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Short Communication

SEED REGENERATION IN PEARL MILLET

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Pearl millet is a highly cross pollinated crop. Due to lack of space for maintaining perfect isolation distance (1000 m) during the main cropping season, seed regeneration of several varieties and populations of pearl millet can be undertaken by planting each population in large plots (>2500 m^2) in square fields, discarding the border rows of 6-8 m on all the 4 sides followed by grid mass selection to represent equally all the component genotypes in the population. This system not only maintains mean performance of the populations with much ease but reduces possible genetic losses that may be caused by cooler climate, unidirectional winds representing unfavourable and a typical environment in the off-season.

In pearl millet, there is a problem of adequate space for obtaining recommended isolation plots at 1000 m apart during the main cropping season for seed regeneration. Undertaking seed multiplication by delayed planting with time isolation during the main cropping season causes loss of vigour and increased incidence of diseases and pests. Cooler climate during dry-season accompanied with occasional heavy unidirectional winds (east-west) causes unidirectional pollen flow and hence hinders random mating. This results in genetic drift with changes of gene frequencies in the population (Mather, 1973; Wallace, 1968). Lack of assured irrigation facilities in many dry areas may not permit satisfactory off-season crop growth. To examine these aspects, seeds of four varieties and composites were regenerated in the rainy season 1981 and 1982 in large plots of 3000 m^2 under random mating without recommended isolations, and during the dry season 1982-83, with perfect isolation. The performance of the crops raised from these three seed lots has been reported in this paper.

The materials for the present study comprised of three pearl millet varieties, namely, ITMV 8001, ITMV 8003, ITMV 8004 and a composite Souna Mali X Ankutess, developed by the ICRISAT-Niger cooperative programme at the National Agronomic Research Center (CNRA), Maradi, Niger through a population breeding programme. Two seed lots of these varieties and composite were produced by random mating without recommended isolation grown in adjacent fields during the rainy season 1981 and 1982. In this system, the large plots of 3000 m^2 were sown with each variety and composite during normal cropping (rainy) season and any shibra plants (intermediate between cultivated and wild millet) growing in these fields were removed before they shed pollen.

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Ear heads of downy mildew (*Sclerospora graminicola*) susceptible plants were also removed before they shed pollen. At maturity, two heads/hill were harvested from the central rows by eliminating 5m wide border hills on all the 4 sides of the plot. During dry season 1982-83, one seed lot of each of the varieties and composite was also produced by growing the crops in perfect isolated plots with no possibility of pollen contamination.

The varieties were evaluated in a randomised complete block design with 3 replications at Maradi and Sadore in the Republic of Niger, West Africa, during the rainy season 1983. Each treatment was sown in hills, in 8 rows of 5m length at a distance of 1m x 0.50m. Two plants/hill were maintained by thinning, 20 days after sowing. The observations were recorded on the central 4 rows leaving 2 border rows on each side of the plot, on characters such as days to 50% flowering, plant height (cm), head length (cm) and grain yield (kg/ha).

The performance of the crop raised from different seed lots at two locations, Maradi and Sadore, in the main pearl millet growing areas of the Republic of Niger, is summarised in table 1. At Maradi, no significant influence of time of seed production was noticed for days to 50% flowering except for composite Souna Mali x Ankutess where for the seed lot produced during rainy season 1982, 4 days delayed flowering was observed than 1981 rainy season seed lot. In all other seed lots and varieties, the difference in days to 50% flowering were close to least significant difference of 1 day. In the trial at Sadore, it was observed that the seed production during dry-season unfavourably influenced flowering time (delayed) for ITMV 8001 and ITMV 8003. The influence on two other populations namely ITMV 8004 and comp. (Souna Mali x Ankutess) was non significant. When the mean of the two locations was compared, the similar trend was noticed.

The differences in height of the plants produced by different seed lots for ITMV 8001 and ITMV 8003 were non-significant at Maradi indicating no effect of time of seed production on this character. This character favourably changed (reduced plant height) for ITMV 8004 for the seed lot produced during rainy season 1982 which might have been due to selection for reduced plant height. At Sadore also, favourable effect of seed production during dry-season with perfect isolation and during rainy season 1982 was noticed for ITMV 8004 for the plant height. No significant influence of time of seed production was noted for any other experimental varieties or composites included in the present study for this character.

In the trial at Maradi, the significant influence of the time of seed production on head length was noted only in variety ITMV 8001 where shift of head length was observed towards increased head length. This might have resulted due to selection pressure in this experimental variety towards increased head length. At Sadore, it was also observed that the seed multiplication during rainy season 1982 (without perfect isolation) and during dry-season 1982-83 (with perfect isolation) resulted into significant increase in head length for experimental variety ITMV 8001. The results were similar to

Table 1. Performance of the pearl millet populations raised from different seed lots

Population	Seed lot	Days to 50% flowering			Plant height (cm)			Head length (cm)			Grain yield (kg/ha)		
		M	S	A	M	S	A	M	S	A	M	S	A
ITMV 8001	R 81	68	66	67	245	273	259	50	59	54	1130	780	955
ITMV 8001	R 82	67	63	65	247	253	250	60	62	61	1092	846	969
ITMV 8001	D 82-83	68	71	69	242	275	258	65	69	67	1007	698	852
ITMV 8003	R 81	68	63	65	228	231	229	51	41	46	998	990	994
ITMV 8003	R 82	67	67	67	233	235	234	51	52	51	989	793	891
ITMV 8003	D 82-83	68	68	68	234	249	241	59	49	54	964	921	942
ITMV 8004	R 81	64	60	62	237	242	239	50	52	51	918	927	922
ITMV 8004	R 82	66	60	63	213	225	219	48	53	50	883	992	937
ITMV 8004	D 82-83	64	62	63	220	224	222	47	54	50	840	788	814
Comp. (Souna Mali x Ankutess)	R 81	62	63	62	210	232	221	36	38	37	1077	837	957
Comp. (Souna Mali x Ankutess)	R 82	66	61	63	236	250	243	35	41	38	1058	792	925
Comp. (Souna Mali x Ankutess)	D 82-83	64	61	62	208	248	228	33	42	37	1093	726	909
Mean $\bar{x}$		66	64	65	229	245	237	49	51	50	1004	840	922
L.S.D.		1	1	1	5	8	7	5	6	4	136	108	104
C.V. %		3	5	3	9	10	7	15	17	10	17	15	11

M = Maradi, S = Sadore, A = Average of 2 locations
R = Seed produced in rainy season (crop season)
D = Seed produced in dry-season (off-season)

those obtained at Maradi as well as when averaged over the two locations. This variety has been developed from the INMG-1 (Singh and Naino, 1988) which is a genepool of long headed genotypes of African origin. Preference for longer ear heads form the general practice in seed multiplication of this variety. The differences in head length due to time and method of seed production was nonsignificant for all other experimental varieties and composites where no selection pressure was applied for this trait during the seed multiplication.

The influence of time of seed production was also statistically non-significant on grain yield. Numerically, the crop raised from rainy season seed lots produced better grain yield than from dry season for all the pearl millet populations.

The results of present studies revealed that when several pearl millet populations are to be multiplied at the same time, the seed production of these experimental varieties and composites can be undertaken even in absence of recommended isolation, by planting them during the rainy season (regular cropping season) in large plots (> 2500m^2), in square plots discarding the border rows (6-8 m on all 4 sides) followed by grided mass selection by sampling alternate hills in the central rows. This system not only maintains desirable mean performance in the population with much ease but reduces losses caused by unfavourable and unnatural environment in which the crop is grown during the off-season. The seed production in large plots without perfect isolation can be undertaken by the breeder if the seed of several experimental varieties, synthetics and composites are to be maintained at one site where recommended isolations (1 km distance from other variety) are not possible during the main cropping season. Slight contamination due to undesirable pollen and gene flow from adjacent plots can be reduced by planting varieties with distinct maturity cycles separated by several hills of border rows.

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