INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

Downy Mildew of Onion: Epidemiological Aspects

A. Premila
Associate Professor and Head, Department of Botany, Standard College, Imphal, Manipur, India
Y. Sophiarani
Junior Research Fellow, Institutional Level Biotech Hub,
Department of Botany, Standard College, Imphal, Manipur, India

Abstract:
Fungal airspora over onion field was monitored for two consecutive cropping seasons (Nov. 2013 to Apr. 2014 and Nov. 2014 to Apr. 2015) using Rotorod Air Sampler. 24 fungal types belonging to 5 different subdivisions of fungi constitute the airspora over onion field. Monthly variation of Peronospora destructor and its impact on downy mildew disease (PDI) were observed. Occurrence of downy mildew disease depend on conducive weather parameters. Correlation of meteorological parameters with disease incidence and percentage contribution of P. destructor were significant (p< 5%).

Keywords: *Doowny mildew, onion, epidemiology, meteorological parameters.*

1. Introduction

Onion *(Allium cepa),* one of the most widely cultivated species of Allium, is grown both in the valley and hilly regions of Manipur. Among the important fungal diseases of onion (Downy mildew caused by *Peronospora destructor*, Leaf blight caused by *Botrytis squamosa*, Neck rot caused by *Botrytis allii*, Smut caused by *Urocystis magica*, White rot caused by *Sclerotium cepivorum* and Basal rot caused by *Fusarium oxysporum* which damaged the crop in all growth stages of the crop, Downy mildew caused by *Peronospora destructor* is a major constraint for large cultivationof the crop. Various workers reported the airspora over onion field and store houses ofonion (Maude and Prestly, 1977; Lohare and Kareppa, 2009; Devi, et. al. 2010).Patil (1989) analysed the epidemiology, prediction and control of downy mildew of onion. Few workers have studied the aeromycoflora over onion field in Manipur (Premila, 2013; Premila and Singh, 2014). Hence the present study was undertaken to detect the overall fungal airspora over onion field and percentage contribution by pathogenic conidia for the incidence of downy mildew caused by *Peronospora destructor*. Attempts have also been made to correlate the weather parameters with the percent disease incidence of downy mildew of onion in order to understand the influence of environmental factors on theepidemiology of the disease.

2. Materials and Methods

Fungal airspora was monitored over onion field at Imphal East District, Manipur. Air sampling was carried out for two consecutive cropping seasons (CS_1 - Nov. 2013 to Apr. 2014 and CS_2 - Nov. 2014 to Apr. 2015) at weekly intervals. Transparent cello tape was applied to the rods of the sampler, trimmed back to the width of the rods with a sharp razor blade and then coated with vaseline. The sampler was operated at 1 metre above ground level clinging at the rate of 100 litres per minute. Air sampling was started 7 days prior to plantation of the crop and continued for 7 days after harvesting of the crop. Scanning of the slides was done regularly throughout the investigation period. Fungal spores were identified based on morphological characters, visual identification by comparing with reference slides and published literatures (Barnett and Hunter, 1972; Tilak, 1989). Meteorological parameters duringthe investigation period was obtained from ICAR Research Complex, Lamphelpat, Imphal. Percent disease incidence (PDI) was calculated following standard formula:

PDI= Number of plants infected/total number of plants × 100

3. Results and Discussion

The trapped spores were categorized as Fungal spores and Other types. The fungal spores were identified and assigned to five subdivisions of fungi (Ainsworth, 1966 and Hawkswork et al, 1985). The percentage contribution of different subdivisions was Mastigomycotina (8.82% in CS_1 and 8.80% in CS_2), Zygomycotina (2.25% in CS_1 and 2.20% in CS_2), Ascomycotina (3.75% in CS_1 and 3.67% in CS_2), Basidiomycotina (14.29% in CS_1 and 14.21% in CS_2) and Deuteromycotina (59.46% in CS_1 and 59.34% in CS_2). Other types which consist of hyphal fragments, epidermal scales, pollen grains, etc. contributed 11.54%of the total population in CS_1

and 11.78% in CS_2.(Table 1).Dominant fungal types were Cladosporium contributing 12.33% in CS_1 and 13.55%in CS_2,*Alternaria* (9.81% and 9.42%), *Peronospora* (8.82% and 8.80%), Aspergilli Penicilli (7.33% and 5.32%), *Periconia* (4.41% and 4.91%), *Curvularia* (4.60% and 4.2%), etc. Qualitative and quantitative variations of different spore types were more or less similar in both the cropping seasons. Slight fluctuation in concentration of fungal spores might be due to variations in weather parameters. Similar results were reported by other workers (Patil, 1989; Lohare and Kareppa, 2009).

Sl. No.	Spore types	CS_1 (%)	CS_2 (%)
	MASTIGOMYCOTINA		
1	Peronospora	8.82	8.80
	ZYGOMYCOTINA		
2	Round spores (*Rhizopus Mucor* type)	2.25	2.20
	ASCOMYCOTINA		
3	Fusiform ascospores	2.52	2.25
4	Chaetomium	1.23	1.42
		3.75	3.67
	BASIDIOMYCOTINA		
5	Basidiospores	3.43	3.33
6	Rust spores	3.83	2.87
7	Smut spores	7.03	7.11
		14.29	14.21
	DEUTEROMYCOTINA		
8	*Alternaria*	9.81	9.42
9	Aspergilli Penicilli	7.33	5.32
10	*Beltrania*	1.72	1.60
11	*Bispora*	1.61	1.43
12	*Cladosporium*	12.33	13.55
13	*Curvularia*	4.60	4.22
14	*Drechslera*	1.64	1.90
15	*Epicoccum*	1.12	1.92
16	*Helminthosporium*	1.97	1.45
17	*Nigrospora*	4.00	5.52
18	*Periconia*	4.41	4.91
19	*Pithomyces*	2.83	2.80
20	*Pestalotia*	1.33	1.82
21	*Pseudotorula*	1.75	1.57
22	*Tetraploa*	0.96	0.70
23	*Torula*	0.64	0.82
24	*Trichoconis*	1.10	1.10
		59.46	59.34
	OTHER TYPES	11.54	11.78

Table 1: Percentage contribution of fungal spores over onion field in Imphal

The correlation of meteorological parameters with monthly variations of the concentration of *Peronospora destructor* and its impact on downy mildew of onion was revealed in Table 2. Although overall contribution of *P. destructor* varied from 8.80% to 8.82%, yet its monthly contribution varies from 9% to 20% in CS_1 and 8% to 20% in CS_2.

CS_1 – Nov 2013 to Apr 2014							CS_2 – Nov 2014 to Apr 2015					
MONTH	% of Peronospora	PDI (%)	Meteorological parameters				% of Peronospora	PDI (%)	Meteorological Parameters			
			T max (^oC)	T min (^oC)	RH (%)	RF (mm)			T max (^oC)	T min (^oC)	RH (%)	RF (mm)
Nov.	9	-	27	9.6	67	nil	8	-	26	9.1	65	nil
Dec.	16	-	22	5.6	68	nil	15	-	23	5.5	67	0.1
Jan.	17	5.5	24	4.6	64	nil	19	5.8	25	5.0	66	nil
Feb.	19	9.5	23	6.7	66	1.0	20	9.2	25	5.8	67	0.5
Mar.	20	16	28	10	65	0.9	19	17	27	9	65	0.6
Apr.	19	24	30	14	68	1.6	19	22	30	13	69	1.0

Table 2: Monthly percentage contribution of Peronospora destructor in relation to meteorological parameters

In $CS_{1,}$ percent disease incidence (PDI) caused by the pathogen ranged from 5.5% to 24%. The lowest disease incidence (5.5%) was recorded on 10th Jan, 2014 whereas the highest disease incidence (24%) was recorded on 1st April 2014. In $CS_{2,}$ percent disease incidence (PDI) caused by the pathogen ranged from 5.8% to 22%. The lowest disease incidence (5.8%) was recorded on 10thJan, 2015whereas the highest disease incidence (22%) was recorded on 8th April 2015.Weather parameters like relative humidity, temperature and rainfall influenced the epidemiology of downy mildew of onion as the correlation co-efficient (r = 0.85) between the disease incidence and weather parameters was found significant (P < 5%).Results obtained was in agreement with reports of earlier workers (Patil, 1989; Devi and Chanu, 2012; Premila, 2013).

4. Acknowledgements

The authorsare thankful to Department of Biotechnology, Govt. of India, New Delhi for financial assistance through Institutional Level Biotech Hub and to ICAR Lamphelpat for providing meteorological data. The authors are also thankful to Principal, Standard College, Imphal for encouragement.

5. References

i. Barnett, H. L. and Hunter, B. B. (1972). Illustrated genera of Imperfect fungi. 3rd Edn. Burgass Publishing Co., USA, pp 241.
ii. Devi, J., Medhi, S. and Sarma, T.C.(2010). Aeromycological study of store houses of onion and ginger in Guwahati. The Bioscan**,** 2(Sp. Issue): 547 – 552.
iii. Devi, A.P. and Chanu, L.B. (2012). Airspora and epidemiology of early blight of tomato caused by Alternaria solani (Ell and Mart) Jones and Grant in Manipur. Journal fo Mycopathological Research, 50 (1): 81 – 84.
iv. Ellis, M. B. (1971). Dematiaceous Hyphomycetes. C. M. I., England, pp 608.
v. Hawkswork, D. L., Sutton, B. C. and Ainsworth, G. C. (1985). Dictionary of the fungi. International Books and Periodicals Supply Service, New Delhi.
vi. Lohare, S. D. and Kareppa, B. M. (2009). Airspora over onion field. International Research Journal, 1(3&4):116 – 117.
vii. Maude, R. B. andPrestly, A. H. (1977). Infection of onions by Botrytis allii. Annals of Applied Biology, 85(1): 165– 167.
viii. Patil, J. (1989). Epidemiology, prediction and controlof onion downey mildew caused by Peronospora destructor. Phytoparasitica, 17(1):31 – 48.
ix. Premila, A. (2013).Fungal airspora over onion field in Manipur valley. International Journal ofCurrent Science & Technology, 1(1):77 – 79.
x. Premila, A. and Singh, N. I. (2014). Airborne fungal diversity over home garden in Manipur valley.Journal of Mycopathological Research, 52(1):149 – 151.
xi. Tilak, S. T. (1989). Airborne pollen and fungal spores. Vijayanti Prakashan, Aurangabad, pp 316.