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Growth and Yield of Pearl Millet (*Pennisetum glaucum* L.R. Br.) As Influenced by Downey Mildew and Smut Diseases in Kabuga Area of Kano State, Nigeria

O.T. Mustapha and Y. Mustapha

Department of Biological Sciences, Bayero University, kano, Nigeria

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ABSTRACT

The performance of four Pearl millet varieties comprising three improved varieties and one local variety was investigated in terms of their yield and response to natural infestation of Downy mildew (DM) and smut diseases. Data on yield parameters, disease score and weather were collected over the two year period of the investigation. The investigation revealed the existence of inherent differences among the four varieties tested and the influence of biotic and abiotic factors on some of the yield parameters. The variety ICMN IS 88224 was found to be the most susceptible to DM and smut disease while two improved varieties (ICMn IS series) were found to be tolerant. The local variety, INMV 55 was found to be the most tolerant and as such, ICMN IS 88212 is recommended for this location.

Key Words: Pearl millet (*Pennisetum glaucum*); Downey mildew disease; Smut disease; Crop performance.

Introduction

In Africa, Pearl Millet is primarily grown for human consumption serving as the staple food in some of the poorest countries and regions of the continent. The grain is mainly used in three different ways, as a grain – like flour (couscous), as a dough and as a gruel (Brunken et. al., 1977; Counting and Harris, 1968).

Despite the enormous uses to which Pearl Millet can be put, there are some constraints which limit the production of the crop in savanna environment of Northern Nigeria. Among these are nature of soils, climate of the region and cultural techniques and management practices. Others are diseases, pests, weeds and other parasites whose effects seriously affect the yield of the crop.

It has been established that Downey mildew and smut are the two most important diseases of the crop in the farmers' field and experimental farms – in Northern Nigeria (Selvaraj, 1978). It is a fact that the performance of any crop at a particular location depends on the variety and the biotic and abiotic constraints obtainable at that location. This study therefore aims at finding the influence of these two diseases on the growth and yield of four improved varieties of the crop in the chosen location with a view to identify those varieties that are adapted and suited to this location.

Materials and Methods

Three improved Pearl Millet varieties, ICMN IS 88210, ICMN IS 88212 and ICMN IS 88224 were collected from Lake Chad Research institute (LCRI) Maiduguri while the fourth variety, INMV 55, was collected from a local farm in Kano. The investigation spanned over a period of two cropping seasons, 1992 and 1993 seasons, and was conducted at Bayero University Experimental Plot located at

Kabuga area of Kano. This location was chosen because it has been used for cropping millet solely over the years and it is naturally infested with causative agents of Downey mildew and smut diseases.

The land was cleared and an area of 25x20 metres was measured and divided into 16 plots. A Randomized Complete Block Design (RCBD) layout with four replicates was used. The area was ridged and the plots were separated by an area of 0.5m. Each plot comprises four ridges with the two central ridges serving as the plot (sampling rows). Each plot was ragged with code number.

The seeds were sown on each ridge. Two weeks after sowing, plants that germinated were thinned to two plants per stand by pulling out the weaker and less developed seedlings. Fertilizer (NPK-27-13-13) was applied basally to all the 16 plots. Weeding was done with hand-held hoe as at when required.

Data were collected on a number of parameters, These include seedlings emergence, seedling establishment, days to 50% flowering, plant height, spike length, spike weight, grain yield per plot, disease score, rainfall and temperature. Grain yield was determined by lightly pounding the spikes from each plot in mortar and followed by removal of the husk. The threshed grains were weighed and the weight recorded as grain yield per plot. Disease score was taken 10 weeks after sowing by counting the number of infest plants by Downey mildew and smut diseases per plot. The data on rainfall and temperature were obtained from the meteorological unit of the Department of Biological Sciences, Bayero University, Kano. The data collected were subjected to statistical analysis, i.e. Analysis of Variance (ANOVA).

Results and Discussion

From Table 1 there is a clear evidence that in the two seasons ICMN IS 88210 and ICMN IS 88224 had higher seedlings emergence value than the other two varieties. Seedling establishment followed the same pattern as seedling emergence as statistical analysis showed no significant difference among the varieties in both years. The differences observed in seedling emergence and seedling establishment showed that the individual quality of each variety has come into effect despite the underlying environment conditions.

Differences also exist among the four varieties in terms of their time of flowering and the differences have been found to be significant ($p < .05$). The means show that varieties ICMN IS 88210 and INMV 55 flowered earlier than the other two. On the other hand, the means for yield show that ICMN IS 88210 out yielded the others and it is followed by INMN 55 while the others follow in the order ICMN IS88212, ICMN 88224. This clearly shows that those varieties that flowered earlier recorded higher yields than those that followed later.

Table 1: Mean Values for the effect of Downey mildew and smut diseases on growth and Yield of Pearl Millet.

Varieties/Parameters	ICMN IS 88210		ICMN IS 88212		ICMN IS 88224		INMV 55	
	1992	1993	1992	1993	1992	1993	1992	1993
Emergence (Plants/10m ²)	70.50	50.50	58.50	40.25	64.25	53.50	60.25	49.25
Seedling Establishment 2	13.75	19.00	15.50	17.24	15.25	16.75	13.00	17.50

(Plants/10m)								
50% Flowering (Days)	50.75	58.25	54.75	58.50	55.75	60.75	46.50	59.50
Mean Plant Height (cm)	185.50	183.60	188.80	193.90	174.40	187.30	188.20	188.90
Mean spike Length (cm)	42.80	39.70	43.10	39.98	40.95	38.17	33.95	34.48
Mean spike Weight (cm)	40.53	39.23	40.70	43.51	37.27	39.78	34.40	33.82
Mean Yield (Kg/ha)	535.05	479.33	573.03	424.83	545.63	322.10	452.00	546.63

Table 2: Mean GED and smut Incidence for the varieties.

	ICMN IS 88210		ICMN IS 88212		ICMN IS 88224		INMV 55	
	1992	1993	1992	1993	1992	1993	1992	1993
Mean GED	2.0	3.75	2.25	0.00	6.25	6.50	0.00	2.25
Mean GED Incidence (%)	7.27	9.86	7.25	0.00	20.49	19.40	0.00	6.42
Mean Smut Score	5.50	14.25	5.50	9.0	5.0	14.10	5.25	15.5
Mean Smut Incidence (%)	20.0	37.50	27.41	26.10	29.50	41.79	20.19	44.28

Table 3: Total Rainfall (mm) during the 1992 and 1993 season.

Month	1992	1993
June	-	66.60
July	83.00	74.50
August	351.70	