Mycopath (2019) 17(2): 63-67 **Research Article**

Distribution of powdery mildew in field and waste land weeds in urban and sub-urban areas of Central Punjab

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Abstract

Weeds act as alternative host of many plant pathogens as they serve source of over-wintering for a wide range of pathogens and effects on all aboveground parts of the plant. Perennials weeds play important role in the spreading of obligate pathogens. Among the prevalent diseases caused by obligate fungal pathogens, powdery mildew is counted in most common diseases especially for vegetables and ornamental plants in Pakistan. The pathogens *Erysiphe cichoracearum*, *Sphaerotheca fuliginia*, and *Leveillulata urica* have been reported on *Convolvulus arvensis, Argemone mexicana*, *Rumex obtusifolious* and *Rumex dantatus*, *Euphorbia hirta, Conyza ambigua*, *Cucumis melo* var. Agrestis and *Chenopodium murale* in Lahore, Faisalabad, Gujranwala and Sheikhupura districts of Central Punjab. Distribution assessment on a visual 0–5 visual rating scale was recorded at 4 severity rating on *C. arvensis,* while other weeds showed intermediate reaction except *C. melo* proved highly resistant against powdery mildew.

Keywords: Ornamental, Powdery mildew, Vegetables, Weeds.

Introduction

The weeds are considered as a regular feature of every type of cropping system. Agricultural fields, being a problem for annual and perennial crops due to its perennial character and some are climbing type and have longer contact from soil line to canopy of their target plant. They are also problematic in urban and suburban areas as source of disseminating various plant pathogens, in parks and home gardens. Weeds are recognised worldwide as an important type of undesirable, economic pest, especially in agriculture. Weeds act as alternative host for obligate pathogens and also play importance role in over wintering of pathogen during the unfavourable abiotic condition. The powdery mildew is among the most common occurrence diseases on weeds under warm humid climate. So far it has been reported on a variety of weeds (Sharma *et al.*, 2004; Mulpuri *et al.*, 2016) According to the Yarwood (1957), the outbreak of powdery mildew first time was observed on grapes in Europe in 1845 and most widespread and disastrous losses attributable to a powdery mildew were on grapes in France during the 1850. Powdery mildew is caused by a complex of species of the family *Erysiphaceae* (genera of *Erysiphe, Leveillula, Oidium, Podosphaera, Phyllactinia, Sphaerotheca, Uncinula* and *Microsphaera*under order Erysiphales (Takamatsu *et al.*, 2015; Kraul, 2019). Powdery mildew causal agent is an obligate fungus; it survives on weeds in the absence of their host. Weeds also affect the adjacent susceptible crops and cause severe damage when abiotic conditions are suitable for powdery mildew pathogen (Kusch and Panstruga, 2017).

The disease is characterized with occurrence of white patches of dense mycelium on infected leaves. This on later stages of disease development turns into yellow blotches on the upper and lower surfaces of leaves, leaf sheaths and other fleshy green parts of the weeds. The disease causes yellowing, discoloration, stunting and distortion of leaves, buds, growing tips and green parts of stem. Under severe cases of infection plant fails to survive and inoculum bank develops in the vicinity of the plant which may lead towards disease epidemics (Fondevilla and Rubiales, 2012; Atiq *et al.*, 2016; Singh *et al.*, 2016). In the present investigation a detailed survey was conducted from urban and sub urban areas of Central Punjab to assess the distribution of powdery mildew on eight weeds *viz. Convolvulus arvensis, Argemone mexicana, Rumex obtusifolious*, *Euphorbia hirta*, *Conyza ambigua*, *Cucumis melo*, *Chenopodium murale* and *Rumex dantatu*s.

Materials and Methods

The initial survey was conducted on wasteland and vegetable fields of university of the Punjab which is located at 31.5° North latitude and 74.3° Eastlongitudes in Lahore. For further study, two surveys (2017-2018) of selected areas were carried out on disease incidence, prevalence, severity during summer season (Table 1). Disease assessment was made by randomized block design (RCD). The surveys were conducted in the urban and sub urban areas comprising on Lahore, Faisalabad Gujranwala and Sheikhupura districts of central Punjab. The different sites for crop cultivation anduncultivated wasteland was tagged for regular monitoring of powdery mildew in each selected area, listed in (Table 2) and observed ware made at 7th and 15th day interval.

Prevalence and severity were recorded in %age as formula given below.

$$\text{Prevalence (\%)} = \frac{\text{No. of infected fields}}{\text{Total no. of field visited}} \times 100$$

$$\text{Severity (\%)} = \frac{\text{Infected area of plant}}{\text{Total area of plant}} \times 100$$

During survey, a total of 48 sites from 15 locations of three administrative divisions of Punjab province *viz.* Lahore, Faisalabad, Gujranwala and Sheikhupura key locations were visited. In Lahore vegetables grown as kitchen gardening was observed 10 sites and 3 sites were tagged for regular monitoring of the disease. Kindeya *et al.* (2018), 0–5 visual rating scale was developed to evaluate severity of Powdery mildew where 0 = healthy plant while 5 = more than 80% infected plant (Table 1).

Results and Discussion

The initial surveys were conducted from the mid-June to mid-September 2017 in the administrative divisions of Lahore, Faisalabad and Gujranwala comprising on 11,727 km², 17,917 km² and 17,206 km² total area respectively. The study area represents rice-wheat and mix cropping zones, where Lahore and Gujranwala areas are considered in high rain fall areas with 578 mm and 628.8 mm, respectively. Surveys were conducted before, during and after the monsoon season. Among these districts, the incidence of the powdery mildew on weeds was found in Lahore district mainly in the University of the Punjab Botanical Garden. The minimum incidence was recorded in Sheikhupura region. Weed species were screened as potential alternative hosts for powdery mildew pathogen.

The data collected thorough the surveys from mid-June to September regarding incidence of powdery mildew showed the appearance and distribution of the disease during the second week of August. The observations of disease distribution map exhibited the perfect stage within different growing region of central Punjab. During the study period, 48 fields were surveyed in Lahore growing region. The first observation of perfect stage was recorded in early September from multiple fields in districts of central Punjab, whereas the asexual stage was first reported during mid- Jun. Over 85% of surveyed fields infected with powdery mildew also harboured the perfect stage (Fig. 1).

The fungus on weed plants generally serves as alternate host and source of over wintering for the pathogen. Although powdery mildew has a wide host range but it was observed that attack of fungus was more prevalent on *C. arvensis* (Glawe *et al.,* 2003). According to the data collected. *C. arvensis* was more common in entirely visited fields and also susceptible scored 5 severity rating. *C. ambigua* exhibited 3 SR value with 60% distribution, *R. obtusifolious* recorded 2.5 SR value with 70% distribution. *C. murale* exhibited 2.5 SR value with 40% distribution and *E. hirta* showed 2 SR value with 50% distribution (Table 3). The least occurrence of the disease was recorded on *C. melo* and *A. Mexicana* as shown in (Fig. 2). These weeds were found in wasteland as well as in the fields. Powdery mildew occurring on weeds a great menace in several states of Asia, hence serves as potential source of inoculum. Generally, farmers neglect the weeds presence in their field, therefore proper weed eradication should be done in order to reduce the disease prevalence (Loux *et al.,* 2017).

Conclusion

During the survey, it is concluded that overall quality and quantity of fields crops is lowered by powdery mildew disease. It was observed that weeds not only compete for nutrients they are also major source of survival and multiplication of the pathogens. Therefore, weed management or field sanitation should be adopted for getting healthy crop with high yield. On the *C. arvensis* powdery mildew severe attack and kill the plants, in contrast *C. melo* var. *agrestis* show maximum resistance against the powdery mildew. This disease is also more prevalent in the vegetable's fields and greenhouses, which needs study on fungicides which can control powdery mildew effectively. Adopts alternative management practices such as cultural practices and biological control methods.

Table 1: Modified disease rating scale 0–5 of Kindeya *et al.* (2018).

Rating Scale	Description
0	0% = Highly resistant (HR)
1	1–5% = Resistant (R)
2	6–25% = Moderately resistant (MR)
3	26–50% = Moderately susceptible (MS)
4	51–75% = Susceptible (S)
5	76–100% = Highly susceptible (HS)

Table 2: Surveyed sites of urban and sub urban areas of central Punjab.

Districts	Locations	Observations/Number of days
Lahore	Punjab University waste and Experimental crop areas	7th Days intervals
Faisalabad	Ayub Research Institute and University of Agriculture	15th Days intervals
Gujranwala	Tehsil Nowshera Virkan and tehsil Kamoke	15th Days intervals
Sheikhupura	Tehsil Muridke and Tehsil Ferozwal	15th Days intervals

Table 3: Distribution and severity of powdery mildew on field and waste land weeds

Sr. No.	Local Name	Botanical Name	Distribution (%)	Severity	Distribution pattern
1	Lehli	*Convolvulus arvensis*	80	5	Almost all fields
2	Kandyari	*Argemone mexicana*	20	1.5	Found in rose field
3	Jangli Palak	*Rumex obtusifolious*	70	2.5	Found in tomato, rose, sugarcane fields and waste lands.
4	Lal Dhodhak	*Euphorbia hirta*	50	2	Found in rose fields
5	Chibhar	*Cucumis melo* var. Agrestis	5	1	Found in sugar cane field
6	Krund	*Chenopodium murale*	40	2.5	In nurseries under green house
7	Toothhead dock	*Rumex dentatus*	70	1.5	In rose fields
8	Horse weed	*Conyza ambigua*	60	3	In waste land

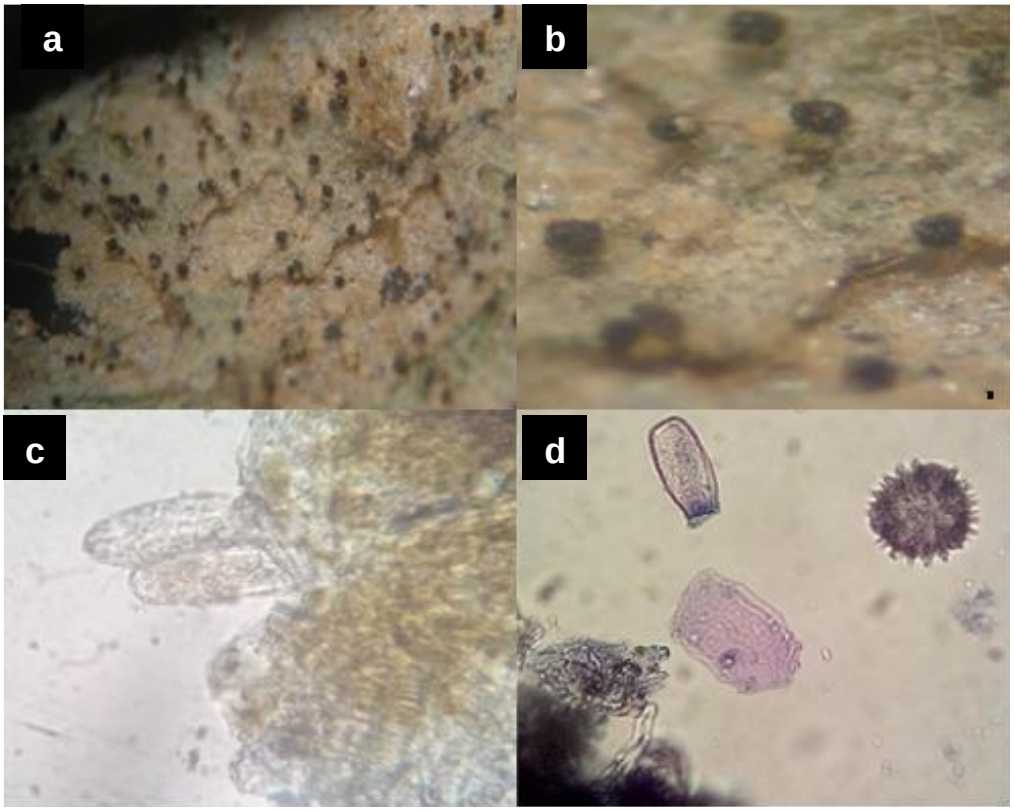

Fig. 1: Mycelium and cleistothecia on leaf (**a** and **b**); Cleistothecium of a powdery mildew (**c**); and Conidia and typical shapes of a powdery mildew (**d**).

Fig. 2 (a-h): Distribution and severity of powdery mildew on field and wasteland weeds.

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