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EVALUATION OF SOYBEAN VARIETIES (*GLYCINE MAX L MERIL*), FOR ADAPTATION TO TWO LOCATIONS OF RAINFOREST ZONE OF DELTA STATE.

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ABSTRACT: *Field experiments were conducted in two locations of rainforest zones (Asaba and Okpe-Isoko) to evaluate the adaptation of ten soybean varieties to this agro-ecological zone. The varieties were TGX1904-6F, TGX1910-11F, TGX1910-15F, TGX1910-10F, TGX1908-8F, TGX1905-2F, TGX1910-1F, TGX1910-8F, TGX1910-6F AND TGX1905-5F. The parameters collected include germination percentage, plant height, number of leaves, leaf area, fresh weight of plant, dry weight of plant, number of flowers, number of pod per plant, number of seeds per pod, and dry seed weight. The growth parameters were determined at 4, 8, 12 and 16 weeks after planting), while the yield data were determined at harvest. The results showed significant differences at (P<0.05) among the varieties for some parameters assessed. TGX1910-8F, TGX1905-2F and TGX1904-6F had the highest number of flowers (68.3), number of pods (26.3) and first to attain maturity (106.6 days) respectively. TGX1910-8F performed better in dry weight of seeds per hectare (2.9t/ha), followed by TGX1910-15F (2.8t/ha). Also, varieties TGX 1910-8F, TGX1905-2F and TGX1904-6F had the highest mean values when compared to other varieties for total dry weight. It is therefore recommended that TGX1910-8F and TGX1910-15F which had higher yields be adopted for cultivation in this agro-ecological zone.*

KEYWORDS: Soybeans, Varieties, Ecology, Adaptation and Proteins

INTRODUCTION

Soybean (Glycine max) is a crop that has great potentials in Nigeria. It is considered to be a "Miracle bean" by many people because of its economic and dietary importance (Barwa, 1990). It is an important source of high quality and inexpensive protein (IITA, 1992a). With an average protein content of 40% and oil content of 20%, soybean has the highest protein of all food crops, and it is second only to groundnut in terms of oil content among food legumes. Compared to other protein rich foods such as meat, fish, and eggs, it is by far the cheapest (IITA, 2000). It also has super amino acid profile compared to other sources of plant protein. The amount of soybean consumed by humans worldwide is currently relatively low, but there is increasing public common interest and it has great potentials as a dietary protein for the future.

The oil produced from soybean is highly digestible and contains no cholesterol (IITA, 1992b). It is the largest single edible source of oil and accounts for roughly 50% of the total seed oil production worldwide (IITA, 2000; IAR & T, 1988). A by-product from the oil production is called soybean cake and is used as a high protein animal feed in many countries.

Attempts to grow soybean in Nigeria were made as early as 1908, but poor seed viability of the varieties introduced made it impossible to grow the crop commercially in the areas where it was first introduced (Ezedinnma, 1964). However, successful cultivation of the crop was first achieved in Samaru, Zaria in 1928 (Nyiakura, 1982), and later in 1937, when the variety "Malayan" was introduced into the country, which was the earliest and most adaptable variety (Wudiri, 1988; IITA, 1992a). Production was and is still concentrated in the areas of Sudan and Guinea Savannah agro-ecological zones of Nigeria (IITA, 1992a). There is a need to maintain and evaluate the improved varieties in different agro-ecological zones for rapid release to farmers in the tropics. This study is aimed at to evaluate the growth and yield performance of some soybean varieties in the rainforest zone of Delta State.

MATERIALS AND METHODS

Areas of Study: This study was carried out at two locations viz Teaching and Research Farm Asaba Campus, Latitude ($06^0$14'N, Longitude $06^0$49'E) of Delta State University and Okpe-Isoko (Latitude $5^0$30'N, Longitude $06^0$28'E) in Oshimili South and Isoko North Local Government Areas, respectively. The experiment was established during the Cropping season of July to November, 2005. These areas are within the rainforest agro-ecological zone of Nigeria (Federal Ministry of Aviation, 2004, unpublished).

Field Evaluation: The field was cleared, debris packed and burnt. The sites were ploughed and harrowed before planting was done. The experimental design was a randomized complete block (RCB) replicated three times. Each experimental site measured 25m-11.2m covering an area of 280m2 (0.028ha). The site was divided into three blocks and ten plots per block, leaving each trial site with thirty plots. Each plot measured 1.4m x 2.4m with 1m between plots and 1m between blocks.

The cultivars used were TGx1904-6F, TGx1910-11F, TGx1910-15F, TGx1910-10F, 1908-8F, 1905-2F, TGx1910-1F, TGx1910-8F, TGx1910-6F and TGx1905-5F. Soybean seeds were planted on the 7^{th} and 8^{th} of July, 2005 for Anwai and Okpe-Isoko locations respectively at a spacing of 10cm x 60cm and two seeds per hole, and thinned to one per hole two weeks after planting giving a plant population of 56 plants per plot of 15 rows that is 840 stands per hectare. Pre-emergence herbicide (Galex-metobromuron + metolachor) was sprayed at the rate of 2.0kg ai/ha to control weeds (Olowe and Alofe, 1992). Supplementary manual weeding was done at four WAP. basal fertilizer application was carried out using band method two weeks after planting at the rate of 20kg N/ha (urea), 25kgP/ha (single super-phosphate) and 35kg K/ha (Muriate of potash) (IITA, 1985). The plants were protected against pod sucking insects at 8 WAP by spraying Nuvacron at the rate of 2L/ha (Olowe and Alofe, 1992).

Data collection and Procedure: For the purpose of data collection, five plants were randomly selected from the nets rows in each plot and tagged for sampling at various stages of growth and development (Olowe and Alofe, 1992). The growth parameters were collected at 4, 8, 12 and 16 weeks after planting. The parameters collected include germination percentage, plant height, number of leaves, leaf area, fresh weight of plant, dry weight of plant, number of flowers, number of pod per plant, number of seeds per pod, and dry seed weight. Data collected were subjected to ANOVA and the treatment means were separated with the Duncan's Multiple Range Test (DMRT) using SAS (2010).

RESULTS AND DISCUSSION

The flowering and fruiting behaviour of the varieties across locations were assessed (Table 1). The data available indicated that there some significant differences among the varieties in all the parameters analysed except in the number of pod per plant which showed no significant differences among the varieties. The variety TGx1904-6F was the first to mature (106.6 days after planting), while the highest mean value of 68.3 (number of flowers/plant) and 26.3 (number of pods/plant) were recorded for TGx1910-8F and TGx1905-2F respectively. The variety TGx1910-8F had the highest dry weight of seed per plant, while TGx1910-11F recorded the highest number of seeds per pod (4.7). TGx1910-6F recorded the least number of flowers, number of pods per plant and dry weight of seeds per plant, while TGx1905-2F was the least to attain maturity (128.8 days) (Table 1). The influence of across locations on growth and yield showed that soybean cultivars had significantly different ($P<0.05$) in flowering and fruiting characters. This also agrees with the findings of Bodunde (1998) who reported that variations in growth and yield of soybean due to climatic factors. Also, the differences in grain yield and other morphological characters observed among the cultivars across location is in consonance with the earlier findings of Ugur et al (2005) who reported that morphological characters such as number of flowers, number of pods, date of harvest are dependent on the genetic constituent of the cultivars.

At Anwai (Asaba) location, TGx1910-1F recorded the highest number of flowers per plant (64.0) and number of pods per plant (27.0), although it was not significantly different from others. TGx1904-6F and TGx1908-8F recorded the least for number of flowers per plant (46.7) and number of pods per plant (18.8) respectively. TGx1904-6F was first to mature (106.3 days) and closely followed by TGx1910-8F (109.4 days), while the cultivar TGx1905-2F matured last at 131.5 days. The highest mean values of 19.4gm (dry weight of seed per plant) were recorded by TGx1910-8F, while TGx1910-15F had the least weight (Table 2).

At Okpe-Isoko location, the highest number of flowers (75.2) and number of pods (28.5) were recorded by TGx1910-8F and TGx1905-2F respectively, while TGx1905-5F and TGx1910-1F recorded the least for number of flowers (40.4) and number of pods (16.20) respectively. The variety TGx1940-6F was the first to mature (107.0 days), closely followed by TGx1910-10F (110.0 days) and lastly by TGx1905-2F (126.1 days). The highest mean values of 5.0 and 22.7g for number of seeds per pods and dry weight of seeds per plant respectively were recorded for TGx1910-15F. The cultivar TGx1910-6F recorded the least values of 3.8 and 6.1g for number of seeds per pod and dry weight of seeds per plant respectively (Table 2). At harvest, the influence of location on yield showed that the mean soybean seed yields of 2.5t/ha and 2.3t/ha for Asaba and Okpe-Isoko respectively confirmed the area findings of Bodunde (1998) that variations in climatic factors in both locations have been partly responsible for the difference in yield of soybeans. This result is also in agreement with the earlier report of RMRDC (2004) on soybean which observed that the total output of the crop (yield), is dependent on the planting material genetic potential.

From this study, it showed that TGx1910-8F, TGx1905-2F and TGx1904-6F varieties had the highest yields over others evaluated. Thus, it recommended that TGx1910-8F, TGx1905-2F and TGx1904-6F which had comparably highest yields be adopted for cultivation in rainforest agro-ecological zone of Delta State.

Table 1: Grain Yield and some morphological characteristics of soybean cultivars

SOYBEAN VARIETIES	No, of flower	No. of Plant	Days to Pod/Plant	Days to Ist Harvest	No. of Seed/Pod	Dry weight Seeds/ha
TGx1904-6F	55.3abc	26.a	106.6e	4.1b	15.3ab	2.5abc
TGx1910-11F	57.5abc	23.6a	112.9de	4.7a	15.5a	2.6abc
TGx1910-15F	56.8abc	24.7a	125.6ab	4.3ab	16.7a	2.8ab
TGx1910-10F	59.8ab	23.0a	112.0de	4.5ab	15.5ab	2.6abc
TGx1908-8F	59.6ab	20.5a	112.5de	4.3ab	12.2ab	2.0bc
TGx1905-2F	61.5ab	26.3a	128.8a	4.5ab	16.1ab	2.7ab
TGx1910-1F	55.9abc	21.6a	122.3abc	4.0b	11.7a	1.9bc
TGx1910-8F	68.3a	25.3a	109.9de	4.6ab	17.7a	2.9a
TGx1910-6F	45.4c	19.7a	115.9cde	4.1a	10.1	1.7c
TGx1905-5F	50.6bc	21.0a	117.0bcd	4.1a	11.6a	1.9b

Means with similar alphabets are not significantly different at P < 0.05 using DMRT.

Table 2: Grain Yield and some Morphological Characteristics of Ten Soybean Varieties at Asaba and Okpe-Isoko

SOYBEAN VARIETIES	No. of flower	No. of Plant	Days to Pod/Plant	Days to Ist Harvest	No. of Seed/Pod	Dry weight Seeds/ha
ASABA						
TGx1904-6F	46.7a	26.5a	106.3a	4.0bc	15.2a	2.5a
TGx1910-11F	63.9a	25.1a	112.3cd	5.0a	17.1a	2.8a
TGx1910-15F	51.3a	22.1	129.0ab	3.7c	10.7a	1.8a
TGx1910-10F	53.7a	23.5a	114.0bcd	4.7ab	16.5a	2.7a
TGx1908-8F	54.5a	18.8a	112.8cd	4.3abc	11.6a	1.9a
TGx1905-2F	54.3a	24.2a	131.5a	4.5abc	15.0a	2.5a
TGx1910-1F	64.0a	27.0a	125.1abc	3.7c	15.3a	2.5a
TGx1910-8F	61.4a	24.4a	109.4cd	5.0a	19.4a	3.2a
TGx1910-6F	55.7a	22.5a	116.7abcd	4.3abc	14.2a	3.3a
TGx1905-5F	60.9a	19.1a	119.2abcd	4.2abc	12.4a	2.0a
OKPE-ISOKO						
TGx1904-6F	63.9abc	26.0a	107.0d	4.1ab	15.5abc	2.6abc
TGx1910-11F	51.1bcd	22.1a	113.5bcd	4.4ab	13.9bcd	2.3bcd
TGx1910-15F	62.2abc	27.3a	122.2ab	5.0a	22.7a	3.8a
TGx1910-10F	65.9ab	22.4a	110.0d	4.4ab	14.4bc	2.4bc
TGx1908-8F	59.7abc	22.2a	12.3cd	4.2ab	12.7bcd	2.1cd
TGx1905-2F	68.6a	28.5a	126.1a	4.5ab	17.2ab	2.9ab
TGx1910-1F	47.8cd	16.2a	119.5abc	4.3ab	8.1c	1.3cd
TGx1910-8F	75.2a	26.1a	110.3cd	4.2ab	16.1a	2.7ab
TGx1910-6F	35.1d	16.9a	115.0bcd	3.8b	6.1d	1.0d
TGx1905-5F	40.4d	22.9a	114.8bcd	4.0ab	10.9bcd	1.8bcd

Means with similar alphabet(s) are not significantly different at P<0.05 using DMRT

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