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Influence of Dates of Sowing on Blast Disease Incidence in Finger Millet

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Influence of dates of sowing on the incidence and severity of blast in different varieties of finger millet was studied. *Magnaporthe grisea* incidence during consecutive three years study indicated that July sown crop suffered less. The crop sown during early season escaped incidence of leaf, neck and finger blast in all the varieties tested. The crop sown late in the season showed severe incidence of leaf, neck and finger blast in all the varieties. Resistant varieties *viz.*, GPU 28 and GPU 48 showed lower incidence of blast as compared to susceptible varieties *viz.,* KM252 and K7 in all the dates of sowing. Grain yield was maximum in crops sown in July when compared to September sown crop. Varieties that had lower blast incidence recorded higher yield as compared to varieties with higher leaf, neck and finger blast incidences.

Key words: Finger millet, blast incidence, sowing dates, *Magnaporthe grisea*

Finger millet (*Eleusine coracana* (L) Gaertn.) is largely grown in India. It is widely consumed in Tamil Nadu, Andhra Pradesh, Karnataka and Maharashtra. The straw is used as cattle fodder. Even though, finger millet is known to be one of the hardiest crops, it is affected by good number of diseases such as blast, foot rot, smut, streak and mottling virus. Finger millet blast is the most devastating disease affecting different aerial parts of the plant at all stages of its growth starting from seedling to grain formation.

Blast of ragi caused by the fungus *Pyricularia grisea* (Cooke) Sacc. anamorph of *Magnaporthe grisea* (Hebert) Barr; is a heterothallic, filamentous fungus, pathogenic to almost 40 plant species in 30 genera of Poaceae including *Eleusine* (Rossman *et al*., 1990). Yield loss due to blast may be around 28 per cent (Vishwanath and Seetharam, 1989), but under favorable conditions it may go higher to 80-90 per cent(Ramappa *et al*., 2002). Madhukeshwara *et al.* (2002) found several varieties to be resistant to blast. Mantur and Madhukeshwara (2001) and Mantur *et al.* (2001) evaluated 66 genotypes over two seasons in field under natural disease development.

In spite of great deal of research on the pathogen and the disease, blast remains a serious constraint to finger millet production in areas with conducive environments where susceptible cultivars are grown. Since small farmers predominantly grow finger millet as rainfed crop, disease management by chemical means is economically unaffordable.

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Growing resistant varieties is not only economical for minimizing the losses caused by the disease, at the best time of sowing and variety for maximizing yield and reduction of blast disease incidence. It is also an environmentally friendly method. In this paper effect of different dates of sowing on the blast incidence of different finger millet varieties is discussed.

Material and Methods

Finger millet varieties Co 14, PR 202, GPU 28, GPU 48, KM 252 and K7 varying in their reaction to the blast pathogen obtained from Millet Breeding Station, Tamil Nadu Agricultural University, Coimbatore were used in all experiments. These varieties were sown from 1st July to September at 15 days interval coinciding with the south west monsoon as practiced by farmers so as to study the effect of sowing on the incidence and severity of the blast disease (leaf, neck, and finger).

Field trials were carried out at Millet Breeding Station, TNAU, Coimbatore for three consecutive years from 2007 to 2009. The experiment was conducted in factorial randomized complete block design with three replications maintained in experiment. Six varieties viz., GPU 28, GPU 48 (resistant), PR 202, Co 14 (Moderately resistant), KM 252 and K7 (Susceptible) were sown in plots (1.5x3 m^2). Each treatment plot was subdivided for the different dates of sowing (early and late), for early sowing, ragi seeds were seeded every year on 1stJuly & 16th July, mid sowing 1stAugust & 16stAugust, whereas for late sowing it was seeded by 1st September to mid September. The effect of sowing dates on ragi blast incidence and severity (as percent leaf area infected) was assessed by visually checking at tillering, ear head and dough stage. Randomly 50 leaves and panicles were chosen and disease incidence was assessed in each sample plot.

The three phases of the disease (leaf, neck and finger) were separately scored (visual subjective scoring). Disease incidence was scored on 0-5 scale where 0= no disease and 5 = more than 75% leaf area covered for leaf blast. Disease incidence scoring for leaf blast was done at seedling and booting stages whereas incidence scoring for finger blast was carried out at physiological maturity and at harvest. Neck blast incidence was also recorded at physiological maturity and at harvesting. Neck and finger infections was observed at the milky or dough stage and the percent finger and / or neck blast has been recorded. The incidence of neck blast (NB) was recorded by counting the number of peduncles infected in a total number of plants. finger blast (FB) was scored on the basis of percentage of finger infection (number of fingers infected out of the total fingers). Neck blast was recorded by counting the number of peduncles infected from 50 panicles. Finger blast was scored on the basis of percentage of finger infection from the number of fingers infected from 50 panicles. Disease index was calculated using the formula (Mackill and Bonman, 1992). The data on disease incidence were analyzed and pooled mean data for three years are presented in Table 1.The package used for analysis was IRRISTAT version 92 developed by the International Rice Research Institute Biometrics unit, the Philippines (Gomez and Gomez, 1984).

Results and Discussion

Studies on time of sowing of different varieties popular in a location are necessary not only to understand the yield, but also to know the incidence of blast, which is a major production constraint in finger millet, so as to choose the best time and variety for maximizing yield. GPU 28 and GPU 48 (resistant variety), Co 14 and PR 202 (moderately resistant), KM 252, and K7 (Susceptible check) were used for this trial. Result showed that leaf, neck and finger blast infection were minimum on 1st and 16th July of consecutive three years sown crop and their infection increased gradually in late dates of sowing. The crop sown on 1st and 16th September showed maximum disease intensity, while similar results

Table 1. Influence of different date of sowing on varieties in relation to blast incidence and yield (Mean of three years)

Varieties	Leaf blast (Grade)*							Neck blast (%)*						
DOS	I	II	III	IV	V	VI	Mean	I	II	III	IV	V	VI	Mean
PR202	0.00	0.65	1.00	2.85	3.63	3.38	1.92	0.38	3.25	5.25	6.68	12.97	15.00	7.26
CO 14	0.86	1.67	2.25	3.47	4.07	4.08	2.73	0.00	0.00	0.20	1.83	2.50	3.33	1.31
GPU28	0.00	0.00	0.00	0.23	0.35	0.60	0.20	0.00	0.00	0.00	0.33	0.63	0.75	0.29
GPU48	0.00	0.00	0.00	0.50	0.50	1.08	0.35	0.00	0.00	0.00	0.45	0.70	0.87	0.34
K 7	0.03	0.32	1.00	2.89	3.93	4.07	2.04	1.72	1.60	4.43	7.08	11.24	11.98	6.34
KM 252	0.17	0.83	1.40	3.08	4.02	3.88	2.23	2.45	5.40	7.13	11.78	14.43	17.50	9.78
MEAN	0.20	0.57	0.94	2.17	2.75	2.85	1.58	0.76	1.71	2.83	4.69	7.08	8.24	4.22
	Var	Dos	VxD		Var	Dos	VxD							
S.Em±	0.10	0.10	0.25		0.54	0.54	1.33							
CD(5%)	0.21	0.21	0.51		0.09	0.09	2.66							

Varieties	Finger blast (%)*							Yield (kg/ha)*						
DOS	I	II	III	IV	V	VI	Mean	I	II	III	IV	V	VI	Mean
PR202	1.98	2.75	9.59	10.24	8.40	8.53	6.92	2496.7	2441.0	2273.3	1890.0	1770.0	1830.0	2116.8
CO 14	0.22	0.00	1.63	2.72	2.37	7.15	2.35	2695.0	2568.3	2450.0	2092.3	1937.3	2105.7	2315.9
GPU28	0.00	0.00	0.48	0.40	0.08	0.77	0.29	2759.3	2716.0	2503.3	2146.0	2076.0	2073.3	2379.0
GPU48	0.00	0.00	2.28	0.73	0.25	1.23	0.75	2741.7	2705.0	2466.7	2137.7	2052.3	2097.3	2359.0
K 7	0.75	1.83	5.58	8.03	7.67	8.89	5.46	2476.7	2428.3	2229.0	1936.0	1733.3	1758.3	2093.6
KM 252	3.69	4.28	11.28	15.55	10.93	9.24	9.16	2374.8	2150.0	2128.3	1749.0	1683.3	1682.3	1961.3
MEAN	1.10	1.48	5.14	6.28	4.95	5.97	4.15	2590.3	2499.7	2342.0	1991.7	1875.7	1924.7	2204.0
	Var	Dos	VxD		Var	Dos	VxD							
S.Em±	0.81	0.81	1.98		20.41	20.41	50.00							
CD(5%)	1.61	1.61	3.95		40.71	40.71	99.72							

were observed in the subsequent years of late sown crop. Leaf and neck infection were maximum in late September sown crop. Among the six varieties, GPU28 and GPU48 showed significantly increased resistance to all the three blast *viz.*, leaf, neck and finger blasts irrespective of sowing dates in all the three years.

Similar studies reported by Viswanath *et al.* (1986), Jena and Patnaik (1987) indicated that resistant varieties recorded less disease incidence even under high disease occurrence irrespective of climatic variation. Ravikumar *et al.* (1990) evaluated 316 ragi accessions over four seasons and indicated that seven genotypes; GE 75, GE 669, GE

866, GE 1309, GE 1407 and GE 1409 showed resistance to both neck and finger blast across environments.

KM 252 and K 7 showed increased susceptibility with leaf blast and neck blast as the sowing time was delayed from 1st July to late September. However finger blast was initially low in July and rose to peak in the crop sown on 16th August and then decreased depending upon the onset of the monsoon (Table 1). Grain yield was maximum in the crops sown in July as compared to September sown crop. The highest grain yield was obtained in 1st July sown crop during all the three years followed by 16th July in 2007, 2008 and 2009. Highest yields of 2759.3 Kg/ha were recorded from early sown crop, which then on declined with delayed sowings. Highest mean yield of 2379, 2359 and 2315.9 Kg/ ha were recorded by GPU 28, GPU 48 and CO 14 respectively on all the seasons of three years. Early sown GPU 28 and GPU 48 recorded higher grain yields of 2759.3 and 2741.7 kg/ha when compared to late sown crop (Table 1).

The present findings conform to the results of earlier workers that indicated early dates of sowing favoured less disease (Rath and Swain, 1978; Pall and Nema, 1979; Pall, 1991). They also observed that early sowing favoured less disease development in comparison with late (September) sowing. Development of blast was less in July, where the temperature was comparatively higher and relative humidity was lower. Thus, it is clear that lower temperature and higher humidity was favourable for disease severity for all the three blast diseases. Minimum temperature (15-20°C), more number of rainy days, higher rainfall and relative humidity were the most important factors favouring blast development (Bhatt and Chauhan, 1985). Several workers considered minimum temperature (20 or below 22.3°C depending on location) along with high relative humidity for maximum blast development (Murlidharan and Venkata Rao, 1980 and Sharma *et al*., 1993).

It is concluded that finger millet varieties, K 7 and KM 252 were highly susceptible for all three type of blast disease followed by CO 14 and PR 202 which were moderately susceptible for blast pathogen. GPU 48 and GPU 28 were highly resistant and recorded low blast disease incidence irrespective of dates of sowing. Late July and early August may be selected as the optimum time for direct sowing and seedling of finger millet in Tamil Nadu, that favoured higher yields with less blast disease development.

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