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Survey for pearl millet downy mildew incidence and severity in major pearl millet growing areas of Marathwada region

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Abstract

A total of 375 fields in the districts viz., Beed, Jalna and Aurangabad, covering 15 tehsils with 75 villages of Marathwada region of Maharashtra state, were surveyed during two consecutive Kharif seasons each (2019-20 and 2020-21) for disease incidence and disease severity of downy mildew of pearl millet at 30 DAS and 60 DAS. The maximum average downy mildew incidence of 4.05 and 5.7 per cent was noticed in Beed district at 30 DAS and 60 DAS respectively followed by followed by Aurangabad district (3.98% and 5.61%), Jalna (1.51% and 2.25%). Similarly maximum disease severity of 2.61% and 3.69%, was noticed in Aurangabad district at 30 and 60 DAS respectively, followed by Beed 2.22% and 3.20% and Jalna 0.88% and 1.45%. The overall mean downy mildew incidence was 3.18% and 1.90% at 30 DAS, 4.53% while overall mean downy mildew severity was 1.90% and 2.75% at 30 DAS and 60 DAS, respectively.

Keywords: Survey, pearl, millet, Marathwada, DAS

Introduction

Pearl millet (*Pennisetum glaucum* (L.) is one of the most drought, heat tolerant, climate resilient, and C4 cereal crop belongs to family Poaceae. It is popularly known as Bajra in India and Cat tail, Bulrush or Spiked millet, African millet or barbed millet in various parts of the world. The photosynthesis efficiency of pearl millet crop is 50 per cent higher than C3 crops (Wang *et al.* 2012). Pearl millet is a climate-smart crop with nutritious grains. Pearl millet is warm weather crop thereby reinforcing fight against food insecurity in the arid and semiarid environments (Bailey *et al.* 1979; Buerkert *et al.* 2001; Jukanti *et al.* 2016)^[2, 3, 4].

It is being grown in Maharashtra as sole crop for grain and fodder purposes. It occupies 0.64 M ha with an annual production 0.64 MT and productivity of 1003 kg/ha (Anonymous, 2021)^[1]. Marathwada region comprising Beed, Jalna and Aurangabad is the major pearl millet growing area of the state; as these three districts jointly contribute more than 80% share in area and production of this crop in the state. Marathwada region occupies 0.137 M ha with an annual production 1.22 MT and productivity of 994 kg/ha (Anonymous, 2021)^[1]. Downy mildew, caused by *Sclerospora graminicola* (Sacc.) Schoret, is the most important and widespread biotic constraint to sustain high productivity of pearl millet in India. The disease was quite severe in Ahmednagar, Jalgaon, Aurangabad and Jalna districts of Maharashtra state with mean disease incidence of 56%, 40%, 35% and 32%, respectively. Therefore, the present study was carried out know to know the actual distribution and prevalence of the disease in the major pearl millet growing areas of Marathwada region is required.

Materials and Methods

A roving survey of farmer's field was undertaken in the major pearl millet growing districts of Marathwada region viz., Beed, Jalna and Aurangabad at pre-boot to flowering stage for downy mildew incidence and severity of pearl millet at 30 DAS and 60 DAS. During Kharif 2019-20 and 2020-21.

Observations for downy mildew incidence and severity were recorded at every 8-10 kilo meter intervals and fields on both sides of the road were scouted in a zigzag fashion. The selection of village and fields was done randomly. In one district five tehsil, in one Tehsil, five villages and in one village five fields were observed to assess the disease incidence and disease severity.

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Average incidence of the disease in each village and Tehsil was calculated. In each field, five random subplots (four at the corners and one in the middle) were selected, and within each subplot, a minimum of 50 plants were counted in 2–3 rows to record diseased and healthy plants. The sum totals of healthy and diseased plants from 5 subplots of each field were used to determine the downy mildew incidence per cent. The per cent disease incidence was calculated as per formula given below

$$\text{Disease severity (\%)} = \frac{[(1-1).n_1 + (2-1).n_2 + (3-1).n_3 + (4-1).n_4 + (5-1).n_5]}{[(5-1).N]} \times 100$$

$$\text{Per cent disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \times 100$$

Results and Discussion

A roving survey of farmer’s field for occurrence of downy mildew incidence and severity at 30 DAS and 60 DAS was undertaken in the major pearl millet growing districts of Marathwada region viz., Beed, Jalna and Aurangabad at pre-boot to flowering stage for of downy mildew of pearl millet during Kharif 2019-20 and 2020-21.

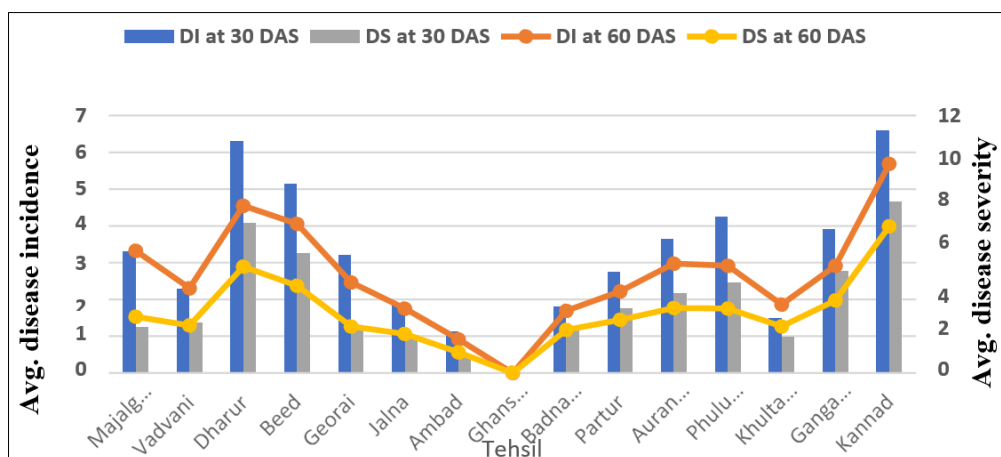


Fig 1: Tahsil – wise pooled pearl millet downy mildew incidence and severity in major pearl millet growing districts of Marathwada region (Kharif 2019-20 and 2020-21)

As a result of discussion, it was observed that the disease appeared in most of the fields wherever The pearl millet crop has been grown commonly as rainfed crop and the farmers are mostly sowing locally available cultivars without seed treatment. Downy mildew incidence and severity were minimal due to disease tolerant cultivars and unfavorable environmental conditions to disease., A total of 375 fields in the districts viz., Beed, Jalna and Aurangabad, covering 15 tahsils with 75 villages of Marathwada region of Maharashtra state, were surveyed during two consecutive *Kharif* seasons each (2019-20 and 2020-21) for disease incidence and disease severity of downy mildew of pearl millet at 30 DAS and 60 DAS. Pooled mean results, (Fig. 1) revealed that, the mean disease incidence at 30 DAS in Beed district’s tahsils ranged from 2.30 to 6.30%. However, it was highest (6.30%) in Dharur tahsil, followed by Beed (5.15%), Majalgaon (3.30%), Georai (3.20%) and Wadvani (2.30%) tahsils. The mean disease severity ranged from 1.22 to 4.07%. However, it was highest (4.07%) was recorded in Dharur tahsil, followed by Beed (3.25%), Wadvani (1.38%), Majalgaon (1.26%) and Georai (1.22%) tahsils. At 60 DAS, mean disease incidence ranged from 3.95 to 7.80. However, it was highest (7.80%) in Dharur tahsil, followed by Beed (6.95%), Majalgaon (5.70%), Georai (4.23%) and Wadvani (3.95%) tahsils. The mean disease severity ranged from 2.17 to 4.96%. However, it was highest (4.96%) was recorded in Dharur tahsil, followed by Beed (4.07%), Majalgaon (2.62), Wadvani (2.21%) and Georai (2.17%) tahsils.

In Jalna district, the mean disease incidence at 30 DAS was ranged from 0.00 to 2.75%. However, it was highest (2.75%)

in Partur tahsil, followed by Jalna (1.90%), Badnapur (1.80%), Ambad (1.12%) tahsils and there was no disease found in Ghansawangi tahsil. The mean disease severity ranged from 0.00 to 1.75%. However, it was highest (1.75%) in Partur tahsil, followed by Badnapur (1.17%), Jalna (1.03%), Ambad (0.47%), Ghansawangi (0.00%) tahsils. At 60 DAS the mean disease incidence ranged from 0.00 to 3.80%. However, it was highest (3.80%) in Partur tahsil, followed by Jalna (3.00%), Badnapur (2.90%), Ambad (1.57%) and Ghansawangi (0.00%) tahsils. The mean disease severity ranged from 0.00 to 2.48%. However, it was highest (2.48%) in Partur tahsil, followed by Badnapur (2.01%), Jalna (1.83%) Ambad (0.96%) tahsil. In Ghansawangi tahsil no disease was found during both Kharif seasons at 30 DAS and 60 DAS.

In Aurangabad district, the mean disease incidence at 30 DAS ranged from 1.50 to 6.60%. However, it was highest (6.60%) in Kannad tahsil, followed by Phulumbhari (4.25%), Gangapur (3.90%), Aurangabad (3.65%) and Khultabad (1.50%) tahsils. The mean disease severity ranged from 0.98 to 4.66%. However, it was highest (4.66%) in Kannad tahsil, followed by Gangapur (2.77%), Phulumbhari (2.47%), Aurangabad (2.17%) and Khultabad (0.98%) tahsils. At 60 DAS mean disease incidence ranged from 3.20 to 9.75%. However, it was highest (9.75%) in Kannad tahsil, followed by Aurangabad (5.10%), Phulumbhari and Gangapur (5.00% each) and Khultabad (3.20%) tahsils. The mean disease severity ranged from 2.17 to 6.84%. it was highest (6.84%) recorded in Kannad tahsil, followed by Gangapur (3.39%), Aurangabad (3.04%) Phulumbhari (3.00%), and Khultabad (2.17%) tahsils.

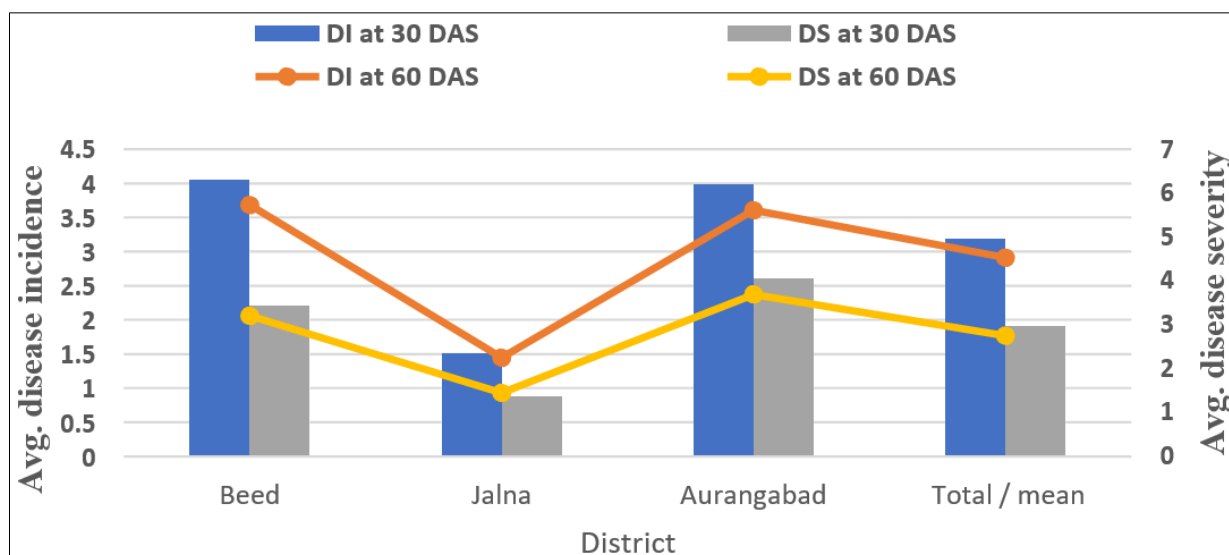


Fig 2: District- wise pooled pearl millet downy mildew incidence and severity in major pearl millet growing districts of Marathwada region (Kharif 2019-20 and 2020-21)

Pooled mean results (Fig. 2) revealed that, the highest disease incidence in Beed district 4.05% and 5.7% at 30 DAS and 60 DAS respectively followed by Aurangabad district (3.98% and 5.61%), Jalna (1.51% and 2.25%). Similarly highest disease severity in Aurangabad district 2.61% and 3.69%, followed by Beed 2.22% and 3.20% and Jalna 0.88% and 1.45% at 30 and 60 DAS respectively during *Kharif* 2019-20 and 2020-21. Overall mean downy mildew incidence was 3.18% and 4.53% while overall mean downy mildew severity was 1.90% and 2.75% at 30 DAS and 60 DAS, respectively.

The above result are accordance with the scientist Rao *et al.*, (2005)^[5] who surveyed 585 pearl millet fields in 16 districts of Rajasthan, 59% of these showed downy mildew infection. The mean downy mildew incidence across pearl millet cultivars over four seasons varied from low to moderate (1–21%) in 14 districts, and minimum downy mildew was recorded in Alwar and Karauli districts. Sharma *et al.*, (2005)^[5], who reported average of 1.02, 2.86 and 1.94 per cent pearl millet downy mildew in Morena, Bhind and Gwalior, respectively. The downy mildew incidence in Morena district was in the range of 0-1.53 percent. Sharma *et al.*, (2010) surveyed total of 24 villages in localities of Morena, Bhind and Gwalior (Northern MP) to find out pearl millet downy mildew incidence, during *Kharif* 2009. They reported majority of pearl millet crop fields surveyed were free from downy mildew. The mean downy mildew incidence in Morena, Bhind and Gwalior was 1.31, 0.79 and 0.5 per cent, respectively. Saini (2019) reported the occurrence of pearl millet downy mildew in Bikaner, Jodhpur, Sikar, Jaipur and Alwar districts (Rajasthan), during *Kharif* 2016 and 2017, at preboot to flowering stage survey. Average downy mildew incidence in different districts varied from 9.87 to 17.95 percent. However, it was maximum (17.95%) in Bikaner district, followed by Sikar (17.4%), Jaipur (16.93%), Alwar (13.35%), and Jodhpur (9.87%). He reported common occurrence of downy mildew wherever millet was grown regularly and receiving average rain fall regularly.

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