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Preliminary response of some soya beans varieties (*Glycin max*) grown on underlying soil of *Tamarindus indica*

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Abstract

Soya beans is an important crop with lots of nutritional and economic benefits. This study aimed to find out the implication of growing the crop on an underlying soil of *Tamarindus indica*. A complete randomised block was employed on three varieties of soya beans (TGX-713-09D, TGX1835-10E, TGX1951-3F) with three replications. Days to germination and germination percentage were observed. The days to germination recorded for the three soya beans varieties did not differ significantly, even though TGX-713-09D variety with 6 days had the highest days to germination while both TGX1835-10E and TGX1951-3F recorded 5 days. The underlying soil of *Tamarindus indica* had a mean average of 6 days to germination compared to the control which recorded 4 days. The germination percentage for the three soya beans varieties also did not differ significantly. Where both TGX-713-09Dl and TGX1835-10E varieties recorded 89% compared to the 78% recorded by TGX1951-3F. When the treatments were compared, the control had the highest germination percentage (93%) while the underlying soil of *Tamarindus indica* had 78%. On the contrary, the underling soil of *Tamarindus indica* did better in terms of plant height, stem girth and number of branches with the values 15.61cm, 2.27cm and 5.33 respectively as against the control which recorded 15.56cm, 2.10cm and 5.11 respectively. Best soya beans variety in terms of plant height, stem girth and number of branches was TGX1835-10E with the values 15.83cm, 2.38cm and 5.50. This study here by recommends planting soya beans close tamarind trees and also recommend the variety TGX1835-10E to farmers.

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1.0 Introduction

Soya beans also known as Soybeans are of major importance worldwide as a plant protein component of diets for non-ruminant livestock. It is accepted that limitations to their use are associated with comparatively modest concentrations of protein and nutritionally essential amino acids (although levels are still higher than most other plant sources) and there is considerable interest in selecting cultivars with improved nutritional quality (Clarke and Wiseman, 2005).

The soybean (Glycine max) is perhaps the world's oldest food crop, and for centuries, nutritionally speaking, they have meant meat, milk, cheese, bread, and oil to the people of Asia (Hartman *et al*., 2011). Soybeans can be traced back to China's early dynasty as early as the 11th century B.C. As this dynasty expanded and trading increased, the soybean migrated to southern China and southeastern Asia (Carter *et al*., 2004; Kim *et al*., 2012).

The Legume's Latin name from the Greek "glykys" (meaning sweet), Linnaeus named this genus Glycine. The word max came from Linnaeus's book Species Plantarum, where he first described and classified the soybean under the name Phaseolus max. In 1917, Elmer Drew Merrill argued that according to international botanical rules, the correct botanical name of the soybean should be Glycine max.

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Combining these two terms as proposed by Merrill, Glycine max is the scientific name for the more commonly known soybean (Hymowitz and Newell, 1981).

Soybean (*Glycine max* (L.) Merr.) is a non-native and non-staple crop in sub-Saharan Africa (SSA) with potential to be a commercial crop owing to its wide range of uses as food, feed, and industrial raw material. Soybean was first introduced to SSA by Chinese traders in the 19th century and was cultivated as an economic crop as early as 1903 in South Africa. In the past four decades, soybean cultivation area and production in SSA has increased exponentially, from about 20,000 ha and 13,000 t in the early 1970s to 1,500,000 ha and 2,300,000 t in 2016. Soybean yield has been stagnant in SSA for decades at about 1.1 t ha−1, much lower than the world average, representing one of the most challenging issues in the soybean industry in SSA. The relatively low soya bean yield in Sub-Saharan Africa can be attributed to the poor performing varieties used and to the inadequate application of solid or liquid fertilizers and rhizobial inoculants in soils that have no history of soya bean production. Countries like Nigeria, South Africa, Uganda and Zambia are the leading soya bean producers in Sub-Saharan Africa. Soya bean research in Sub-Saharan Africa is carried out by international and national research institutions, including IITA (Khojely *et al.,* 2018).

Classification of Soya Beans

Domain- *Eukarya*
Kingdom- *Plantae*
Phylum- *Magnoliophyta*
Class- *Magnoliopsida*
Order- *Fabales*
Family- *Fabaceae*
Genus- *Glycine*
Species- *Glycine max*
(Hymowitz and Newell, 1981)

The tree *Tamarindus indica* L. is ecologically, culturally and economically important in many regions in Su-Saharan Africa. Even though it is gradually becoming rare due to logging and coal production. However, tamarind is cultivated in agroforestry systems for years in many parts of Sub-Saharan Africa due to its numerous uses (Bowe and Haq, 2010; Puttaso *et al.,* 2013; Faust *et al.,* 2015). A Study indicated that soil pH was lower under than outside the tamarind canopy, whereas soil organic carbon (SOC), total nitrogen (N) content, and the cation exchange capacity (CEC) were roughly three times higher than in the uncovered area. Under the tamarind canopy, basal respiration was increased nearly threefold, whereas net N mineralization remained unaffected (Faust *et al.,* 2015).

2.0 Materials and methods

2.1 Study Area

The field experiment was conducted at the botanical garden of Biological Sciences Department, Bauchi State University, Gadau. Gadau is situated in Itas Gadau Local Government Area Bauchi State Nigeria and is in savannah zone of Nigeria.

2.2 Sample Collection

Three varieties of soya beans (TGX-713-09D, TGX1835-10E, TGX1951-3F) were collected at International Institute of Tropical Agriculture (IITA) Kano, Kano State.

2.3 Experimental design

The experiment was a completely randomized design (CRD) with three blocks, three soya beans varieties in three replications. Two treatments were used, which are the underlying soil of *Tamarindus indica* and a control.

2.4 Data Collection

Data were collected from each plant per pot and the following data was taken.

2.5 Days to Germination

The data was taken by recording the number of days it took the seeds to germinate

2.6 Percentage Germination

This data was computed as follows: GP = seeds germinated/total seeds x 100.

2.7 Plant Height (at vegetative growth stage)

The data was taken by measuring shoot from the ground to the tip of the tallest leaf in cm.

2.8 Stem Girth (at vegetative growth stage)

This data was collected by measuring the thickness of the stem in cm

2.9 Number of Branches (at vegetative growth stage)

The data was taken by recording the number of branches per seedling

2.10 Data Analysis

Data collected were subjected to analysis of variance (ANOVA) and where there is significant difference the means were separated using Bonferroni technique.

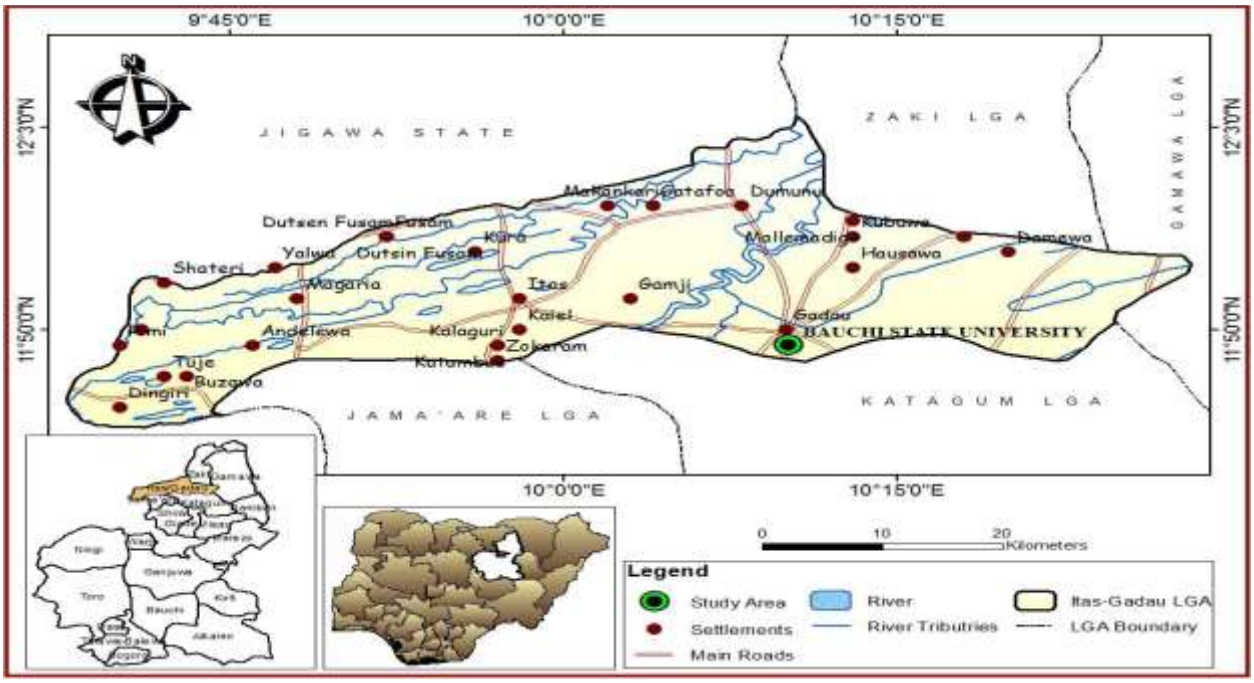

Figure 1: Map of Itas Gadau L.G.A showing Bauchi State University on spot

3.0 Results

The results obtained from this study revealed that, the number of days to germination recorded for the three soya beans varieties did not differ significantly, even though TGX-713-09D variety with 6 days had the highest days to germination while both TGX1835-10E and TGX1951-3F recorded 5 days each. Conversely, the treatments recorded a significant difference between them. The underlying soil of *Tamarindus indica* had a mean average of 6 days to germination compared to the control which recorded 4 days.

The germination percentage for the three soya beans varieties also did not differ significantly. Where both TGX-713-09Dl and TGX1835-10E varieties recorded 89% compared to the 78% recorded by TGX1951-3F. When the treatments were compared, the control had the highest germination percentage (93%) while the underlying soil of *Tamarindus indica* had 78%.

Conversely, the underling soil of *Tamarindus indica* recorded a better plant height, stem girth and number of branches with the values 15.61cm, 2.27cm and 5.33cm respectively as against the control which recorded 15.56cm, 2.10cm and 5.11cm respectively. The best performance of soya beans variety in terms of plant height, stem girth and number of branches in this study was TGX1835-10E with the values 15.83cm, 2.38cm and 5.50cm.

Table 1: Analysis of variance summary table for days to germination and germination percentage of some soya beans varieties grown on underlying soil of *Tamarindus indica*

Source of Variation	Df	MS(Days to Germination)	MS (Germination Percentage)	Plant Height (cm)	Stem Girth (cm)	Number of Branches
Varieties	2	2.056	249.4	1.13	0.29	1.39
Treatments	1	20.056**	997.6	0.01	0.13	0.22
Residual	14	2.484	890.7	1.92	0.05	0.58

** indicate significant difference at P< 0.05

Table 2: Means and Standard Error of Days to Germination and Germination Percentages of Some Soya Beans varieties grown on underlying soil of *Tamarindus indica*

Soya beans Varieties	**Days to germination**		**Germination Percentage(%)**		**Plant Height (cm)**		**Stem Girth (cm)**		**Number of Branches**	
	Mean	SE Mean ±	Mean	SE Mean ±	Mean	SE Mean ±	Mean	SE Mean ±	Mean	SE Mean ±
TGX-713-09D	5.7[a]	0.6	88.8[a]	12	15.8[a]	0.57	1.95[b]	0.09	4.67[a]	0.31
TGX1835-10E	5[a]	0.6	77.7[a]	12	15.83[a]	0.57	2.38[a]	0.09	5.50[a]	0.31
TGX1951-3F	4.5[a]	0.6	88.8[a]	12	15.08[a]	0.57	2.23[ab]	0.09	5.50[a]	0.31
Treatments										
Control	4[b]	0.5	92.6[a]	10	15.56[a]	0.46	2.10[a]	0.07	5.11[a]	0.25
Underlying soil of *Tamarindus indica*	6.1[a]	0.5	77.7[a]	10	15.61[a]	0.46	2.27[a]	0.07	5.33[a]	0.25

Means that do not share the same letter are significantly different at 95.0% Confidence level

4.0 Discussion

The nutritional status of soils under the canopies of trees encourages farmers to plant their crops under a particular tree or move away from such a tree. Inputs in to soil fertility or alellopathy could be litter fall and parts of the bark (Abdulhameed, 2005). A lot of studies reported good performance of crops under the canopies of savanna trees compared to those grown away from these trees canopies (Isichie and Moughalu, 1992; Abdulhameed *et al.*, 2004).

This study indicated that the underlying soil of *Tamarindus indica* affected the germination rate and the germination percentage when compared to the control. Where the mean days to germination for the soya beans varieties planted on the control was 4 days compared to the 6 days recorded by the underlying soil of *Tamarindus indica.* Similarly, the control recorded the highest germination percentage (93%) compared to 78% recorded by the underlying soil. On the other hand it aided some growth parameters such as plant height, stem girth and number of branches with the values 15.61cm, 2.27cm and 5.33cm respectively as against the control which recorded 15.56cm, 2.10cm and 5.11cm respectively. The best performance of soya beans variety in terms of plant height, stem girth and number of branches was TGX1835-10E with the values 15.83cm, 2.38cm and 5.50. The is in conformity with the findings of Abdulhameed (2005) in terms of the growth parameters, where the underlying soils of *Albizia lebbeck* and *Dalbergia sissoo* indicated fertility effects of the growth of plants.

5.0 Conclusion

Tamarindus indica underlying soil was found to have positive effect on plant height, stem girth and number of branches but it had no effect on the germination rate and germination percentages of the three soya beans varieties used in this study.

Declarations

Consent for publication

All authors have read and consented to the submission of the manuscript.

Competing interests

All authors declare no competing interests.

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