

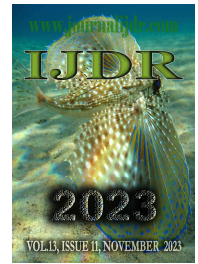


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## INFLUENCE OF EPIDEMIOLOGICAL PARAMETERS ON DISEASE DEVELOPMENT OF PURPLE BLOTCH OF ONION [*Alternariaporri* (Ellis) Cifferi]

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### ABSTRACT

The present study entitled “Studies on epidemiological parameters on disease development of purple blotch of onion [*Alternariaporri* (Ellis) Cifferi]” was conducted in the Division of Plant pathology, P.G. Department of Agriculture, Khalsa College Amritsar, Rabi 2022-23. Onion (*Allium cepa* L.) is major vegetable crop cultivated primarily as food and export worldwide. It contains various anti-inflammatory, anti-cholesterol, anticancer and antioxidant properties with phytochemicals such as ‘quercetin’. It includes compound namely ‘Allyl propyl disulfide’ which is responsible for its smell, pungency and irritation of the eyes. Correlation of meteorological parameters viz., temperature, rainfall and relative humidity with respect to per cent disease index studied from 01/01/2023 to 28/04/2023 for sixteen weeks. Weather parameters temperature and rainfall was significantly positively correlated with PDI (0.937\*\* and 0.525\*, respectively), whereas, relative humidity was non-significantly negatively correlated with PDI (-0.495<sup>NS</sup>).

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## INTRODUCTION

Onion (*Allium cepa* L.) is one of the most widely cultivated bulbous crops all around the world and belongs to family Amaryllidaceae. It composed of nutrients such as vitamins, proteins, minerals, ascorbic acid, fiber, calcium, iron, Sulphur, insulin and calories (Bektas and Kusek, 2021; Sliemstad *et al.*, 2007). Onion proved beneficial to cure heart diseases as well as various other diseases such as anaemia, urinary illness, bleeding piles and teeth disorders (Lokhande *et al.*, 2011). Onion is caused by many fungal diseases viz., damping off, white rot, purple blotch, downy mildew, vascular wilt, fusarium basal rot, white rot, pink root rot and stemphylium blight. Out of these diseases, purple blotch is one of the important diseases, which cause huge economic losses to the crop. The disease may reach an epidemic state during the favorable conditions of high relative humidity (80-90%) and optimum temperature (25°C) Shahanaz *et al.* (2007). Purple blotch disease caused by *Alternariaporri* (Ellis) Cifferi considered as the most destructive of *Allium* sp. viz., onion and garlic. Symptoms appeared as brown-black spots and small sunken purple-colored centric lesions on leaves after two to three weeks of disease development under favorable weather conditions (temperature, rainfall and relative humidity). Continuity of infection leads to the downward drooping of leaves along with the girdling of stalks. Frequent rain during moderate temperatures (25 to 27°C) causes more severe disease and spread rapidly in warm and wet conditions. Temperature below 55°C disables the pathogen to cause infection. The dispersal of fungus is possible through the water as well as wind.

The pathogen is generally, seed-borne and may also remain dormant and survives on and in crop residues (Yadav *et al.*, 2014).

## MATERIALS AND METHODS

The impact of weather parameters on purple blotch disease of onion were examined at different stages of crop at weekly intervals during the months of January and February of rabi season (2023). Environmental parameters viz., maximum temperature (°C), minimum temperature (°C), relative humidity (%), relative humidity (%) and rainfall (mm) were taken from the meteorological observatory, Department of agrometeorology, Khalsa College Amritsar and were correlated with disease incidence under natural field conditions by laying an experimental plot from row to row spacing of 15 cm. Observations related to per cent disease index (PDI) of the observing weeks were recorded from the time of disease initiation. The per cent disease index (PDI) was assessed by using following formula given by McKinney (1923)

$$PDI = \frac{\text{sum of all disease ratings} \times 100}{\text{total number of ratings} \times \text{maximum disease grade}}$$

## RESULTS AND DISCUSSION

The assessment of weather parameters such as temperature (°C), rainfall (mm) and relative humidity (%) was done to evaluate their role and interaction effect on the purple blotch disease incidence.

Table 1. Weather parameters on purple blotch of onion during, Rabi 2022-2023

weather parameter→ Interval(I)↓	max temp (°C)	min temp (°C)	Avg. temp (°C)	rainfall (mm)	relative humidity (%)	PDI (%)
1.1.2023-7.1.2023	22.33	8.14	15.23	0	68.42	0
8.1.2023-15.1.2023	20.145	6.28	13.21	0	93.71	0
16.1.2023-23.1.2023	16.68	4.78	10.73	0.12	93.62	0
24.1.2023-31.1.2023	15.765	5.01	10.38	0	94	0
1.2.2023-7.2.2023	16.55	6.02	11.28	0	92.28	0
8.2.2023-15.2.2023	19.87	3.68	11.77	0.18	72.85	0
16.2.23-23.2.2023	19.44	4.57	12.01	0	82	0
24.2.2023-3.3.2023	21.5	6.84	14.17	1.59	80.85	1.8
4.3.2023-11.3.2023	23.77	8.22	15.99	0	73.71	10.2
12.3.2023-19.3.2023	24.77	7.94	16.35	0	67.71	27.6
20.3.2023-27.3.2023	27.34	11.01	19.17	0	76	36.4
28.3.2023-4.4.2023	26.04	13.27	19.65	0.32	73.71	48.9
5.4.2023-12.4.2023	29.54	13.87	21.7	0	68.4	59.3
13.4.2023-20.4.2023	29.34	15.08	22.21	1.7	72.71	66.5
21.4.2023-28.4.2023	26.27	14.1	20.18	2.54	80	64.7

Table 2. Co-relation Matrix of climate parameters on disease incidence (Rabi 2022-23)

	Temp	rainfall	RH	PDI
Temp	1.000	0.440 <sup>NS</sup>	-0.662 <sup>**</sup>	0.937 <sup>**</sup>
Rainfall	0.440 <sup>NS</sup>	1.000	-0.075 <sup>NS</sup>	0.525 <sup>*</sup>
RH	-0.662 <sup>**</sup>	-0.075 <sup>NS</sup>	1.000	-0.495 <sup>NS</sup>
PDI	0.937 <sup>**</sup>	0.525 <sup>*</sup>	-0.495 <sup>NS</sup>	1.000

\*\* Highly significant

\*Significant

NS Non-significant

Correlation of weather parameters on disease incidence was studied from 01/01/2023 to 28/04/2023 in fifteen meteorological weeks under field conditions at experimental plot, P. G. Department of Agriculture, Khalsacollege, Amritsar. The correlation coefficient was computed using OPSTAT software by obtaining the observations of weather parameters and per cent disease index (PDI). The weather parameters (average temperature, rainfall and relative humidity) were kept as independent variables while observations of PDI (%) were kept as dependent variable. The correlation coefficient during rabi season 2022-2023 was depicted in Table 1 and Table 2. Temperature was significantly positively correlated with PDI (0.937\*\*), rainfall was also significantly positively correlated with PDI (0.525\*), whereas, relative humidity was non significantly negatively correlated with PDI (-0.495<sup>NS</sup>). Our findings are similar to Khamariet *al* (2017) reported that the disease incidence of *Alternaria* blight caused by *Alternariaporri* depends on epidemiological parameters and observed that change of climate affects the disease incidence. Correlation of weather parameters on disease occurrence was observed from 21/11/2012 to 19/03/2013 in sixteen meteorological weeks under field condition. The weather factors such as maximum and minimum temperature (°C), maximum and minimum relative humidity (%), rainfall (mm), number of rainy days (days), wind velocity (km/hr) were responsible for 70.2% of the *Alternaria* blight disease incidence. Thus, they observed that the parameters like maximum temperature, maximum relative humidity, number of rainy days and wind velocity were statistically significant towards disease development. Islam *et al* (2020) considered metrological parameters for contributing purple blotch disease incidence in the experimental plot when the minimum and the maximum air temperature was 11.21°C and 24.14°C, respectively, with relative humidity more than 95%. The disease incidence continued on increasing until the last observation (05.03.16), but there was variation in the disease infection rate among the observation dates. However, the disease infection rate was rapid during the maximum air temperature of 25.62 °C and relative humidity of 95.71 % up to 09.02.16. The disease infection rate gradually declined when there was increase in air temperature and decrease in relative humidity.

## CONCLUSION

From above study, it can be concluded that the epidemiological parameters such as temperature (°C), rainfall (mm) and relative humidity (%) were recorded from the time of sowing of onion seedlings and successive purple blotch disease development was

reported from 24.02.2023 to 28.4.2023 at seven days intervals by calculating per cent disease index (PDI). Fifteen meteorological weeks were observed to correlate weather parameters with per cent disease index. The results showed that the disease started appearing in the last week of February when the temperature reached up to 21.5 (°C) and relative humidity reached up to 80.85 %. The correlated data showed that the temperature was significantly positively correlated with PDI (0.937\*\*), rainfall was also significantly positively correlated with PDI (0.525\*), whereas, relative humidity was non significantly negatively correlated with PDI (-0.495<sup>NS</sup>).

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