Original Research Article

Screening of Little Millet Germplasm against Grain Smut Caused by Macalpinomyces sharmae

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ABSTRACT

Three field trials were conducted during Kharif 2014 at experimental area of AICRP on Small millet, College of Agriculture, Rewa (M.P.) to screen the little millet germplasm against grain smut under field conditions. Six pre-released and released cultivars namely DhLTMV 36-3, Kadi 1, OLM 203, KOPLM 53, GPUL 1 and GPUL 2 were free from grain smut and seven namely BL 8, TNPSU 171, TNPSU 170, BL 6, DhLTMV 10-2, TNAU 160 & BL 41-3 were found resistant. Four entries namely OLM 203, TNAU 163, TNAU 176 and TNAU 178 were free and RLM 208 was resistant to grain smut in Donor Screening Nursery. Fourteen landraces namely RLM 175, RLM 177, RLM 179, RLM 182, RLM 186, RLM 189, RLM RLM 203, RLM 204, RLM 211, RLM 225, RLM 226, RLM 228, RLM 231 & RLM 232 were free from grain smut and 28 were resistant having up to 5.0 susceptibility index. Among, 100 landraces of little millet, 13.9% landraces were highly resistant, 27.7% were resistant, 41.6% moderately resistant, 11.9% susceptible and 4.9% highly susceptible to grain smut. Fourteen landraces namely RLM 175, RLM 177, RLM 179, RLM 182, RLM 186, RLM 189, RLM RLM 203, RLM 204, RLM 211, RLM 225, RLM 226, RLM 228, RLM 231 & RLM 232 were completely free from grain smut.

Keywords
Germplasm, Grain smut, Macalpinomyces sharmae, Little millet.

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Introduction

Little millet (Panicum sumatrense Roth ex Roemer and Schultes), locally known as kutki, mejhari, medoi is one of the hardiest minor cereal crop belonging to the family Poaceae (Gramineae) and is indigenous to Indian sub-continent. The crop is cultivated by tribal and poor farmers in low fertile soils with low or no cash input for food and feed. It has an excellent rejuvenating capacity compared to other cereal crops. In India, the crop is cultivated in an area of 291 thousand hectares with annual production of 102 thousand tones and productivity of 349 kg per hectare (Anonymous, 2011) which is very less as compared to other cereal crops. Andhra Pradesh, Chhattisgarh, Madhya Pradesh, Odisa, Tamil Nadu, Karnataka, Jharkhand and Gujarat are major little millet growing states in the country. In Madhya Pradesh, the crop is cultivated in 51.54 thousand hectare with productivity of 525.5 kg per hectare (www.landrecords.mp.gov.in). Dindori, Mandla, Chhindwara, Balaghat, Seoni, Anuppur, Betal, Singrauli, Umaria, Sidhi, Shahdol, Jabalpur, Narsinghpur, Raipsen and Khandwa are major little millet growing
districts of Madhya Pradesh. The crop is highly drought tolerant and nutritionally as well as medicinally superior or at par with other cultivated cereals. Grains are recommended for diabetic and patients of cardio-vascular diseases. The grain of little millet possesses excellent storage properties and can be stored for several years without fear of store grain pests under ordinary storage conditions. Little millet is well known for its drought tolerance and is considered as one of the least water demanding crop. Being eco-friendly, the crop is suitable for fragile and vulnerable agro-ecosystems. Grain smut (Macalpinomyces sharmae), rust (Uromyces linearis), banded leaf and sheath blight (Rhizoctonia solani) and Udbatta (Ephelis oryzae) are important fungal diseases occurred at different stages of plant growth and caused economical yield loss under favourable environmental conditions (Pall et al., 1980; Jain et al., 1997 and Chauhan, 2014). In India, grain smut was first reported by Sharma and Khare (1987) from Dindori district of Madhya Pradesh and causal organism was identified as Tolyposporium sp. Later, it was described as Macalpinomyces sharmae (Vanky, 1995). The disease is also reported from Jharkhand, Chhattisgarh and Tamil Nadu states of the country (Anonymous, 2004 and 2012; Haider, 1997). Sharma and Khare (1987) noticed up to 50 per cent plants/ grains affected by the pathogen whereas Jain et al., (2006) reported 9.8 to 53.5 per cent reduction in grain yield per plant, 4.2 to 16.6 per cent in plant height and 6.4 to 38.9 per cent in panicle length. Jain and Joshi (2015) recorded 2.1 to 18.9% loss in grain yield due to grain smut in little millet.

The disease is ovaricolous and symptoms appeared at grain formation stage. The affected ovary is converted into smut, but does not increase in size than the normal grain. Some of the late developing grains remain greenish and increase in size slightly over the normal grains. On pressing such greenish healthy appearing grains release spores (Sharma and Khare, 1987). Studies on management of grain smut in little millet is meager in the literature, however few studies on identification of resistant sources and management through seed treatment with carboxin and carbendazim has been reported. Although, disease can be controlled by application of different chemicals but this is not the right way to control diseases in the present context because chemical application has its many disadvantages like soil pollution, water pollution and environment hazardous. Now a day people are very conscious to health and they are moving to organic production and consumption. The growing of resistant genotypes of crops is one of the best ways to manage many biotic and abiotic stresses in organic crop production system. So the present study was focused on status of the disease in the farmers’ field and identification of resistant sources.

Materials and Methods

Pre-released and released cultivars of little millet

Twenty pre-released and released cultivars (DhLtMV 36-3, TNPSU 174, BL 8, Kadiri 1, DLM 89, TNPSU 167, BL 150, OLM 203, DLM 103, TNPSU 171, JK 8, TNPSU 170, BL 6, DhLtMV 10-2, TNAU 160, BL 41-3, KOPLM 53, GPUL 1, GPUL 2 and JK 36) of little millet having different maturity period were screened against grain smut. The seeds were sown in two rows of 3.0 m length in three replications at the spacing of 25.0 cm row to row and 7.5 cm plant to plant in randomized block design. Recommended doses of fertilizer i.e. 40 kg N and 20 kg P2O5 were applied before sowing for optimum plant growth. Grain smut incidence was recorded at dough stage by counting healthy and smutted plants in each row. Grain smut
severity was recorded by counting infected grains per panicle and susceptibility index (SI) was calculated for each cultivars.

**Reaction of little millet cultivars in donor screening nursery**

Thirteen cultivars (RLM 135, RLM 175, RLM 192, RLM 203, RLM 204, RLM 208, RLM 224, JK 8, OLM 203, TNAU 163, TNAU 176, TNAU 178 and RLM 4-1) of little millet received from Project Coordinating cell (Small millets), Bangalore, were sown in two rows of 3.0 m length in three replications at the spacing of 25.0 cm row to row and 7.5 cm plant to plant in randomized block design. Recommended doses of fertilizer i.e. 40 kg N and 20 kg P₂O₅ were applied before sowing for optimum plant growth. Grain smut incidence was recorded at dough stage by counting healthy and smutted plants in each row. Grain smut severity was recorded by counting infected grains per panicle and susceptibility index (SI) was calculated for each cultivar.

**Land races of little millet**

One hundred land races collected from seven districts of Madhya Pradesh were screened along with susceptible check (JK 8) against grain smut under field condition. The Seeds were sown in two rows of 3.0 m length with 25.0 cm row to row and 7.5 cm plant to plant spacing in augmented design. Recommended doses of fertilizer i.e. 40 kg N and 20 kg P₂O₅ were applied before sowing for optimum plant growth. Grain smut incidence was recorded by counting healthy and smutted plants in each row. Grain smut severity was recorded in 20 panicles and susceptibility index was calculated.

Identification and utilization of resistant cultivars is the cheapest and feasible way to combat with any disease problem. In the present study, 20 pre-released and released cultivars, 13 entries from Donor Screening Nursery (DSN) and 100 landraces of little millet were screened against grain smut under field conditions. Six pre-released and released cultivars namely DhLTMV 36-3, Kadiri 1, OLM 203, KOPLM 53, GPUL 1 and GPUL 2 were free from grain smut and seven namely BL 8, TNPSU 171, TNPSU 170, BL 6, DhLTMV 10-2, TNAU 160 and BL 41-3 have shown resistance. In DSN, four entries namely OLM 203, TNAU 163, TNAU 176 and TNAU 178 were free from grain smut and RLM 208 was resistant. Among 100 landraces of little millet, 14 landraces namely RLM 175, RLM 177, RLM 179, RLM 182, RLM 186, RLM 189, RLM RLM 203, RLM 204, RLM 211, RLM 225, RLM 226, RLM 228, RLM 231 and RLM 232 were free from grain smut whereas 28 were resistant showing up to 5.0 susceptibility index. These cultivars may be utilized for resistance breeding programme. Earlier few studies, for identification of resistant sources against grain smut of little millet were undertaken by Jain (2002), Jain (2003), Jain et al., (2006) and Jain and Tripathi (2007) and little millet variety OLM 203 was reported resistant while JK 8 susceptible to grain smut. These reports are in agreement with the present findings.

**Results and Discussion**

**Screening of little millet cultivars against grain smut**

Different categories of little millet cultivars i.e. pre- release and released cultivars, Donor Screening Nursery and land races exhibited significant variation in their response to grain smut caused by *Macalpinomyces sharmae* under field conditions. Grain smut incidence, severity and susceptibility index in 20 pre-released and released cultivars of little millet are presented in table 1. Grain smut incidence ranged 0.0 to 56.8% with 0.0 to 6.7% smut.
Susceptibility index (SI) varied from 0.0 to 17.2% was maximum in JK 36 followed by DLM 89 (15.6%) and JK 8 (14.4%). Six cultivars namely DhLTMV 36-3, Kadi 1, OLM 203, KOPLM 53, GPUL 1 and GPUL 2 were free from grain smut and showed highly resistant reaction, whereas seven germplasm namely BL 8, TNPSU 171, TNPSU 170, BL 6, DhLTMV 10-2, TNAU 160 and BL 41-3 had shown resistant reaction. Three cultivars namely TNPSU 167, BL 150 and DLM 103 were moderately resistant, two germplasm namely TNPSU 174 and JK 8 were susceptible and two germplasm namely DLM 89 and JK 36 was highly susceptible to grain smut.

Table 1 Reaction of pre-released and released little millet cultivars against grain smut

| S. No. | Germplasm       | Incidence (%)a | Severity (%)b | Susceptibility Index (SI) | Reaction |
|--------|-----------------|----------------|---------------|---------------------------|----------|
| 1.     | DhLTMV 36-3     | 0.0(0.00)      | 0.0 (0.701)   | 0.0                       | HR       |
| 2.     | TNPSU 174       | 55.7(48.33)    | 2.2 (1.654)   | 11.1                      | S        |
| 3.     | BL 8            | 30.4(33.44)    | 0.7 (1.077)   | 4.6                       | R        |
| 4.     | Kadi 1          | 0.0(0.00)      | 0.0 (0.701)   | 0.0                       | HR       |
| 5.     | DLM 89          | 56.8(48.97)    | 4.3 (2.189)   | 15.6                      | HS       |
| 6.     | TNPSU 167       | 34.5(35.91)    | 1.4 (1.382)   | 6.9                       | MR       |
| 7.     | BL 150          | 27.1(31.11)    | 1.2 (1.302)   | 5.7                       | MR       |
| 8.     | OLM 203*        | 0.0(0.00)      | 0.0 (0.701)   | 0.0                       | HR       |
| 9.     | DLM 103         | 35.7(36.57)    | 2.1 (1.604)   | 8.7                       | MR       |
| 10.    | TNPSU 171       | 19.5(26.13)    | 0.8 (1.119)   | 3.9                       | R        |
| 11.    | JK 8**          | 42.6(40.68)    | 4.9 (2.327)   | 14.4                      | S        |
| 12.    | TNPSU 170       | 24.1(29.27)    | 0.7 (1.077)   | 4.1                       | R        |
| 13.    | BL 6            | 22.1(27.72)    | 0.4 (0.924)   | 3.0                       | R        |
| 14.    | DhLTMV 10-2     | 21.1(26.93)    | 0.6 (1.028)   | 3.6                       | R        |
| 15.    | TNAU 160        | 10.1(18.39)    | 0.6 (1.037)   | 2.5                       | R        |
| 16.    | BL 41-3         | 13.7(21.26)    | 0.5 (1.005)   | 2.6                       | R        |
| 17.    | KOPLM 53        | 0.0(0.00)      | 0.0 (0.701)   | 0.0                       | HR       |
| 18.    | GPUL 1          | 0.0(0.00)      | 0.0 (0.701)   | 0.0                       | HR       |
| 19.    | GPUL 2          | 0.0(0.00)      | 0.0 (0.701)   | 0.0                       | HR       |
| 20.    | JK 36           | 44.4(41.75)    | 6.7 (2.673)   | 17.2                      | HS       |
| CD(0.05)|               | 7.603          | 0.248         | -                         | -        |

a Figures in parentheses are ARC SIN transformed values.

b Figures in parentheses are square root transformed value.

*Resistant check  ** Susceptible check,

HR = Highly Resistant,  R = Resistant,  MR= Moderately Resistant,
S = Susceptible,  HS= Highly Susceptible
Table 2 Reaction of little millet entries against grain smut in donor screening nursery

| S. No. | Germplasm | Grain smut<sup>a</sup> Incidence (%) | Grain smut<sup>b</sup> severity (%) | Susceptibility index (SI) | Reaction |
|--------|-----------|--------------------------------------|-------------------------------------|--------------------------|----------|
| 1.     | RLM 135   | 35.6(36.60)                          | 2.7 (1.776)                         | 9.8                      | MR       |
| 2.     | RLM 175   | 41.4((39.93)                         | 3.1 (1.860)                         | 11.3                     | S        |
| 3.     | RLM 192   | 41.3(39.89)                          | 1.7 (1.477)                         | 8.4                      | MR       |
| 4.     | RLM 203   | 57.1(49.15)                          | 2.7 (1.774)                         | 12.4                     | S        |
| 5.     | RLM 204   | 61.0(51.43)                          | 3.3 (1.942)                         | 14.2                     | S        |
| 6.     | RLM 208   | 25.5(30.16)                          | 0.8 (1.111)                         | 4.5                      | R        |
| 7.     | RLM 224   | 47.2(43.34)                          | 2.8 (1.804)                         | 11.5                     | S        |
| 8.     | JK 8**    | 69.4(57.00)                          | 5.4 (2.436)                         | 19.4                     | HS       |
| 9.     | OLM 203*  | 0.0(0.00)                            | 0.0 (0.701)                         | 0.0                      | HR       |
| 10.    | TNAU 163  | 0.0(0.00)                            | 0.0 (0.701)                         | 0.0                      | HR       |
| 11.    | TNAU 176  | 0.0(0.00)                            | 0.0 (0.701)                         | 0.0                      | HR       |
| 12.    | TNAU 178  | 0.0(0.00)                            | 0.0 (0.701)                         | 0.0                      | HR       |
| 13.    | RLM 4-1   | 28.4(32.13)                          | 0.9(0.701)                          | 5.1                      | MR       |
|        | CD(0.05)  | 9.424                                | 0.367                               | -                        | -        |

<sup>a</sup>Figures in parentheses are ARC SIN transformed values
<sup>b</sup>Figures in parentheses are square root transformed value.
*Resistant check, **Susceptible check
HR = Highly Resistant,  R = Resistant,  MR= Moderately Resistant,  S=, Susceptible,  HS= Highly Susceptible

Table 3 Reaction of little millet land races against grain smut under field conditions

| S No. | Germplasm | Grain smut<sup>a</sup> Incidence (%) | Grain smut<sup>b</sup> severity (%) | Susceptibility index (SI) | Reaction |
|-------|-----------|--------------------------------------|-------------------------------------|--------------------------|----------|
| 1.    | RLM 101   | 23.0                                 | 2.5                                 | 7.6                      | MR       |
| 2.    | RLM 102   | 26.7                                 | 6                                   | 12.7                     | S        |
| 3.    | RLM 103   | 20.6                                 | 1.8                                 | 6.1                      | MR       |
| 4.    | RLM 104   | 7.7                                  | 2.3                                 | 4.2                      | R        |
| 5.    | RLM 105   | 66.7                                 | 6.1                                 | 20.2                     | HS       |
| 6.    | RLM 106   | 14.3                                 | 2.3                                 | 5.7                      | MR       |
| 7.    | RLM 108   | 14.3                                 | 1.4                                 | 4.5                      | R        |
| 8.    | RLM 109   | 30.0                                 | 1.4                                 | 6.5                      | MR       |
| 9.    | RLM 110   | 64.3                                 | 3.5                                 | 15.0                     | S        |
| 10.   | RLM 112   | 33.3                                 | 2.2                                 | 8.6                      | MR       |
| 11.   | RLM 113   | 35.7                                 | 5.1                                 | 13.5                     | S        |
| 12.   | RLM 114   | 10.0                                 | 8.7                                 | 9.3                      | MR       |
| 13.   | RLM 115   | 23.1                                 | 1.7                                 | 6.3                      | MR       |
| 14.   | RLM 116   | 16.7                                 | 3.0                                 | 7.1                      | MR       |
| S No. | Germplasm | Grain smut | Reaction |
|-------|-----------|------------|----------|
|       |           | Incidence  | Severity  |Susceptibility index (SI)| |
| 15.   | RLM 117   | 15.0       | 1.3       | 4.4 R                  |
| 16.   | RLM 119   | 13.3       | 2.1       | 5.3 MR                 |
| 17.   | RLM 120   | 19.4       | 1.6       | 5.6 MR                 |
| 18.   | RLM 121   | 10.0       | 0.7       | 2.6 R                  |
| 19.   | RLM 122   | 11.8       | 2.1       | 5.0 R                  |
| 20.   | RLM 126   | 13.3       | 1.5       | 4.5 R                  |
| 21.   | RLM 127   | 27.8       | 8.2       | 15.1 HS                |
| 22.   | RLM 128   | 20.0       | 1.3       | 5.1 MR                 |
| 23.   | RLM 129   | 21.1       | 1.3       | 5.2 MR                 |
| 24.   | RLM 130   | 7.1        | 1.9       | 3.7 R                  |
| 25.   | RLM 134   | 16.7       | 2.1       | 5.9 MR                 |
| 26.   | RLM 135   | 21.4       | 3.4       | 8.5 MR                 |
| 27.   | RLM 138   | 21.7       | 1.3       | 5.3 MR                 |
| 28.   | RLM 139   | 20.0       | 3.1       | 7.9 MR                 |
| 29.   | RLM 140   | 36.4       | 3.0       | 10.4 S                 |
| 30.   | RLM 141   | 23.1       | 3.5       | 9.0 MR                 |
| 31.   | RLM 142   | 23.5       | 3.0       | 8.4 MR                 |
| 32.   | RLM 143   | 45.4       | 7.9       | 18.9 HS                |
| 33.   | RLM 144   | 19.4       | 1.6       | 5.6 MR                 |
| 34.   | RLM 146   | 32.8       | 2.6       | 9.2 MR                 |
| 35.   | RLM 147   | 17.6       | 1.9       | 5.8 MR                 |
| 36.   | RLM 148   | 25.0       | 3.5       | 9.4 MR                 |
| 37.   | RLM 149   | 53.3       | 7.5       | 20.0 HS                |
| 38.   | RLM 150   | 17.6       | 2.3       | 6.4 MR                 |
| 39.   | RLM 151   | 13.3       | 1.4       | 4.3 R                  |
| 40.   | RLM 152   | 16.7       | 1.3       | 4.7 R                  |
| 41.   | RLM 153   | 21.4       | 3.6       | 8.8 MR                 |
| 42.   | RLM 154   | 14.9       | 1.4       | 4.6 R                  |
| 43.   | RLM 155   | 41.7       | 2.8       | 10.8 S                 |
| 44.   | RLM 156   | 25.0       | 3.0       | 8.7 MR                 |
| 45.   | RLM 157   | 19.3       | 1.7       | 5.7 MR                 |
| 46.   | RLM 158   | 38.5       | 4.1       | 12.6 S                 |
| 47.   | RLM 160   | 17.6       | 3.6       | 8.0 MR                 |
| 48.   | RLM 161   | 7.7        | 1.7       | 3.6 R                  |
| 49.   | RLM 162   | 21.1       | 0.4       | 2.9 R                  |
| 50.   | RLM 165   | 20.0       | 1.2       | 4.9 R                  |
| 51.   | RLM 166   | 7.7        | 1.4       | 3.3 R                  |
| 52.   | RLM 167   | 30.8       | 2.5       | 8.8 MR                 |
| 53.   | RLM 170   | 15.4       | 1.3       | 4.5 R                  |
| 54.   | RLM 171   | 7.8        | 1.1       | 2.9 R                  |
| S No. | Germplasm | Grain smut | Reaction |
|-------|-----------|-------------|----------|
|       |           | Grain smut Incidence (%) | Grain smut Severity (%) | Susceptibility index (SI) |
| 55    | RLM 172   | 22.2        | 1.2      | 5.2 | MR |
| 56    | RLM 173   | 7.7         | 3.3      | 5.0 | R  |
| 57    | RLM 174   | 33.3        | 2.6      | 9.3 | MR |
| 58    | RLM 175   | 0.0         | 0.0      | 0.0 | R  |
| 59    | RLM 176   | 25.0        | 1.7      | 6.5 | MR |
| 60    | RLM 177   | 0.0         | 0.0      | 0.0 | HR |
| 61    | RLM 178   | 25.0        | 3.5      | 9.4 | MR |
| 62    | RLM 179   | 0.0         | 0.0      | 0.0 | HR |
| 63    | RLM 181   | 20.0        | 2.9      | 7.6 | MR |
| 64    | RLM 182   | 0.0         | 0.0      | 0.0 | HR |
| 65    | RLM 183   | 23.1        | 1.1      | 5.0 | R  |
| 66    | RLM 185   | 41.1        | 2.5      | 10.1 | S |
| 67    | RLM 186   | 0.0         | 0.0      | 0.0 | HR |
| 68    | RLM 189   | 0.0         | 0.0      | 0.0 | HR |
| 69    | RLM 191   | 6.3         | 1.3      | 2.9 | R  |
| 70    | RLM 193   | 23.1        | 2.5      | 7.6 | MR |
| 71    | RLM 194   | 16.7        | 3.0      | 7.1 | MR |
| 72    | RLM 195   | 8.3         | 1.4      | 3.4 | R  |
| 73    | RLM 196   | 53.3        | 3.2      | 13.1 | S |
| 74    | RLM 198   | 18.0        | 1.3      | 4.8 | R  |
| 75    | RLM 199   | 50.0        | 3.2      | 12.6 | S |
| 76    | RLM 200   | 25.0        | 1.8      | 6.7 | MR |
| 77    | RLM 201   | 19.2        | 1.2      | 4.8 | R  |
| 78    | RLM 202   | 6.2         | 1.3      | 2.8 | R  |
| 79    | RLM 203   | 0.0         | 0.0      | 0.0 | HR |
| 80    | RLM 204   | 0.0         | 0.0      | 0.0 | HR |
| 81    | RLM 205   | 11.7        | 1.3      | 3.9 | R  |
| 82    | RLM 206   | 13.3        | 2.8      | 6.1 | MR |
| 83    | RLM 207   | 7.1         | 2.1      | 3.9 | R  |
| 84    | RLM 211   | 0.0         | 0.0      | 0.0 | HR |
| 85    | RLM 215   | 42.2        | 2.2      | 9.6 | MR |
| 86    | RLM 216   | 15.4        | 2.1      | 5.7 | MR |
| 87    | RLM 217   | 12.1        | 2.3      | 5.3 | MR |
| 88    | RLM 218   | 22.2        | 2.7      | 7.7 | MR |
| 89    | RLM 219   | 29.0        | 2.8      | 9.0 | MR |
| 90    | RLM 220   | 41.7        | 4.6      | 13.8 | S |
| 91    | RLM 222   | 46.1        | 7.1      | 18.1 | HS |
| 92    | RLM 223   | 16.3        | 1.3      | 4.6 | R  |
| 93    | RLM 224   | 41.7        | 2.7      | 10.6 | S |
| 94    | RLM 225   | 0.0         | 0.0      | 0.0 | HR |
| S No. | Germplasm | Grain smut | Reaction |
|-------|-----------|------------|----------|
|       |           | Incidence (%) | Severity (%) | Susceptibility index (SI) |
| 95    | RLM 226   | 0.0         | 0.0       | 0.0 | HR  |
| 96    | RLM 227   | 15.1        | 1.3       | 4.4 | R   |
| 97    | RLM 228   | 0.0         | 0.0       | 0.0 | HR  |
| 98    | RLM 229   | 6.2         | 2.9       | 4.2 | R   |
| 99    | RLM 231   | 0.0         | 0.0       | 0.0 | HR  |
| 100   | RLM 232   | 0.0         | 0.0       | 0.0 | HR  |
| 101   | JK 8 (SC) | 43.1        | 5.1       | 14.8| S   |

Mean: 20.0, Max.: 66.7, Min: 0.0, SD: 14.73

The disease incidence, severity and susceptibility index varied from 0.0 to 69.4%, 0.0 to 5.4% and 0.0 to 19.4%, respectively. Four germplasm namely OLM 203, TNAU 163, TNAU 176 and TNAU 178 found highly resistant showing 0.0% grain smut incidence, whereas RLM 208 was found resistant to grain smut. Three germplasm namely RLM 135, RLM 192 and RLM 4-1 were moderately resistant, four namely RLM 175, RLM 203, RLM 204 and RLM 224 were susceptible and JK 8 was highly susceptible to grain smut.
Incidence of grain smut in 101 land races of little millet including one susceptible check JK 8 is presented in table 3. Significant variation among land races for their reaction to grain smut was observed. Grain smut incidence varied from 0.0 to 66.7% with a mean of 20% among the screened land races. Smut severity ranging from 0.0 to 8.7% with a mean of 2.3% and susceptibility index (SI) varied from 0.0 to 20.2% with a mean of 6.5. Fourteen land races namely RLM 175, RLM 177, RLM 179, RLM 182, RLM 186, RLM 189, RLM 203, RLM 204, RLM 211, RLM 225, RLM 226, RLM 228, RLM 231 and RLM 232 were free from grain smut, whereas 28 land races namely RLM 104, RLM 108, RLM 117, RLM 121, RLM 122, RLM 126, RLM 130, RLM 151, RLM 152, RLM 154, RLM 161, RLM 162, RLM 165, RLM 166, RLM 170, RLM 171, RLM 173, RLM 183, RLM 191, RLM 195, RLM 198, RLM 201, RLM 202, RLM 205, RLM 207, RLM 223, RLM 227 and RLM 229 were resistant showing up to 5.0 susceptibility index. Forty two land races were with moderately resistant reaction of which 12 namely RLM 102, RLM 110, RLM 113, RLM 140, RLM 155, RLM 158, RLM 185, RLM 196, RLM 199, RLM 220, RLM 224 and JK 8 were susceptible and 5 namely RLM 105, RLM 127, RLM 143, RLM 149 and RLM 222 were highly susceptible to grain smut. Data presented in table 4 revealed that 41.7% land races were MR, 27.7% were R and 13.9% were highly resistant to grain smut. While only 11.9% land races were susceptible and 4.9% were highly susceptible to grain smut.

Identification and utilization of resistant cultivars is the cheapest and feasible way to combat with any disease problem. Six pre-released and released cultivars namely DhLTMV 36-3, Kadiri 1, OLM 203, KOPLM 53, GPUL 1 and GPUL 2 were free from grain smut and seven namely BL 8, TNPSU 171, TNPSU 170, BL 6, DhLTMV 10-2, TNAU 160 and BL 41-3 have shown resistance. In DSN, four entries namely OLM 203, TNAU 163, TNAU 176 and TNAU 178 were free from grain smut and RLM 208 was resistant. Among 100 landraces of little millet, 14 landraces namely RLM 175, RLM 177, RLM 179, RLM 182, RLM 186, RLM 189, RLM RLM 203, RLM 204, RLM 211, RLM 225 and RLM 231 and RLM 232 were free from grain smut whereas 28 were resistant showing up to 5.0 susceptibility index. These germplasm may be utilized for resistance breeding programme. Earlier few studies, for identification of resistant sources against grain smut of little millet were undertaken by Jain (2002), Jain (2003). Jain et al., (2006) and Jain and Tripathi (2007) and little millet variety OLM 203 was reported resistant while JK 8 susceptible to grain smut.

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