

Effect of planting dates and varieties on blast disease and grain yield of finger millet (*Eleusine coracana*) in mid Garhwal hills

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Received:19-02-2012 Revised:04-10-2012 Accepted:31-10-2012

ABSTRACT

Present studies were initiated to examine the impact of sowing dates and varieties on the incidence of disease and grain yield of finger millet. In 2006 and 2007, four finger millet varieties (PR 202, KM 252, VL 149 and PRM 1) were sown in at least one of the following planting windows; early (7th June 2007 and 12th June 2006), mid (17th June 2007 and 22nd June 2006), and late (27th June 2007 and 3rd July 2006). Significant effect of sowing dates in both the years of experimentation on blast incidence and grain yield was noticed. The incidences of neck and finger blast were quite high during kharif 2006 than 2007. Neck and finger blast increased gradually in crops sown in early planting window to mid planting window and decreased considerably in crop sown in late planting window. The highest grain yields have been recorded when the crop was sown in early planting window and decreased gradually in crops sown in mid and late planting window. On the basis of disease incidence and grain yield of two year's results the optimum time of sowing for all the four varieties is early planting window.

Key words: Blast, *Eleusine coracana*, finger millet, *Pyricularia grisea*

Among all small millet crops finger millet (*Eleusine coracana*) occupies a special position in the hill agriculture of Uttarakhand occupying the largest area next only to rice. It is grown over an area of about 1.26 lacs ha with annual production of 1.79 lacs mt (Yadav *et al.*, 2010). It is an important cereal crop grown under rainfed conditions by small and marginal farmers of mid hills of Himalayas ensuring their food security. Although, finger millet is known to cope up with abiotic and biotic stresses, nevertheless, under vulnerable conditions some of the diseases cause heavy losses and can damage entire crop. Of the several fungal diseases blast caused by *Pyricularia grisea* is an important foliar disease in almost all the finger millet growing regions of India. The disease was reported for the first time in India, from Tanjore delta of Tamil Nadu by McRae (1920). Since then, the disease is known to occur almost every year during rainy season in all major ragi growing areas and is perceived as one of the major diseases causing recurring yield losses in all the states of India (Seetharam, 1983). The extent of damage depends on the severity and time of onset of disease. The average loss due to finger millet blast has been reported to be around 28% and has been reported as high as 80-90% in endemic areas (Bisht, 1987; Rao, 1990; Ramappa *et al.*, 2002).

Information on the incidence and occurrence of blast in finger millet sown at different dates can help to adjust the sowing time to harvest high yields. Though, the recommended time of sowing in mid Garhwal hills is second fortnight of May to second fortnight of June (Kumar *et al.*, 2005), nevertheless, it has been observed that even if the sowing has been completed in May the germination of seeds takes place only after the first rainfall and the maximum probability of rain is in June. Therefore, keeping this

in mind the field experiments were conducted at Ranichauri, Tehri Garhwal, Uttarakhand during 2006-07 and 2007-08 to assess the impact of planting dates and varieties on the resultant incidence of blast disease of finger millet in the field, with the goal of acquiring data that may facilitate development of disease management guidelines that would enable growers to minimize losses due to blast and harvest high yield.

MATERIALS AND METHODS

Trials were established under rainfed conditions for two consecutive years, 2006-07 and 2007-08 in a randomized block design in 3m X 2m plot at a spacing of 20cm X 10cm with three replications of each treatment at G. B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri. In both the years, a set of four varieties namely; PR 202, KM 252, VL 149 (local, recommended variety for the region) and PRM 1 (local susceptible variety) were sown in at least one of the following planting windows: early season (7th June 2007 and 12th June 2006), mid-season (17th June 2007 and 22nd June 2006) and late-season (27th June 2007 and 3rd July 2006). The crop was raised as per the recommended package of practices and no spray application of any chemical was given for the management of disease. The data on neck and finger blast were recorded at dough stage of the crop and grain yield was recorded after the harvest of the crop. Neck blast was recorded as the percentage of ears showing infection on the peduncle and finger blast as the percentage of fingers affected (Nagaraja *et al.*, 2007), in following ways:

Neck blast (%) = (Number of ears showing infection on peduncle or neck/ Total number of ears in all the plants in two rows) X 100

Finger blast (%) = (Number of infected fingers in five plants/ total number of fingers in five plants) X 100

Meteorological data like temperature (maximum and minimum), rainfall (mm) and number of rainy days for the experimental period were collected from the meteorological observatory located

near the experimental blocks. The data were statistically analyzed by ANOVA (Cochran and Cox 1957) and the differences among means were tested by using critical difference (CD) value at 5% level of probability.

Table 1: Meteorological data recorded during experimentation at Hill Campus, Ranichauri

Month	Temperature (Max.)		Temperature (Min.)		Rainfall (mm)		No. of rainy days	
	2006	2007	2006	2007	2006	2007	2006	2007
June	26.0	25.6	15.2	16.0	111.9	107.1	8	6
July	24.0	23.5	17.4	16.9	267.0	289.5	14	15
August	23.4	23.7	16.6	16.6	253.2	166.3	14	12
September	22.8	22.9	14.7	14.7	135.2	50.4	7	4
October	20.8	21.1	10.3	10.1	40.8	42.5	2	1
November	17.2	16.7	5.5	6.1	11.9	3.4	1	1
Total					820	659.2	46	39

RESULTS AND DISCUSSION

Significant effect of sowing dates in both the years of experimentation on blast incidence and grain yield was noticed (Table 2, 3 and 4). The incidences of neck and finger blast were quite high during kharif 2006 than 2007. However, neck blast almost disappeared and the incidence of finger blast remained low during 2007. It is evident that neck and finger blast increased gradually in crops sown in early

planting window (June 7th to 12th) to mid planting window (June 17th to June 22nd) and decreased considerably in crop sown in late planting window (June 27th to July 3rd). The crop sown in mid planting window (17th June and 22nd June) recorded maximum incidences of neck and finger blast during both the years, while, the lowest incidences of neck and finger blast have been noticed in late planting window (27th June and 3rd July).

Table 2: Effect of dates of sowing on the incidence of neck blast disease of finger millet

Variety	Incidence of neck blast					
	Planting dates, 2006			Planting dates, 2007		
	12 th June	22 nd June	3 rd July	7 th June	17 th June	27 th June
PR 202	0.83	0.00	0.00	0.00	0.00	0.00
KM 252	9.17	17.50	11.67	0.00	1.11	0.00
VL 149	0.00	0.00	0.00	0.00	0.00	0.00
PRM 1	5.83	12.50	5.83	0.00	0.00	0.00
LSD (0.05)						
Variety	4.97			0.54		
Date of sowing	4.30			0.46		
Variety x Date of sowing	8.16			0.93		

The data presented in table 3 revealed that the highest grain yields have been recorded when the crop was sown in early planting window (7th June and 12th June) and decreased considerably in crops sown in mid (17th June and 22nd June) and late planting window (27th June and 3rd July). Though the crop sown in late planting window is less affected by neck and finger blast than the crop sown in early and mid planting window the yield was poor due to less tillering. Reduction in diseases incidence and grain yield in the crop sown in late planting window (27th June and 3rd July) may be due to unfavourable weather conditions for crop and the pathogen and such observations have also been made earlier by Viswanath and Seetharam (1989) who reported that dates of sowing significantly influenced the incidence of blast and grain yield of finger millet.

Present findings are also in accordance with work of Prasad *et al* (2009), Gupta *et al.* (2004) and Ghasolia *et al* (2004) studied the effect of dates of sowing on various diseases and yield of mustard.

It is also clear from the table 1, 2 and 3 that the incidences of neck and finger blast was higher during 2006 as compared to the crops sown during 2007 the effect of this is visible in grain yields. The higher incidences of neck and finger blast during 2006 resulted in comparatively lower yields. This may be due to comparatively high temperature, rainfall and more number of rainy days received during 2006 (Table 4) which favours the disease development. The present findings are in accordance with the work of Viswanath and Seetharam (1989) who reported that high humidity and temperature between 25 and 30°C favours the disease development.

Table 3: Effect of dates of sowing on the incidence of finger blast disease of finger millet

Variety	Incidence of finger blast					
	Dates of sowing, 2006			Dates of sowing, 2007		
	12 th June	22 nd June	3 rd July	7 th June	17 th June	27 th June
PR 202	13.33	25.00	4.17	7.78	10.00	2.22
KM 252	60.67	83.33	35.00	23.33	26.66	12.22
VL 149	0.00	3.33	0.00	0.00	1.11	0.00
PRM 1	66.67	76.67	43.50	16.67	18.89	10.00
LSD (0.05)						
Variety	11.42			3.90		
Dates of sowing	9.89			3.38		
Variety x Dates of sowing	19.78			6.76		

Table 4: Effect of dates of sowing on grain yield of finger millet

Variety	Grain yield (q ha ⁻¹)					
	Dates of sowing 2006			Dates of sowing 2007		
	12 th June	22 nd June	3 rd July	7 th June	17 th June	27 th June
PR 202	10.51	8.30	7.75	13.81	11.79	9.83
KM 252	11.90	11.34	9.68	17.42	15.61	13.58
VL 149	15.49	14.40	12.17	20.25	17.79	16.47
PRM 1	10.79	9.96	9.41	16.37	13.68	11.65
LSD (0.05)						
Variety	1.93			2.18		
Dates of sowing	1.67			1.89		
Variety x Dates of sowing	3.34			3.78		

On the basis of disease incidence and grain yield of two years results it may be concluded that the different varieties gave different response to blast. The disease incidence and grain yield were highly influenced by dates of sowing. The optimum time of sowing in mid Garhwal hills for all the four varieties is early planting window (June 7th to 12th).

ACKNOWLEDGEMENTS

The authors are grateful to the Indian Council of Agricultural Research, New Delhi, for funding this research through an All India Coordinated Research Improvement project on small millets.

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