# GROWTH AND YIELD PERFORMANCE OF SOYBEAN (*Glycine max* [L.] Merill) GENOTYPES IN MINNA, NIGER STATE

**Joseph*, E.C., K.D. Tolorunse, A., S. Gana**

Department of Crop Production,
Federal University of Technology, Minna.

*Corresponding Author's E-mail: **ethelchinaza.joseph@gmail.com**, GSM: 08039251146

## ABSTRACT

*The study was conducted at the Teaching and Research Farm of the School of Agriculture and Agricultural Technology, Federal University of Technology, Gidan-Kwano campus Minna, Niger state during the 2018 cropping season between July and November 2018 to determine the growth and yield performance of six soybean genotypes. The genotypes were TGx 1987-62F, TGx 1835, TGx 1955, TGx 1951-3F, TGx 1904-6F and TGx 1448-2E. The experiment was laid out in randomized complete block design (RCBD) with 3 replications and a gross and net plot size of 4.5 $m^2$ and 3 $m^2$ respectively. Data for emergence percentage, plant height (cm), number of leaves, days to 50 % flowering, number of pods per plant, number of branches and 100-seed weight (g) were collected. Data collected were subjected to analysis of variance (ANOVA) at 5 % probability level.*

*TGx 1951-3F showed the highest emergence percentage (50.70 %) with early flowering at 49 days after sowing. Among the evaluated genotypes, TGx 1951-3F gave the highest 100 seed weight (13.53 g). This was closely followed by TGx 1904-6F (13.36 g). The genotype TGx 1951-3F which produced the highest 100 seed yield could be selected for further evaluation and cultivation in areas with similar agro-ecological conditions.*

**KEYWORDS:**Growth, Yield, Performance, Soybean, Genotype

## INTRODUCTION

Soybean, *Glycine max* [L.] Merill is an important legume which belongs to the pea family Fabaceae and belongs to the genus *Glycine* Willd (Singh, 2017). Soybeans is said to have originated in Southeast Asia where it was first domesticated by some Chinese farmers around 1100 BC, and was later grown in Japan and many other countries in the first century AD. Soybean is an annual plant. It exhibits taproot growth initially, and later undergoes the development of a large number of secondary roots. These roots establish a symbiotic relationship with the nitrogen fixing bacterium, *Bradyrhizobium aponicum*, through the formation of root nodules (Singh, 2017) and it can supplement nitrogen in cropping systems in subsistence farming and large scale farming involving cereals such as maize, sorghum, millet and others.

It is grown mainly for seed production and is one of the world's leading source of oil and protein, possesses a higher protein content compared to other food crops, it is next to groundnut in oil content among other food legumes (Fekadu *et al.*, 2009). It is also rich in all essential amino acids (except methionine), lipids, vitamins and minerals (Lokuruka, 2010) and is one of the major industrial and food crops grown in Africa (Adama *et al.*, 2015). It is estimated that about 2 % of soybean produced is used as food by humans (Goldsmith, 2008). Soybean can also be used as cover crop to enrich the soils with nitrogen.

Morphological characteristics focus on physical plant attributes such as plant height, number of leaves, leaf area and days to 50 % flowering. An understanding of morphological characters facilitates the identification, selection of desirable traits, designing of new populations and in transferring their desirable genes into widely grown food legumes through biotechnological means. Resistances to biotic and abiotic stresses that are known to individual accessions increase the importance of the germplasm (Belul *et al.*, 2014). For an effective breeding program, information concerning the extent and nature of variation within a crop species is essential. There is a need to study the agro-biodiversity and best use of the potential of a genotype, this is important in crop improvement.The study of plant material with desired traits by means of identifying morphological characteristics is an essential step for effective utilization of crop germplasm. It is important to know the factors that limit crop success, and it is essential to search for solutions accessing all existing genetic variation both inside and outside the species (Koorneef and Stam 2001). The study was therefore undertaken to determine the growth and yield performance of some soybean genotypes in Minna, Niger state.

## METHODOLOGY

The study was carried out during the cropping season between July and November 2018, at the Teaching and Research Farm of the School of Agriculture and Agricultural Technology in Federal University of Technology, Gidan-Kwano campus located at longitude 09.52935°N and Latitude 006.45025°E 234m above sea level, Minna, Niger State. Six soybean genotypes (TGx 1987-62F, TGx 1835, TGx 1955, TGx 1951-3F, TGx 1904-6F and TGx 1448-2E) obtained from Olam Farms Kaduna were laid out in Randomized Complete Block Design (RCBD) with three replications. A Gross plot size of 1.5 m × 3 m = 4.5 $m^2$ containing 6 ridges, 1.5 m in length and a net plot of 1.5 m × 2m = 3$m^2$. A distance 0.5 m between each plot and 1m between each replication, giving a total experimental area of 12 m × 20.5 m = 246 $m^2$. Land preparation was done, after which seeds were sown in inter-row and intra-row spacing of 50 cm and 10 cm respectively, giving a population of 192 plants per plot. Manual weeding was adopted, using hoes at 2, 4 and 6 weeks after planting.

### Data Analysis

Data was collected from five randomly tagged plants within the net plots. Emergence percentage was calculated according to Baset Mia and Shamsuddin, 2009. Plant height (cm) and number of leaves were taken at 4,6, and 8 weeks after sowing, while other parameters taken were; days to 50 % flowering, number of branches, pods per plant and 100-seed weight (g). Data collected were subjected to analysis of variance, while means were separated with Duncan Multiple Range Test (DMRT) using SAS (2008).

## RESULTS AND DISCUSSION

There was significant difference in emergence percentage (Table 1) among the evaluated genotypes. TGx 1951-3F showed the highest emergence percentage (50.70 %), this was closely followed by TGx 1904-6F (45.31 %).The other genotypes (TGx 1955, TGx 1987-62F, TGx 1448-2E and TGx 1835) showed no significant difference ($p<0.05$) in emergence percentage, however , TGx 1835 recorded the least emergence percentage of 40.12 %. This does not agree with the findings of Talaka *et al.,* (2013), who reported that TGx 1448-2E had the highest germination count. This can be attributed to the difference in genotypes that were used for the study. The variation in germination rate is also dependent on the moisture content of the soil (Hosseini *et al.,* 2009).

There were significant differences ($p<0.05$) in plant height (Table 2) across the evaluated soybean genotypes with heights ranging from 29. 60 cm to 36.60 cm at 4 weeks after sowing (WAS). Plant heights of TGx 1951-3F (35.70 cm), TGx 1904-6F (36.60 cm) and TGx 1835 (36.53 cm) were statistically at par at 4 WAS. At 6 WAS, TGx 1904-6F maintained the highest plant height (67.63 cm), this was consistent till 8 WAS with the height of 76.27 cm. TGx 1835 recorded a height of 2.23 cm moreover, TGx 1951-3F, TGx 1955, TGx 1987-62F and TGx 1448-2E were statistically similar with plant heights of 61.50 cm, 59.73 cm, 61.83 cm and 61.93 cm respectively. These differences in plant height is in consonance with the study of Talaka *et al.,* (2013) who also observed significant differences among soybean genotypes for plant height.

The data on number of leaves are presented in Table 2. Significant differences ($p<0.05$) exist in leaf number produced at 4 and 6 WAS. TGx 1904-6F produced the highest number of leaves (24) at 4 WAS with TGx 1955 having the least number of leaves (18). Similarly, at 6 WAS, soybean genotype, TGx 1448-2E recorded the highest number of leaves (85) which was consistently high 2 weeks after with 114 leaf number. Number of leaves was statistically similar at 8WAS but TGx 1955 produced the lowest number of leaves (82).

The data on number of branches, days to 50 % flowering and number of pods per plant (Table 1) showed no significant difference among the tested genotypes. However, TGx 1904-6F produced higher number of branches (18) per plant, this was closely followed by TGx 1835 (17 branches per plant). TGx 1955 and TGx 1448-2E produces the lowest number of branches per plant (11).

Early flowering was observed in soybean genotype TGx 1987-62F (42 days after sowing), TGx 1904-6F and TGx 1835 followed immediately at 50 days after sowing while TGx 1448-2E recorded the highest number of days to 50 % flowering (51). The number of pod per plant ranges between 52 (TGx 1951-3F) to 87 (TGx 1835) pods per plant. However, a significant difference was observed among the genotypes for 100-seed weight, where TGx 1951-3F recorded the highest weight (13.53 g) and TGx 1987-62F had the least (10.54 g). This observation agrees with the finding of Awal (2014) who reported in his study that 100-seed weight of soybean genotypes ranged from 10.57 g to 15.74 g.

## CONCLUSION AND RECOMMENDATIONS

The soybean genotype TGx 1951-3F having shown the higher emergence percentage, number of leaves and great yield can be advanced for further yield

trials alongside TGx 1448-2E which produced greater number of leaves. Seed weight is an important character in any breeding programme owing to its direct effect on crop productivity. This therefore informed the choice of TGx 1951-3F for germplasm improvement. Similarly, the production of high number of leaves is good for cover cropping and will serve as forage sources for animal production with significant effect on sustainable agriculture and food security.

**Table 1:** Emergence percentage, Number of branches, days to 50 % flowering, pod per plant and 100 seed weight from evaluated soybean genotypes

| Genotype | Emergence Percentage (%) | No. of branches | Days to 50 % flowering | Pod per plant (no) | 100 seed weight (g) |
|---|---|---|---|---|---|
| TGx 1951-3F | 50.70$^{a}$ | 12$^{a}$ | 49$^{a}$ | 52$^{a}$ | 13.53$^{a}$ |
| TGx 1904-6F | 45.31$^{ab}$ | 18$^{a}$ | 50$^{a}$ | 69$^{a}$ | 13.36$^{a}$ |
| TGx 1955 | 43.57$^{b}$ | 11$^{a}$ | 45$^{a}$ | 56$^{a}$ | 11.85$^{b}$ |
| TGx 1987-62F | 43.57$^{b}$ | 15$^{a}$ | 42$^{a}$ | 78$^{a}$ | 10.54$^{b}$ |
| TGx 1448-2E | 42.71$^{b}$ | 11$^{a}$ | 51$^{a}$ | 57$^{a}$ | 11.09$^{b}$ |
| TGx 1835 | 40.12$^{b}$ | 17$^{a}$ | 50$^{a}$ | 87$^{a}$ | 12.53$^{b}$ |
| ± SE | 2.02 | 2.47 | 4.75 | 16.61 | 0..66 |

Means followed by the same letter within the column differ significantly ($p<0.05$) by Duncan Multiple Range Test (DMRT)

**Table 2:** Plant height per plant and number of leaves per plant from evaluated soybean genotypes

| | Plant height (cm) weeks after sowing | | | Number of leaves (no.) weeks after sowing | | |
|---|---|---|---|---|---|---|
| Genotype | 4 | 6 | 8 | 4 | 6 | 8 |
| TGx 1951-3F | 35.70$^{a}$ | 57.13$^{c}$ | 61.50$^{b}$ | 21$^{ab}$ | 64$^{ab}$ | 86$^{a}$ |
| TGx 1904-6F | 36.60$^{a}$ | 67.63$^{a}$ | 76.27$^{a}$ | 24$^{a}$ | 76$^{ab}$ | 101$^{a}$ |
| TGx 1955 | 32.23$^{ab}$ | 54.63$^{c}$ | 59.73$^{b}$ | 18$^{b}$ | 52$^{b}$ | 82$^{a}$ |
| TGx 1987-62F | 29.60$^{b}$ | 54.47$^{c}$ | 61.83$^{b}$ | 21$^{ab}$ | 60$^{ab}$ | 92$^{a}$ |
| TGx 1448-2E | 32.93$^{ab}$ | 56.67$^{c}$ | 61.93$^{b}$ | 22$^{ab}$ | 85$^{a}$ | 114$^{a}$ |
| TGx 1835 | 36.53$^{a}$ | 62.40$^{b}$ | 72.23$^{a}$ | 21$^{ab}$ | 70$^{ab}$ | 105$^{a}$ |
| ± SE | 1.57 | 1.37 | 2.57 | 1.51 | 8.70 | 10.42 |

Means followed by the same letter within the column differ significantly ($p<0.05$) by Duncan Multiple Range Test (DMRT)

## REFERENCES


Adama, C.J., Salaudeen, M.T., Ishaq, M.N., Bello, L.Y. and Oyewale, R.O. (2015). Evaluation of *Blackeye Cowpea Mosaic Virus* pathogeneity in soybean. *Nigeria Journal of Agriculture, Food up and Environment* [NJAFE], 11(4]) 39 – 44.

Awal, A. M. (2014). Grain yield and seed quality of early maturing dwarf soybean genotypes as influenced by planting time and spacing. Ph.D Dissertation. *Department of Agronomy, BSMRAU, Gazipur*. pp. 10-45.

Baset Mia, M.A. and Shamsuddin, Z.H. (2009). Enhanced emergence and vigour seedling production of rice through growth promoting bacterial inoculation. *Research Journal of Seed Science*, (2), 96-104.

Belul Gixhari, Hekuran Vrapi, Valbona Hobdari. (2014). Morphological characterization of pea (Pisum sativum L.) genotypes stored in Albanian genebank. Conference paper. "*Biotechnology in Agriculture*" Agricultural University of Tirana, Albania.

Fekadu Gurmu, Hussein Mohammed and Getinet Alemaw. (2009). Genotype X Environment Interactions and Stability of Soybean Forgrain Yield and Nutrition Quality. *African Crop Science Journal*, Vol. 17, No. 2, pp. 87 – 99.

Goldsmith, P. (2008). Economics of soybean production, marketing, and utilization. In *Soybeans: Chemistry, Production,Processing, and Utilization, Eds.*

Hosseini, N.M., Siddique K.H. M., Palta J. A., and Berger J. (2009). Effect of Soil Moisture Content on Seedling Emergence and Early Growth of Some Chickpea (*Cicer arietinum* L.) Genotypes. *Journal of Agricultural Science and Technology*. 11: 401-411

Koorneef M and Stam P. (2001). Changing paradigms in plant breeding. *Plant Physiology* 125:156–159.

Lokuruka, M. N. I. (2010). Soybean nutritional properties: the good and the bad about soy foods consumption-a review. *African Journal of Food Agriculture and Nutrition Development*, 10:2439– 2459.

Singh, R.J. and USDA, (2017). Agricultural Research Service, Soybean/Maize Germplasm, Pathology, and Genetics Research Unit, Department of Crop Sciences, University of Illinois, 1101 West Peabody Drive, Urbana, IL 61801, USA e-mail: ramsingh@illinois.ed.

Talaka, A., Rajab, Y.S., Mustapha, A.B. (2013). Growth Performance of Five Varieties of Soybean (Glycine Max. [L.] Merill) under Rainfed Condition in Bali Local Government Area of Taraba State-Nigeria. *Journal of Agriculture and Veterinary Science*. 2(4): PP 05-08

Ugur B, Mehmet S, Abdurrahim T G, Zek M T and Esvet A. (2005). Forage and Grain Performances of Soybean Lines. *Journal of Central European Agriculture*. 6 (3): 397-402.