (79%) at village Goji (Dhamtari district). The highest incidence of *Ampelomyces* was observed at Jagdalpur (68%). Six isolates of *Ampelomyces* sp. were isolated from the powdery mildew infected leaves of various crops and were designated as AMP1 (Gariyaband isolate), AMP2 (Raipur isolate), AMP3 (Raipur isolate), AMP4 (Dhamtari isolate), AMP5 (Durg isolate) and AMP6 (Jagdalpur isolate).
Keywords **:** Ampelomyces, Powdery mildew, Hyperparasite, Pycnidia.

Introduction

Powdery mildew is a widespread fungal disease distinguished by a characteristic white powdery growth on the aerial parts of plants. This disease thrives in conducive environmental conditions, typically marked by high humidity and moderate temperatures. From a taxonomic standpoint, powdery mildew fungi belong to the order Erysiphales, a diverse group encompassing numerous genera and species that infect a broad range of host plants globally. The impact of powdery mildew is far-reaching, affecting various plant types, including grasses, vegetables, fruits, forest trees, and agricultural crops. This results in substantial economic losses due to reduced crop yields annually. To mitigate these losses, plant protection scientists continually develop and recommend effective management strategies. Currently, a multifaceted approach is employed to control powdery mildew, incorporating physical, chemical, and biological methods (Zhao *et al*., 2012). But the best method of control is prevention (Gautam and Avasthi, 2016). Nature offers a diverse array of biocontrol agents that can aid plants in managing fungal pathogens. One notable example of such biocontrol interactions is mycoparasitism. Mycoparasitism refers to a relationship between two fungi where one fungus acts as a parasite on the other (Butler, 1957).

Ampelomyces is one of the naturally occurring mycoparasites which affects mycelium, conidial spores and ascocarps of powdery mildew (Kiss *et al*., 2004). These mycoparasites function as hyperparasites, penetrating the pathogen and infecting it by forming specialized structures within the powdery mildew's hyphae, conidiophores, and chasmothecia. Notably, pycnidial fungi from the genus *Ampelomyces* have been identified as intracellular mycoparasites that specifically target powdery mildew fungi (Szentiványi *et al*., 2003). Genus Ampelomyces belong to the class of Coelomycetes that are widespread, thermophilic and adapted to various climatic conditions Following successful penetration, the mycoparasite's hyphae continue their growth within the host fungus. Over a period of 5 to 8 days, these hyphae colonize the mycelia of the fungal host and produce intracellular pycnidia. This stage is critical in the lifecycle of the mycoparasite, as it facilitates the production of spores that can further disseminate the mycoparasite and enhance its biocontrol efficacy against the target fungal pathogen. (Hashioka and Nakai 1980; Sundheim and Krekling, 1982).

Materials and Methods

Survey

An intensive survey was conducted during 2023 and 2024 on the % disease incidence of powdery mildew and *Ampelomyces* sp. in growing districts of Chhattisgarh. The aerial parts of different plants infected with powdery mildew (50 leaves) were collected from each nineteen locations. Samples were collected randomly from the field in these locations (Rawan, Dharampura, Baronda, Purena, Serikhedi, Bagtarai, Goji, Shivni, Kosmarra, Khapri, Balodabajar, Bemetara, Bilaspur, Kanker, Lormi, Pandariya, Dasapal, Nrayanpur). The incidence of *Ampelomyces* from the powdery mildew infected samples were determined using following formula:

$$\text{Incidence of disease} = \frac{\text{No. of plants affected}}{\text{Total number of plants observed}} \times 100$$

$$\text{Incidence of Ampelomyces} = \frac{\text{No. of samples with Ampelomyces sp.}}{\text{Total no. of samples}} \times 100$$

Results and Discussion

Survey

An intensive survey was conducted during 2023-24 to record the incidence of *Ampelomyces* and incidence of powdery mildew in different districts (Raipur, Dhamtari, Jagdalpur, Gariyaband, Durg, Balodabajar, Bemetara, Bilaspur, Narayanpur, Kanker, Mungeli and Kabirdham) of Chhattisgarh. In the twelve districts, nineteen locations (Purena, Baronda, Dharampura, Serikhedi, Bagtarai, Goji, Shivni, Kosmarra, Dasapal, Rawan, Khapri, Balodabajar, Bemetara, Bilaspur, Narayanpur, Kanker, Lormi and Pandariya) were selected and the observations were recorded from farmer's fields under natural conditions. The results of survey, aare presented in table 1.

The disease incidence of powdery mildew at the time of survey ranged from 8.5% to 79% in various crops during the year 2023-24. The maximum (79%) percent of disease incidence was observed on okra at village Goji (district Dhamtari), followed by mustard (77%) at Bilaspur, mustard (72.8%) at Baronda, mustard (60%) at Balodabajar, mustard (59%) at Kosmarra, cowpea (59.6%) at Narayanpur, okra (58.5%) at Purena, okra (58.8%) at Bilaspur, mustard (57.4%) at Lormi, okra (51.3%) at Shivni, okra (50%) at Khapri, okra (48.2%) at Bagtarai, okra (41%) at Rawan, okra (39%) at Dasapal, cowpea (36.4%) at Dharampura, mustard (18%) at Serikhedi, bottlegourd (16%) at Pandariya, bottlegourd (12%) at Kanker. The lowest (8.5%) percent of incidence was observed in okra at Bemetara. Powdery mildew incidence was seen in various crops (plate.4.1.1). Presence of bioagent *Ampelomyces* was observed in locations Rawan, Dharampura, Purena, Bagtarai, Khapri and Jagdalpur, while it was absent in other locations surveyed during the year 2023-24. The incidence of *Ampelomyces* varied significantly across different locations, ranging from 34.7% (Jagdalpur) to 68% (Gariyaband).

Various workers (Banupriya *et al.,* 2019, Kanipriya *et al.,* 2019) engaged in survey observed significant differences in the index of powdery mildew from various locations and also confirmed for the presence of *Ampelomyces* in the surveyed areas (Kanipriya *et al.,* 2019).

Banupriya *et al.* (2019) reported that the percent disease index of powdery mildew in grapevine Coimbatore district ranged from 14.65 to 63.21. The maximum disease index of 63.21 was observed at Theethipalayam village followed by 52.24 at Alanthurai village and minimum disease index of 14.65 was recorded at Devarayapuram village in Coimbatore district.

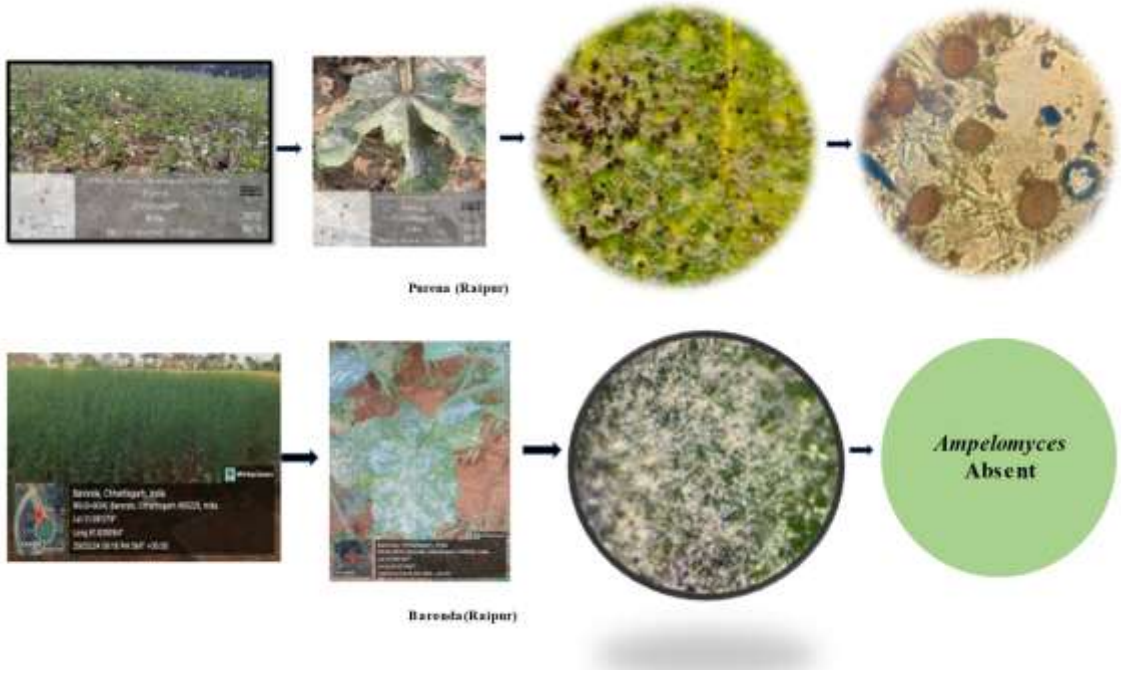
Kanipriya *et al.* (2019) also conducted a survey in major bhendi (*Abelmoschus esculentus* (L.) Moench) growing regions of Coimbatore district of Tamil Nadu to assess the index of powdery mildew disease. The results revealed that disease index ranged from 38.04 to 69.54 percent. From the surveyed areas, ten isolates of *Ampelomyces* spp. were also isolated using water agar medium.

Table 1: Survey and collection of *Ampelomyces* sp. from different locations of two agroclimatic zones of Chhattisgarh during (November-April) 2023-24.

Agroclimatic zones	S.No.	Location		Crop	Stage of the crop	Longitude	Latitude	Variety	Mean percentage incidence	Prevalence of *Ampelomyces*	Percentage incidence of *Ampelomyces* in randomly selected 50 infected leaves
		District	Village								
A. Plain zone	1.	Gariyaband	Rawan	Okra	Vegetative	20.99856	81.9200642	Ravi	41%	Present (AMP1)	68%
	2.	Raipur	Dharampura	Cowpea	Vegetative	81708839	21.225328	OH-102	36.4%	Present (AMP2)	46%
			Baronda	Mustard	Pod formation	81.826094	21.381279	VBH-11	72.8%	Absent	-
			Purena,	Okra	Fruiting	81.711159	21.229359	Jhanvi	58.5%	Present (AMP3)	60%
			Serikhedi	Mustard	Vegetative to Flowering	81.714394	21.233374	Diwa	18%	Absent	-
	3.	Dhamtari	Bagtarai	Okra	Flowering	20.871595	81.58607	OH-940	48.2%	Present (AMP4)	49%
			Goji	Okra	Fruiting	81.802564	20.913132	Diwa	79%	Absent	-
			Shivni	Okra	Flowering	81.7313511	20.7520648	Diwa	51.3%	Absent	-
			Kosmarra	Mustard	Flowering	81.593742	20.860324	Sakar	59%	Absent	-
	4.	Durg	Khapri	Okra	Fruiting	21.273079	81.517297	Radhika	50%	Present (AMP5)	54.5%
	5.	Balodabazar	Balodabajar	Mustard	Vegetative	81.655269	22.038256	Ashok	60%	Absent	
	6.	Bemetara	Bemetara	Okra	Vegetative	81.326851	21.658301	Ashok	8.5%	Absent	-
	7.	Bilaspur	Bilaspur	Okra	Vegetative	81.616018	22.337085	Ashok	58.8%	Absent	-
			Bilaspur	Mustard	Flowering	81.615338	22.340973	Arka Anamika	77%	Absent	-
	8.	Kanker	Kanker	Bottlegourd	Vegetative	81.140501	19.90966	BG-1	12%	Absent	
	9.	Mungeli	Lormi	Mustard	Fruiting	81.628309	22.383203	M-1	57.4%	Absent	
	10.	Kabirdham	Pandariya	Bottlegourd	Flowering	81.480177	22.329852	BG-1	16%	Absent	
B. Bastar plateau zone	11.	Jagdalpur	Dasapal	Okra	Vegetative	19.201725	20.078978	Rita	39%	Present (AMP6)	34.7%
	12.	Narayanpur	Narayanpur	Cowpea	Fruiting	80.960808	19.741172	Namdhari	59.6%	Absent	–

Table 2 : Six isolates of *Ampelomyces sp.* collected from different locations of Chhattisgarh

S.N.	Name of the Isolates	Village	Name of District
1	AMP1	Rawan	Gariyaband
2	AMP2	Dharampura	Raipur
3	AMP3	Purena	Raipur
4	AMP4	Bagtarai	Dhamtari
5	AMP5	Dasapal	Jagdalpur
6	AMP6	Khapri	Durg



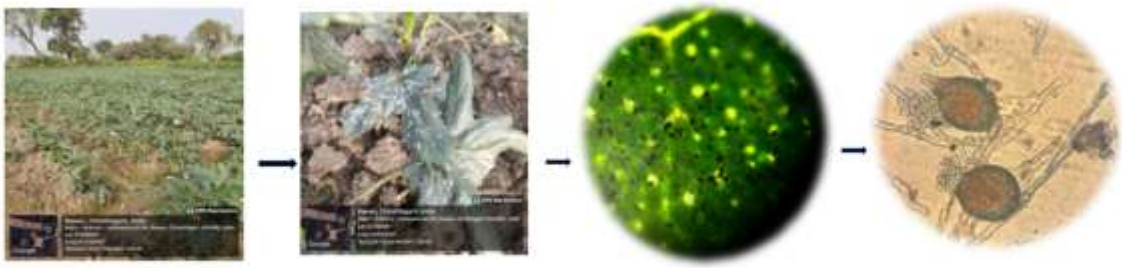
Dharampura (Raipur)

Serikheri (Raipur)

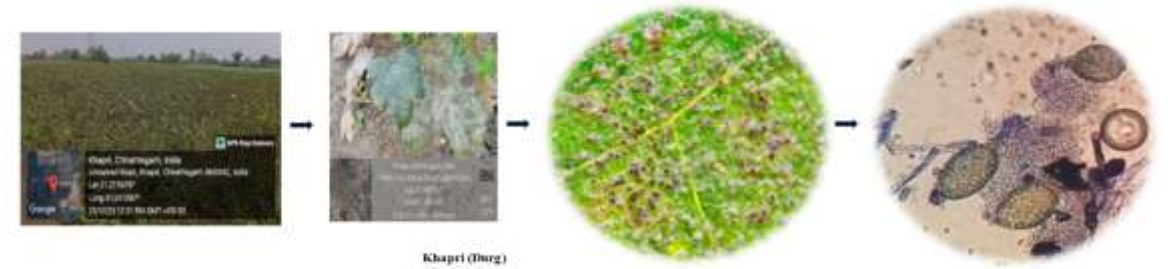
Shivni (Dhamtari)

Kosmarra (Dhamtari)

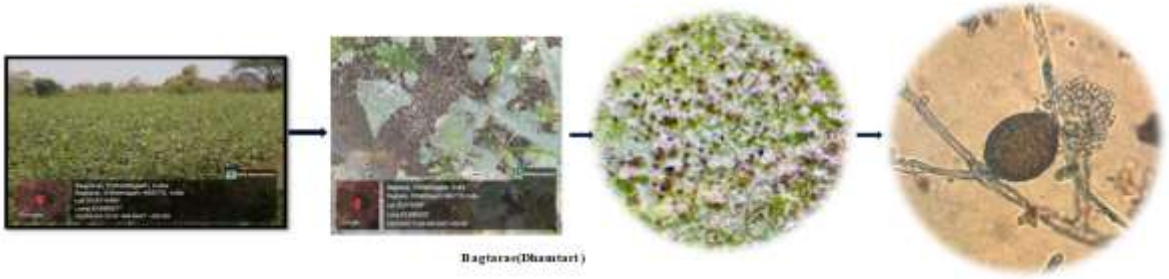
Devapal (Jagdalpur)



Rawan (Gariyaband)



Khapri (Durg)



Bagtarai(Dhamtari)

Gariyaband

Balodabazar

Bemetara

Goji (Dhamtari)

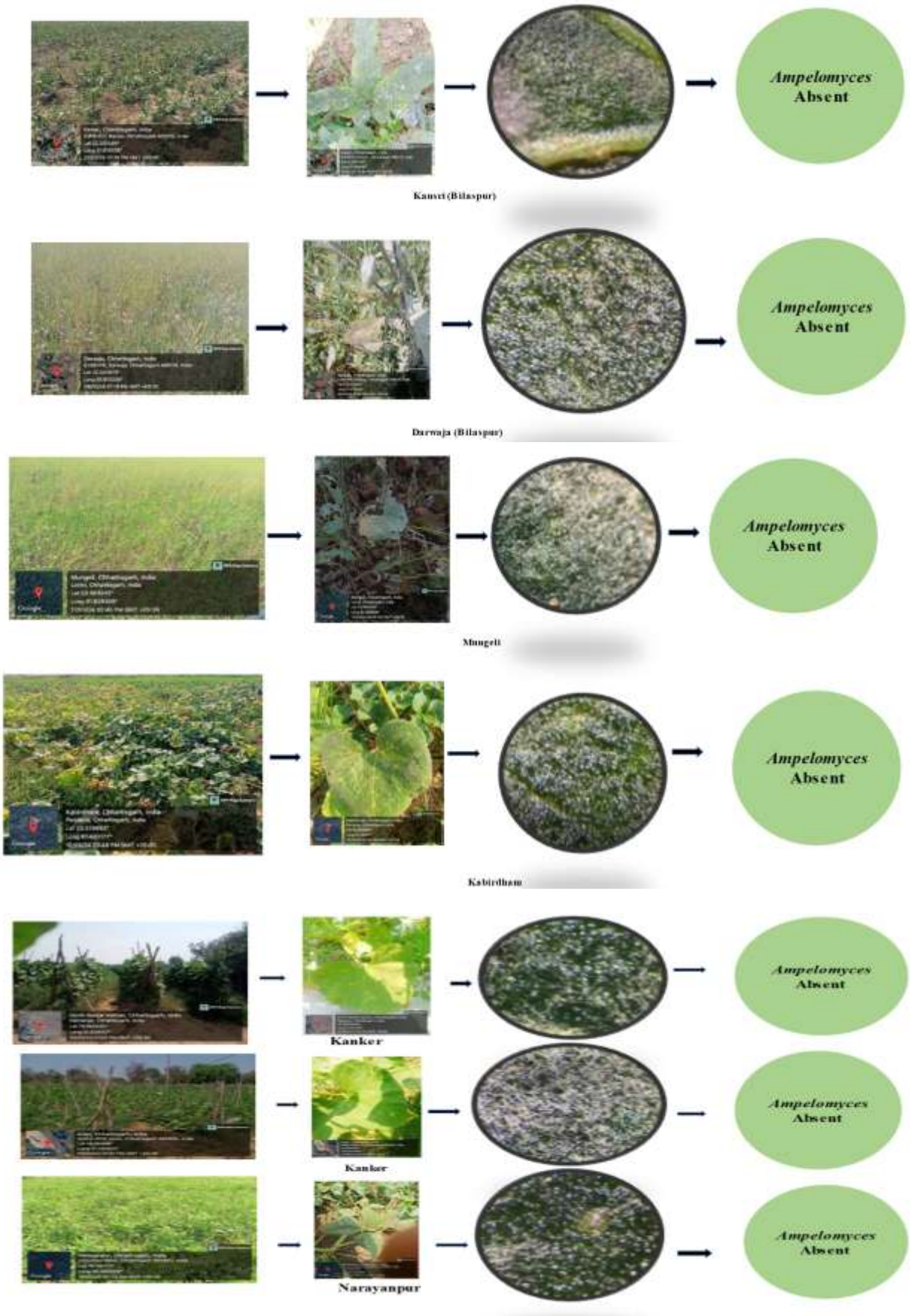


Plate 1 : Survey and collection of *Ampelomyces* sp. from different locations of Chhattisgarh

Conclusion

The survey highlights the widespread incidence of powdery mildew in various crops across Chhattisgarh and the presence of *Ampelomyces* in certain locations. The highest disease incidence (PM) was observed on okra (79%) at village Goji (Dhamtari district). The highest incidence of *Ampelomyces* was observed at Jagdalpur (68%).

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