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RESEARCH ARTICLE

RESISTANT AND SUSCEPTIBLE RESPONSE OF FINGER MILLET TO SEEDLING BLAST (*PYRICULARIA GRISEA* SACC.)

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ABSTRACT

25 accessions of finger millet, 20 from Parbat and 5 from Khotang, were experimented at nursery stage in randomized complete block design at Institute of Agriculture and Animal Science (IAAS), Rampur, Chitwan from July 2015 to September 2015 to identify the resistance response against seedling blast. Inoculation was done by piling up of diseased leaves in trenches between the beds. Ten plants from each plot were tagged randomly and disease severity was assessed by scoring on a 0-9 scale for 4 times at 6 days interval from 22 days after sowing (DAS) onwards. Dry root and shoot weights of the tagged plants were measured on 43 DAS to access plant biomass. Three accessions failed to geminate. Final disease severity was found to be highest in NGRC05161 (58.5%) and lowest in NGRC05146 (39.3%). Based on total AUDPC, NGRC05143 (664) was found to be least susceptible to seedling blast while NGRC05164 (895) was most susceptible. Disease severity increased upto 34 DAS and decreased thereafter. AUDPC showed continuous increase in decreasing rate. Shoot weight was found to be negatively correlated to mean AUDPC whereas root÷shoot ratio was positively correlated. Three accessions were categorized as moderately susceptible and rest as susceptible to seedling blast. Accessions collected from Khotang were in general more susceptible to blast than those from Parbat district.

INTRODUCTION

Finger millet (*E. coracana*Gaertn.) is the fourth important cereal crop of Nepal after rice, maize and wheat (ABPSD, 2015). It occupies almost 7% of the total cultivated area of the country. It covers 271183 ha land producing304105 mt with 1121 kgha^{-1} yield in Nepal (ABPSD, 2015). It is very hardy annual crop, tolerant to drought. The importance of the crop is more in subsistence agro-farming system where it is grown without or with little external input in marginal land. Finger millet blast caused by *Pyricularia grisea*Sacc. (teleomorph*Magnaporthe grisea* (Hebert) Brar.) is the major production constraint of finger millet (ICRISAT, 2007). It is distributed in almost all millet growing regions of the world. Severe incidence of blast, 70-90% seedling blast, 60% neck blast, 3-80% finger blast was reported at Lumle, Kaski of Nepal (Ghimire and Pradhanang, 1994). It is the most destructive disease for the yield and biomass reduction in Nepal (Subedi and Budathoki, 1996). The average loss due to blast has been reported to be around 28-36% (Nagaraja and Mantur, 2007), however yield losses could be as high as 80-90% in endemic areas (Vishwanath*et al*., 1986).

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Yield losses upto 100% has been reported in Rampur, Nepal (Batsa and Tamang, 1983). Blast affects different aerial parts at all growth stages. The symptoms appear on leaf lamina with typical spindle shaped spots with gray or whitish centers and brown or reddish brown margin that that enlarge and coalesce to give blasted appearance (Babu, 2011). In addition to leaf, the pathogen also attacks nodal region, neck region, fingers and developing grains. Comparison of the isolates causing leaf, neck and finger blast by AFLP analysis showed these isolates were not genetically distinct (Hittalmani*et al*., 2004). *Pyricularia* has been found to attack a wide range of host, most of which belong to Poaceae family. Todman*et al*. (1994) suggested that the pathogenicity of the blast fungus is largely restricted to its host species of origin. Cross inoculation test conducted by Adipala (1989) revealed that the *Pyricularia* infecting finger millet was supported by weed species including wild *Eleusine, Digitaria* and *Setaria*, which might act as reservoir of inoculum. Pathogenicity test done by Viji*et al*. (2000) confirmed that the rice and millet-infecting *M. grisea* populations were distinct. The sources of primary inoculums of blast are plant residues, seed, weed hosts and perhaps also teleomorph, sclerotia and chlamydospores. The conidia are disseminated by wind and attach on the leaves of the plant and germinate in presence of thin film of water. After spore germination, infection pegs formed from the appressoria and latter penetrated through the cuticle or entered through the stomata and epidermis (Kato, 1974). After entering the cell, the infection tube formed a vesicle to give rise to hyphae. The fungus uses a hemibiotrophic infection i.e. initial proliferation inside living host cells before switching to a destructive necrotrophic mode. Effective management of blast disease in finger millet can best be achieved through host-plant resistance. HPR means utilization of plant's own defense mechanism in management of pests and diseases, particularly the rapid localized cell death, also known as hypersensitive response. Growing disease resistant varieties is preferable for the resource-poor and marginal farmers, who cannot afford other method of disease control such as using expensive chemical fungicides or inefficient labor-intensive cultural practices. HPR is highly cost effective, safe and convenient. To identify the source of resistance, regular blast screening is necessary and should be done at multi-location to identify stable genotypes against wide range of virulence (Sharma, 1995). Screening of 128 entries of finger millet genotypes against blast disease at Lumle of Nepal showed that 85 entries were moderately resistant to leaf blast and 48 entries were resistant to leaf blast (NARC, 1997). According to Khadka et al. (2013), finger millet varieties Kavre, SPFM#K2, ACC#456, KLB#184, GPU#48 are resistant to many isolates of blast.

To recognize the importance of finger millet and the constraint posed by the blast disease, the present study was planned with the objectives of identifying resistant and susceptible reactions of seedling blast on finger millet accessions from diverse geographical location of Nepal.

MATERIALS AND METHODS

The experiment was conducted at IAAS, Rampur, Chitwan during July to September of 2015. The location was classified as sub-tropical hot and the weather as humid and humid. The land was upland unirrigated type with 5% slope. The nursery experiment was conducted in randomized complete block design with 25 treatments and 3 replications. Treatment consisted of 25 Nepalese finger millet accessions provided by Gene Bank, NGRC, NARC. They were collected from Parbat and Khotang and registered from NGRC05143 to NGRC05167. The layout consisted of 3 beds, representing 3 blocks and measuring 6.25m long and 1 m wide and raised by 15 cm, arranged along the slope gradient. 25 rows of 1 m with R-R distance of 25 cm were drawn crosswise in each bed, each representing a plot. Each plot of a block was assigned to different treatments randomly by using RCB design. The beds were separated by 0.75m wide trenches. A 0.5 m wide border strip was made around the beds separated by 0.75m wide trench.

Following primary tillage, fast-growing maize of Rampur Composite variety was sown in border strip in double rows in order to provide shading and to create moist environment which is conducive for transmission of blast. After few days, raised beds were prepared and seeds of respective treatments were sown continuously in the rows along with basal application of NPK at 0.5:0.25:0.25 g per row. They were covered with thin layer of soil and then mulched until emergence. On 12 DAS, blast infested leaves *Eleusine* and *Setaria* collected from the vicinity were piled up in the trenches between the blocks provide adequate inoculum (conidia) in the field. Seedling blast was assessed by visual estimation on ten seedlings, randomly tagged from each plot. Scoring was done 4 times after 22 DAS in 6 day interval using a 0-9 scale based on lesion character and lesion area, where 0 represented no lesion characteristics and 9 represented lesions in more than 75% leaf area. Disease severity was calculated by formula given by Shrestha and Mishra (1994).

$$Disease\ severity\ (\%) = \frac{Sum\ of\ all\ scores}{Number\ of\ scores\ \times Maximum\ possible\ score} \times 100\%$$

The accessions were categorized into 4 groups based on disease severity with 0-15% as resistant (R), 15-30% as moderately resistant (MR), 30–50% as moderately susceptible (MS) and 50.1-100% as susceptible (S).

The AUDPC was calculated using the following formula given by Das et al (1992). The Area under Disease Progress Curve (AUDPC) is defined as the quantitative measure of disease intensity with time. It's use in plant pathology to indicate and compare levels of resistance to diseases among varieties of crops.

$$AUDPC = \sum_{i=1}^{n} \frac{(y_i + y_{i+1})}{2} \times (t_{i+1} - t_i)$$

where, y_i = disease severity % on the i^{th} scoring
t_i = number of days from sowing to i^{th} scoring
n = total numbers of scorings

In order to study effect of disease on biomass, the tagged plants were uprooted after final scoring, cleaned and dried. Shoots and roots were severed and weighed separately.

Stastical Analysis

Data entries were done with Microsoft Excel 2016 and data analysis were done *via.* R 3.2.2 using R-studio GUI and 'agricolae' and 'dendrogram' packages. Significance of resistance of accessions to blast was diagnosed by ANOVA at 5% level of significance. When significant differences were found, means were separated and assessed using Duncan's Multiple Range Test (DMRT). Regression analysis was done to determine correlation of mean AUDPC with biomass (Maindonald , 2008). A dendrogram was constructed by using the average AUDPC from 3 replications at 3 observations. The number of clusters was set to 3 using the elbow method. UPGMA method was used for clustering. Data was normalized before calculation of Euclidean distance (Wiley, 2014).

RESULT AND DISCUSSIONS

Disease Severity

The finger millet accessions varied significantly ($P \leq 0.05$) for disease severity at 22 DAS and 34 DAS but were non-significant at 28 DAS and 40 DAS. On 22 DAS, disease severity was highest in NGRC05144 (25.5) and lowest in NGRC05163 (14.4). On 28 DAS, mean values ranged from 32.2 in NGRC05154 to 46.7 in NGRC05164. On 34 DAS, disease severity was ranged from 25.5 in NGRC05144 to 14.4 in NGRC05163. On 40 DAS, it ranged from 39.3 in NGRC05146 to 58.5 in NGRC05161 from Table 1.

Table 1. Disease severity percentage of finger millet accessions at Rampur, Chitwan

Accessions	Disease Severity %			
	22 DAS	28 DAS	34 DAS	40 DAS
NGRC05143	$24.815^{abc}\pm1.96$	$36.667^{ab}\pm3.333$	$41.481^{g}\pm4.551$	$40.37^{bc}\pm7.734$
NGRC05144	$25.556^{a}\pm2.566$	$40^{ab}\pm4.491$	$43.704^{fg}\pm1.335$	$45.556^{abc}\pm10.082$
NGRC05145	$21.111^{abcdef}\pm2.566$	$42.963^{ab}\pm2.671$	$51.111^{bcdefg}\pm0.642$	$47.407^{abc}\pm7.839$
NGRC05146	$25.185^{ab}\pm1.96$	$41.111^{ab}\pm2.566$	$48.148^{defg}\pm1.852$	$39.259^{c}\pm3.292$
NGRC05147	$24.074^{abcd}\pm2.429$	$39.63^{ab}\pm6.859$	$46.667^{efg}\pm4.843$	$44.815^{abc}\pm1.335$
NGRC05148	$21.481^{abcdef}\pm1.614$	$38.889^{ab}\pm4.491$	$54.444^{abcdefg}\pm7.057$	$55.556^{a}\pm2.566$
NGRC05149	$18.519^{abcdef}\pm1.852$	$33.333^{b}\pm3.902$	$52.593^{abcdefg}\pm7.734$	$55.185^{a}\pm1.96$
NGRC05150	$20.37^{abcdef}\pm3.292$	$37.037^{ab}\pm5.38$	$45.926^{efg}\pm4.983$	$54.074^{ab}\pm3.292$
NGRC05151	$18.889^{abcdef}\pm1.111$	$38.148^{ab}\pm7.734$	$45.926^{efg}\pm4.506$	$52.593^{abc}\pm3.292$
NGRC05152	$17.407^{bcdef}\pm4.074$	$37.037^{ab}\pm3.648$	$56.667^{abcdef}\pm7.883$	$50.37^{abc}\pm2.062$
NGRC05153	$16.667^{def}\pm2.796$	$38.148^{ab}\pm3.164$	$55.926^{abcdef}\pm4.551$	$56.296^{a}\pm6.063$
NGRC05154	$17.778^{abcdef}\pm1.111$	$32.222^{b}\pm2.796$	$49.63^{cdefg}\pm2.893$	$55.926^{a}\pm0.98$
NGRC05155	$15.556^{ef}\pm0.642$	$33.333^{b}\pm2.313$	$50.37^{cdefg}\pm2.593$	$53.704^{ab}\pm2.593$
NGRC05156	$17.037^{cdef}\pm1.852$	$41.111^{ab}\pm1.697$	$66.296^{a}\pm2.593$	$57.037^{a}\pm1.96$
NGRC05157	$18.889^{abcdef}\pm0.642$	$45.185^{ab}\pm0.98$	$65.185^{a}\pm5.531$	$56.296^{a}\pm3.648$
NGRC05158	$22.222^{abcdef}\pm1.111$	$38.519^{ab}\pm0.741$	$63.333^{abc}\pm2.313$	$54.815^{ab}\pm2.893$
NGRC05161	$17.037^{cdef}\pm1.335$	$34.815^{ab}\pm2.963$	$61.111^{abcd}\pm3.572$	$58.519^{a}\pm3.533$
NGRC05163	$14.444^{f}\pm0.642$	$43.333^{ab}\pm0.642$	$65.185^{a}\pm1.614$	$55.926^{a}\pm2.593$
NGRC05164	$20^{abcdef}\pm2.313$	$46.667^{a}\pm3.395$	$66.296^{a}\pm1.96$	$52.593^{abc}\pm1.614$
NGRC05165	$22.222^{abcdef}\pm1.111$	$44.074^{ab}\pm3.648$	$64.815^{ab}\pm3.032$	$52.593^{abc}\pm4.551$
NGRC05166	$18.889^{abcdef}\pm2.222$	$40.37^{ab}\pm3.533$	$58.148^{abcde}\pm3.292$	$46.667^{abc}\pm1.111$
NGRC05167	$23.333^{abcde}\pm5.251$	$44.444^{ab}\pm2.313$	$58.148^{abcde}\pm3.648$	$46.296^{abc}\pm2.429$
Grand Mean	20.06734	39.41077	55.05051	51.44781
CV%	20.02845	16.43499	13.05109	14.31234
LSD	6.618067	NS	11.83047	NS

DAS: Days After Sowing, CV: Coefficient of Variation, LSD: Least Significant Difference, NS: Not Significant, Means followed by same letter in a column are not significantly different by DMRT at 1% level of significance. SEm (±) indicates standard error of mean.

Table 2. AUDPC values of finger millet accessions at Rampur, Chitwan

Accessions	AUDPC			
	16 DAI	22 DAI	28 DAI	Total AUDPC
NGRC05143	$184.444^{abcd}\pm15.674$	$234.444^{f}\pm22.305$	$245.556^{f}\pm36.835$	$664.444^{e}\pm71.63$
NGRC05144	$196.667^{abc}\pm21.17$	$251.111^{ef}\pm16.592$	$267.778^{ef}\pm32.792$	$715.556^{cde}\pm70.246$
NGRC05145	$192.222^{abcd}\pm9.686$	$282.222^{abcdef}\pm9.876$	$295.556^{cdef}\pm24.82$	$770^{abcde}\pm31.505$
NGRC05146	$198.889^{ab}\pm13.517$	$267.778^{bcdef}\pm9.493$	$262.222^{ef}\pm4.843$	$728.889^{bcde}\pm24.216$
NGRC05147	$191.111^{abcd}\pm13.517$	$258.889^{cdef}\pm27.644$	$274.444^{def}\pm12.373$	$724.444^{bcde}\pm46.201$
NGRC05148	$181.111^{abcd}\pm18.19$	$280^{abcdef}\pm34.048$	$330^{abcde}\pm18.559$	$791.111^{abcde}\pm70.457$
NGRC05149	$155.556^{bcd}\pm9.686$	$257.778^{cdef}\pm33.903$	$323.333^{abcde}\pm29.059$	$736.667^{abcde}\pm72.444$
NGRC05150	$172.222^{abcd}\pm25.844$	$248.889^{ef}\pm30.692$	$300^{bcdef}\pm21.43$	$721.111^{cde}\pm73.845$
NGRC05151	$171.111^{abcd}\pm23.121$	$252.222^{def}\pm36.582$	$295.556^{cdef}\pm21.111$	$718.889^{cde}\pm80.1$
NGRC05152	$163.333^{abcd}\pm3.333$	$281.111^{abcdef}\pm31.348$	$321.111^{abcde}\pm29.835$	$765.556^{abcde}\pm62.341$
NGRC05153	$164.444^{abcd}\pm2.222$	$282.222^{abcdef}\pm22.553$	$336.667^{abcd}\pm26.458$	$783.333^{abcde}\pm48.8$
NGRC05154	$150^{cd}\pm10.715$	$245.556^{ef}\pm16.592$	$316.667^{abcde}\pm5.774$	$712.222^{cde}\pm33.017$
NGRC05155	$146.667^{d}\pm7.698$	$251.111^{ef}\pm13.922$	$312.222^{abcde}\pm12.222$	$710^{de}\pm27.756$
NGRC05156	$174.444^{abcd}\pm10.599$	$322.222^{abcd}\pm11.759$	$370^{a}\pm12.019$	$866.667^{abcd}\pm33.83$
NGRC05157	$192.222^{abcd}\pm2.222$	$331.111^{ab}\pm19.373$	$364.444^{ab}\pm27.51$	$887.778^{ab}\pm48.927$
NGRC05158	$182.222^{abcd}\pm2.94$	$305.556^{abcdef}\pm9.095$	$354.444^{abc}\pm12.222$	$842.222^{abcd}\pm21.886$
NGRC05161	$155.556^{bcd}\pm6.759$	$287.778^{abcdef}\pm12.814$	$358.889^{abc}\pm11.6$	$802.222^{abcde}\pm18.493$
NGRC05163	$173.333^{abcd}\pm1.925$	$325.556^{abc}\pm4.006$	$363.333^{abc}\pm12.62$	$862.222^{abcd}\pm14.444$
NGRC05164	$200^{ab}\pm9.623$	$338.889^{a}\pm14.572$	$356.667^{abc}\pm8.389$	$895.556^{a}\pm32.049$
NGRC05165	$198.889^{ab}\pm14.186$	$326.667^{abc}\pm19.245$	$352.222^{abc}\pm20.578$	$877.778^{abc}\pm47.506$
NGRC05166	$177.778^{abcd}\pm9.876$	$295.556^{abcdef}\pm15.436$	$314.444^{abcde}\pm6.759$	$787.778^{abcde}\pm22.305$
NGRC05167	$203.333^{a}\pm22.69$	$307.778^{abcde}\pm4.006$	$313.333^{abcde}\pm3.849$	$824.444^{abcde}\pm14.948$
Grand Mean	178.4343	283.3838	319.4949	781.3131
CV%	13.28577	12.70612	10.81228	10.69437
LSD	NS	59.29006	56.88208	137.586

Mean disease severity increased up to 34 DAS and decreased in final observation. The corresponding mean severities for 4 observations were 20.1%, 39.4%, 55.1% and 51.4%. Yeh and Bonman (1986) also reported increased resistance and reduce blast severity with plant age. Very few experiments were performed in screening of finger millet blast nursery till date. Plant severity decreased after certain time due to fading away of the infected lower leaves of the plant and the maturity of the younger leaves. As the crop attained vegetative growth phase the from seedling stage the susceptibility of crop to blast diseases might have decreased. Sreenivasaprasad et al. (2001) reported leaf blast severity ranging from 35.1% to 91.3% in East Africa and among all the genotypes studied, no lines showed immune response to leaf blast.

Area under Disease Progress Curve (AUDPC)

The finger millet accessions varied significantly ($P \leq 0.05$) for AUDPC at 34 DAS and 40 DAS but was non-significant at 28 DAS. On 28 DAS, mean values ranged from 146.7 in NGRC05155 to 203.3 in NGRC05167. On 34 DAS, AUDPC was highest in NGRC05164 (338.9) and lowest in NGRC05143 (234.4). On 40 DAS, highest AUDPC value of 370 was found in NGRC05156 and lowest value was found in NGRC05143 (245.6). The finger millet accessions varied significantly in total AUDPC as well with mean value ranging from 895.6 in NGRC05164 to 664.4 in NGRC05143 from Table 2.

For R:S, values ranged from 0.216 in NGRC05163 to 0.416 in NGRC05143. Highest shoot weight was found in NGRC05143 (142.6) and lowest in NGRC05158 (96.8). Root÷shoot ratio and shoot weight were significantly correlated to average AUDPC. R:S showed positive linear relationship and shoot weight showed negative linear relationship with average

Table 3. Plant biomass of finger millet accessions at Rampur, Chitwan

Accessions	Biomass @ 43 DAS	
	Root:Shoot ratio	Shoot weight
NGRC05143	$0.146^{e}\pm0.007$	$142.625^{a}\pm6.313$
NGRC05144	$0.2^{abc}\pm0.014$	$104.696^{defg}\pm7.781$
NGRC05145	$0.208^{abc}\pm0.007$	$100.454^{defg}\pm3.677$
NGRC05146	$0.166^{cde}\pm0.011$	$126.727^{abcde}\pm8.72$
NGRC05147	$0.168^{bcde}\pm0.012$	$124.504^{abcdefg}\pm8.843$
NGRC05148	$0.156^{de}\pm0.013$	$134.943^{abc}\pm11.49$
NGRC05149	$0.165^{cde}\pm0.015$	$128.187^{abcd}\pm10.92$
NGRC05150	$0.174^{abcde}\pm0.018$	$121.571^{abcdefg}\pm11.635$
NGRC05151	$0.178^{abcde}\pm0.015$	$118.404^{abcdefg}\pm9.765$
NGRC05152	$0.175^{abcde}\pm0.015$	$121.156^{abcdefg}\pm10.707$
NGRC05153	$0.149^{e}\pm0.011$	$141.091^{ab}\pm9.828$
NGRC05154	$0.167^{bcde}\pm0.004$	$124.856^{abcdef}\pm3.126$
NGRC05155	$0.179^{abcde}\pm0.01$	$117.246^{abcdefg}\pm6.227$
NGRC05156	$0.21^{ab}\pm0.008$	$99.038^{efg}\pm4.129$
NGRC05157	$0.208^{abc}\pm0.014$	$100.811^{defg}\pm6.237$
NGRC05158	$0.216^{a}\pm0.015$	$96.831^{fg}\pm5.893$
NGRC05161	$0.184^{abcde}\pm0.006$	$113.174^{cdefg}\pm3.604$
NGRC05163	$0.216^{a}\pm0.012$	$96.21^{g}\pm4.883$
NGRC05164	$0.203^{abc}\pm0.019$	$104.41^{defg}\pm11.015$
NGRC05165	$0.199^{abcd}\pm0.019$	$106.242^{defg}\pm10.521$
NGRC05166	$0.199^{abcd}\pm0.009$	$104.529^{defg}\pm4.863$
NGRC05167	$0.183^{abcde}\pm0.012$	$113.622^{bcdefg}\pm8.289$
Grand Mean	0.1840606	115.5148
CV%	12.11421	12.34354
LSD	0.000497178	23.49474

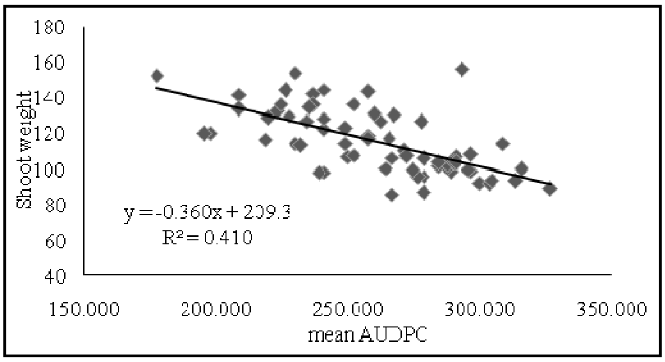


Figure 1. Estimated linear relation between mean AUDPC and shoot weight

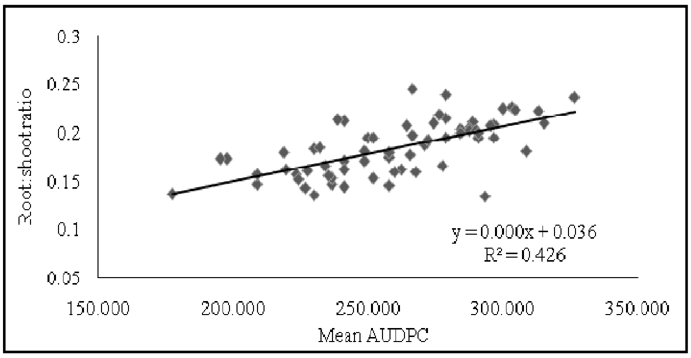


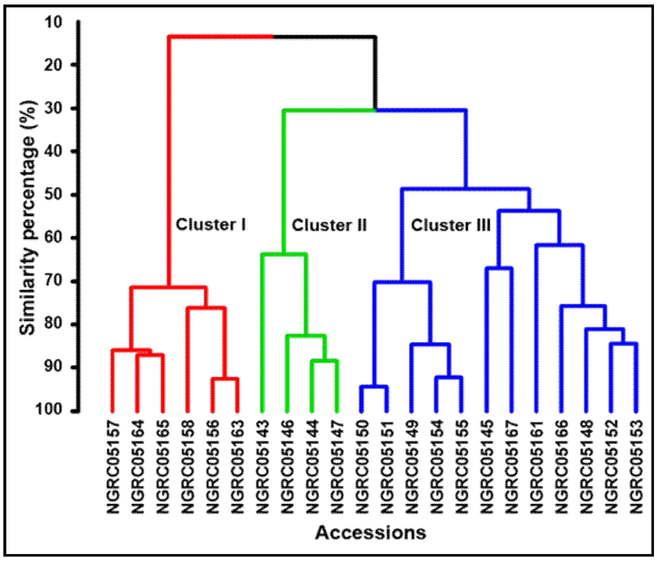
Figure 2. Estimated linear relation between mean AUDPC and root: shoot ratio

Mean AUDPC value showed incremental trend throughout the growing period, albeit in decreasing rate, with corresponding values of 178.4, 283.4 and 319.5 at consecutive observations. This rate, represented by AUDPC/day shows rapid rate of disease progress in NGRC05154 and NGRC05161, a slower rate in NGRC05143 and NGRC05167 and decreased final AUDPC in NGRC05146. This result is supported by Khadka*et al.*(2013), who reported that AUDPC of the leaf blast steeply increases up to 40 days after sowing and then it declined slowly or remained constant. Plants got the highest AUDPC at maximum tillering stage then gradually declined, mainly due to adult plant resistance (Yeh and Bonman, 1986).

Biomass

Root÷shoot ratio (R:S) and shoot weight varied significantly ($P \leq 0.05$) among the accessions.

AUDPC contributing 32.6% and 41.1% respectively towards the variation from Table 3. The negative correlation between mean AUDPC and shoot weight may be due to hindrance in shoots or leaves development and death of leaves cells and tissues caused by blast lesions, which increases with increase in lesion area (Fig. 1). Root is supposedly not significantly affected by blast diseases. This is supported by the statement given by Nagaraja *et al.,* 2007 which states that the pathogen infects most aboveground parts of the plant, but neck and finger blast are the most damaging phases of the disease. Crop growth rate and leaf area formation declined sharply during establishment of the disease and continued to be reduced till maturity. This resulted in a marked reduction of total dry matter production (Bastiaans, 1993). Similar results were observed in our experiment.



Cluster analysis

Cluster I consists of accession with final AUDPC more than 350 and showing high susceptibility. Cluster II consists of accessions showing final AUDPC under 275, and thus moderate amount of resistance. Cluster III consists of accessions having final AUDPC between above two and showing moderate susceptibility. There was no genotype which was immune or resistant to the leaf blast from Figure 3. It could be generalized that accessions in cluster II might have minor gene governing the blast resistance, while other might have no gene for resistance. Thus the resistance was not vertical type.

Conclusion

From the experiment, we concluded that NGRC05143 showed highest blast resistance among the accessions studied, however improvement of genotype through breeding is strongly suggested before recommending to the farmers. NGRC05164 is most susceptible to blast among the accessions and can be suggested to further trials to be used as a susceptible check. Alternate hypothesis was accepted that the finger millet accessions showed differential resistance to blast. The blast resistance of the accessions is subject to change due to different environmental conditions. In order to completely access the performance, multi-location trial can be conducted to evaluate the accessions in different climatic conditions, particularly the temperate region and upland soil. Besides that, evaluation of accessions can be done in controlled green house to access their performance when other parameters are same.

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