

To effectively manage DM, the development of cultivars with genetic resistance to the disease should be a primary objective of the local pearl millet breeding program. To facilitate breeding for resistance, a DM 'sick plot' (oospore-infested field) could be developed for screening breeding lines at the Hagaz Research Station. A brief (1-2 months) training period for a pathologist and technical staff in DM screening can be provided at ICRISAT, Patancheru. Surveys of DM incidence in farmers' fields should continue to document variation in spatial and temporal virulence patterns on landraces and improved cultivars. The International Pearl Millet Downy Mildew Virulence Nursery, co-ordinated by ICRISAT, could be useful in assessing variation in the pathogen population. A number of new resistant cultivars should be made available to farmers to reduce both the losses from DM and the likelihood of the pathogen overcoming the resistance of any single variety. Ultimately, greenhouse facilities for screening seedlings for DM resistance should be established at the agricultural research headquarters, Halhale.

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Pearl Millet Downy Mildew in Gujarat

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Introduction

Downy mildew (DM) caused by *Sclerosporagraminicola* (Sacc.) J. Schrott., is the most serious disease of pearl millet (*Pennisetum glaucum* (L.) R.Br.), particularly when it affects hybrids. In recent years due to the large-scale cultivation of hybrids in India, several new pathotypes of *S. graminicola* have evolved, and some promising ones have succumbed to DM (Thakur and Rao 1997; Thakur et al. 1999). Monitoring the DM resistance of pearl millet hybrids and virulence in the pathogen is critical for effective utilization of resistance genes. During a collaborative project on characterization of pathogenic variability in the pearl millet DM pathogen between ICRISAT and the All India Coordinated Pearl Millet Improvement Project (AICPMIP) of the Indian Council of Agricultural Research (ICAR), field surveys were conducted in Gujarat. The results of a systematic field survey undertaken to monitor DM incidence on various hybrids in farmers' fields in major pearl millet growing areas of Gujarat during the 2001 rainy season are reported.

Materials and methods

The survey involved 18 *talukas* (subdivisional revenue units) of Jamnagar, Rajkot, Surendranagar, Kheda, Anand, and Panchmahal districts of Gujarat during the 2001 rainy season. It covered 88 fields (17 fields in Anand, 30 in Jamnagar, 3 in Rajkot, 18 in Kheda, 7 in Panchmahal, and 13 in Surendranagar), ranging between 0.25-1 ha per field and encom-passing 21 different hybrids. DM incidence was recorded in five 2-nr random subplots where 50 plants subplot⁻¹ were examined for disease symptoms. Disease incidence (%) was calculated from the ratio of diseased to total plants.

Information on cultivars, seed treatment, sowing date, fertilizer application, weeding, latitude and longitude, and cropping sequence were recorded to ascertain the relationship between these components and disease development. Seeds of most hybrids were available on

time, facilitating sowings to be completed by the 2nd week of June. Many farmers applied 30-40 kg P₂O₅ ha⁻¹ as a basal dose and 80 kg ha⁻¹ of urea (46% N) as top dressing. The crop was at the soft-dough to hard-dough stages during the survey.

Results and discussion

The average rainfall was >500 mm, which was above normal. Its distribution was uniform in most of the areas surveyed. There were 21 hybrids from public and private seed companies grown by farmers (Table 1). Some seed lots were treated with Apron[®] (metalaxyl) as indicated on the seed bags.

DM incidence in general was only a trace in Jamnagar, Rajkot and Surendranagar districts, but the mean incidence was 30% in Kheda with a range of 1-86%; 45% in Anand with a range of 0-92%, and 36% with a range of 4-77% in Panchmahal districts. Of the 15 private-sector hybrids, seven (Amul, MRB 2210, Nandi 3, PAC 931, Proagro 7501, - 9330, and Vikram 51) were free from DM and the remaining eight recorded mean incidences from 9% on JKBH 26 to 55% on Super Prashanth 44 (Table 1). Of the six public-sector hybrids only GHB 235 was free from DM and the remaining five hybrids (GHB 316, GHB 526, Pusa 23, BK 560, and ICMH 451) recorded mean incidence of 2% on GHB 316 to 68% on ICMH 451.

Table 1. Downy mildew (DM) incidence of pearl millet hybrids grown in farmers' fields surveyed in Jamnagar, Surendranagar, Rajkot, Kheda, Anand and Panchmahal districts, Gujarat, India, rainy season, 2001

| Cultiva | Fields | Mean | Range ¹ |
|--------------------|--------|----------|--------------------|
| Private sector | | | |
| Nava Moti | 1 | 2 ± 0.0 | 2-2 |
| JKBH 26 | 2 | 9 ± 2.4 | 0-30 |
| Proagro 7701 | 1 | 18 ± 2.2 | 12-14 |
| PBH 47 | 1 | 27 ± 1.9 | 20-30 |
| MLBH 308 | 3 | 28 ± 1.8 | 20-40 |
| Pioneer 7777 | 3 | 34 ± 4.8 | 10-60 |
| Swaminath | 1 | 42 ± 6.2 | 28-60 |
| Super Prashanth 44 | 1 | 55 ± 4.5 | 40-66 |
| Public sector | | | |
| GHB 316 | 1 | 2 ± 0.5 | 0-6 |
| GHB 526 | 1 | 16 ± 2.1 | 10-20 |
| Pusa 23 | 10 | 20 ± 3.1 | 0-70 |
| BK 560 | 2 | 24 ± 5.3 | 10-50 |
| ICMH 451 | 12 | 68 ± 3.6 | 24-100 |

1. Across subplots in fields surveyed.

Different cropping sequences were followed during the rainy and post-rainy seasons based on the availability of irrigation. DM incidences in cropping sequences were 37% in pearl millet-tobacco (*Nicotiana tabacum* L.)-pearl millet, 92% in pearl millet-wheat (*Triticum aestivum* L.)-castor (*Ricinus communis* L.)-pearl millet, and 29% in pearl millet-vegetables-pearl millet, 10% in pearl millet-cowpea (*Vigna sinensis* Endl.)-maize (*Zea mays* L.)-pearl millet, compared to 55-77% DM incidence in pearl millet after pearl millet. The pearl millet-cowpea-maize-pearl millet sequence had the comparative advantage of reducing DM incidence that needs further investigation.

It is necessary to constantly monitor the performance of hybrids for DM incidence. Since the cultivation of pearl millet during summer has increased in central Gujarat, a similar survey could be useful to assess DM incidence on different cultivars.

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