Journal of Agriculture and Environment Vol. 18 No. 2, 2022: 37-48
ISSN: 1595-465X (Print) 2695-236X (Online)

EFFECT OF RHIZOBIA INOCULATION ON GROWTH AND YIELD OF SELECTED SOYBEAN (*Glycine max* L.) VARIETIES UNDER SALT STRESS

A.S. Ishaq, M. Hayatu, L.A. Sani and H. Ahmed

Department of Plant Biology, Bayero University Kano, Nigeria

ABSTRACT

Salinity stress is among the factors that limits biological nitrogen fixation (BNF), growth and yield of soybean. Effects of different rhizobia inoculations on the growth and yield of soybean (*Glycine max*) varieties under salt stress condition were determined in a screen house. Five improved varieties of soybean (TGX1987-62F, TGX1987-10F, TGX1835-10E, TGX1951-3F and TGX1904-6F) and one local variety (Silba) were tested. The experiment was laid out in a Completely Randomized Design (CRD) with three replications. Different levels of rhizobia inoculation were prepared at 0 g/kg, 5 g/kg, 10 g/kg, 15 g/kg, 20 g/kg and 25 g/kg while salinity was maintained at 75 mM NaCl. Data were collected on root and shoot biomass, leaf area, relative water contents of leaf, relative growth rate, seed number, seed weight, chlorophyll contents and number of nodules, and analyzed using One-way Analysis of Variance at 5% significant level. Variety TGX1987-10F recorded the highest leaf area (1.78 cm^2 at 32 DAS and 2.58 cm^2 at 66 DAS), seed number (74.61) and seed weight (8.36 g) while varieties TGX1835-10E and TGX1987-62F recorded the lowest leaf area (1.41 cm^2 and 4.21 cm^2), shoot biomass (12.23 g and 21.75 g) chlorophyll content (32.69, 43.22, 34.99) at 23, 46 & 63 DAS with 0.0056 RGR. Higher inoculation level of the rhizobia (25 g per kg of soybean) was found to increases leaf area, LRWC, shoot biomass, chlorophyll content and yield of varieties TGX1987-10F and TGX1904-6F under salinity condition. Inoculation with rhizobia is effective in improving growth, BNF, yield and yield components of soybean varieties in a saline soil. Soybean varieties TGX1987-10F and TGX1904-6F inoculation with rhizobia are recommended for cultivation in saline area while TGX1835-10E and Silba are highly salinity sensitive.

Keywords: Rhizobia; inoculant; salinity; stress; soybean

INTRODUCTION

Soybean (*Glycine max* L.) is an important legume crop in human diet grown mainly for its edible bean. It belongs to the Fabacae family and one of the crucial cash crops in Nigeria that add nutrient to the soil through the process of biological nitrogen fixation (BNF) thus, improves soil fertility and structure. It is considered as an excellent intercropping crop in agriculture. Soybean has thus been variously described as a “miracle bean” or a “golden bean”. It contains 40 % high quality protein, 20 % edible vegetable oil and a good balance of amino acids (Fekadu *et al.*, 2009; Mahamood *et al.*, 2009). Farmers have adopted new cultivars developed by the International Institute for Tropical Agriculture (IITA) that store well and are freely nodulating to check low yields in soybean producing countries (Ewansiha *et al*., 2022). Nigeria has huge potential for soybean production, but average yield nationwide is low, and this is attributed to combination of several production constraints among which are poor nodulation of soybean cultivars with the indigenous Rhizobium sp. (Kamara *et al*., 2014), limited use of P fertilizer, salinity, and poor crop management practice (Ewansiha *et al*., 2022). Two early maturing cultivars (TGX1835-10E, TGX1987-62F**)**, two medium maturing cultivars (TGX1951-3F**,** TGX1987-10F) and two late maturing cultivars (TGX1904-6F**,** Silba (local variety)) were used in the study.

Soybean production requires good supply of N for high yield. However, like many other annual legumes, the crop could meet most of its N requirement through inoculation with *Brady rhizobia* (Kumaga and Ofori, 2004).

The use of high amount of fertilizers, rising water tables and the use of saline irrigation water cause soil salinity (Taiz and Zeiger, 1998). Thus, using Rhizobia inoculants that are well adapted to the edaphic and climatic conditions will essentially maximize the BNF in legume systems and improved the growth and the yield of soybean. The aim of this study is to determine the effect of Rhizobia inoculant on the growth and yield of some selected soybean *(Glycine max)* varieties under salt stress condition.

MATERIALS AND METHODS

Study Area and Seed Collection

The seeds of the selected soybean varieties were collected from International Institute of Tropical Agriculture (IITA), Kano station, Nigeria. A total of six (6) varieties (consisting of five improved varieties; TGX1987-62F, TGX1987-10F, TGX1835-10E, TGX1951-3F, TGX1904-6F and one local variety; Silba) were evaluated. The study was conducted in round plastic pot of 25 x 30 cm at screen house in the Department of Plant Biology, Bayero University Kano on latitude $11^{\circ}58^{1}$ N and longitude $8^{\circ}30^{1}$ E with altitude of 44 m above sea level.

Rhizobia Inoculants

Commercially prepared rhizobia inoculant was obtained from International Institute of Tropical Agriculture (IITA) Kano. The inoculant was prepared from peat (50 %) and aqueous rhizobium suspension (50 %).

Seed Treatment

Soybean seeds were inoculated using slurry method. Twenty grams of gum Arabic was dissolved in 200 ml warm distilled water to make a sticker solution in a clean container. The gum Arabic serves as adhesive to enable the inoculants to stick to seeds. The inoculants were thoroughly mixed with the gum Arabic solution and stirred vigorously before sprayed onto the seeds.

Experimental Design and Treatment

The experiment was arranged in a Completely Randomized Design (CRD) with three replications. Soybean varieties were treated with five (5) level of rhizobia inoculants (5 g/10 kg, 10 g/10 kg, 15 g/10 kg, 20 g/10 kg and 25 g/10 kg) while 0 g/10 kg serve as control treatment. Salinity was maintained at 75 mM (NaCl). A total of six varieties of soybean with six inoculants levels were adopted in this study which amount into thirty-six (36) treatments. Two plants stand per pot and the experiment was terminated at 106 days after sowing.

Data Collection

Leaf area: The leaf area of the seedlings was measured using leaf area meter at two growth stages i.e., 32 and 66 Days after sowing (DAS).

Shoot biomass: The shoots of the soybean plants were cut off at 29 and 48 DAS using destructive sampling, sun dried (using sun and oven) and weighted using weighing balance (Scout^{TM} pro, w=400g).

Chlorophyll Contents: The chlorophyll contents were measured using chlorophyll SPAD meter (SPAD- 502, Minolta, Japan) at 28, 43 and 63 DAS.

Relative Growth Rate (RGR): At 50 DAS the crop relative growth rate was calculated using the formula:

$$\text{RGR} = \frac{W2-W1}{t2-t1}$$

Where:
W_1 = Dry weight of plant recorded at time t_1, W_2 = Dry weight of plant recorded at time t_2, t_1 and t_2 were the interval of time, respectively.

Leaf relative water content (LRWC): This was calculated using the formula:

$$\text{LRWC}= \frac{Fresh\ weight - dry\ weight}{Turgid\ weight - dry\ weight} \times 100$$

Number of seeds and Seed weight: Number of seeds per pods were counted and recorded. Seeds of the soybean were dried and then measured to determine dry weight.

Number of nodules: The number of nodules per plant was counted and recorded using a hand lens.

Data Analysis

Data collected were presented as means ± SD of the 3 replicates used. One-way Analysis of Variance (ANOVA) was used to determine the differences across means at 5% ($P=0.05$) level of significance. Fisher LSD Procedure at 0.05 Probability level was used to separate means that are significantly ($p<0.005$) different.

RESULTS

The result on the effect of different rhizobia inoculations on leaf area of soybean variety under salt stress condition and the interaction effect between treatment and soybean varieties is presented in Table 1. There is significant difference ($p<0.05$) between the treatments and varieties at 32 and 66 DAS. At 32 DAS there is interaction effect between the treatment and soybean varieties.

Table 1: Main effect of Leaf area (cm^2) in soybean variety inoculated with different level of rhizobia under salinity stress.

Treatment	32 DAS	66 DAS (% inc.LA)	
25g/kg and 75Mm	1.85^{a}	2.64^{a}	
20g/kg and 75Mm	1.68^{ab}	2.51^{a}	
15g/kg and 75Mm	1.61^{bc}	2.48^{a}	
10g/kg and 75Mm	1.52^{bcd}	2.20^{b}	
5g-k/g and 75Mm	1.47^{cd}	2.13^{b}	
0g/kg and 75Mm	1.41^{d}	2.10^{b}	
Varieties			
TGX1987-10F	1.78^{a}	2.58^{a}	(36.6)
TGX1951-3F	1.61^{ab}	2.43^{ab}	(17.8)
TGX1904 -6F	1.56^{b}	2.31^{b}	(53.5)
Silba	1.56^{b}	2.30^{b}	(41.4)
TGX1987-62F	1.52^{b}	2.27^{b}	(16.9)
TGX1835-10E	1.50^{b}	2.21^{b}	(12.0)
Treat x Var	*	NS	

Means with different letters in the column indicate significant ($p < 0.05$). LA= percentage increased in Leaf area.

Results revealed that 25 g/kg (75 mM) treatment at 32 and 66 DAS has the highest leaf area (1.85 and 2.64) followed by 1.68 and 2.51 in 20 g/kg while the control treatment recorded the lowest leaf area (1.41 and 2.10). At 32 and 66 DAS the variety TGX1987-10F has the highest leaf area (1.78 and 2.58) followed by TGX1951-3F (1.61 and 2.43) while the lowest leaf area (1.50 and 2.21) was recorded on TGX1835-10E at both 32 and 66 DAS. Similarly, the highest percentage increased in leaf area was recorded on Variety TGX1904-6F (53.5 %) and the least percentage increased in leaf was on TGX1835-10E (12 %).

Effect of different rhizobia inoculations on shoot biomass of selected soybean varieties under salt stress conditions and the interaction between treatment and soybean varieties were analyzed and presented in Table 2. The result showed significant difference ($p<0.05$) within treatments and varieties at 29 and 48 DAS. At 48 DAS there is interaction effect between the treatment and soybean varieties but no interaction effect between the treatment and variety at 29 DAS. It further showed that at 29 DAS and 48 DAS the treatment 25 g/kg `recorded the highest shoot biomass (18.35 g and 29.01 g) respectively followed by 20 g-kg (16.54 g and 27.63 g) while the lowest shoot biomass (12.23 g and 21.75 g) was recorded in the control treatment (Table 2). Soybean variety TGX1987-10F recorded the highest shoot biomass at 29 and 48 DAS (17.87 g and 29.47 g) followed by TGX1904-6F (16.63 g and 26.05 g) while the lowest shoot Biomass was recorded in TGX1835-10E at both 29 and 48 DAS.

Interaction between treatment and varieties showed that at 48 DAS the highest shoot biomass was observed at 25 g/kg treatment. The variety TGX1987-62F recorded highest percentage (76.7 %) increased in shoot biomass while the TGX1951-3F variety recorded the least (19.7 %).

Table 2: Main effect of Shoot Biomass (g) of some soybean variety inoculated with different level of rhizobia under salinity stress

Treatment	29 DAS	48 DAS	(% inc.SB)
25g^{-}kg and 75mM	18.35^{a}	29.01^{a}	
20g^{-}kg and 75mM	16.54^{ab}	27.63^{ab}	
15g^{-}kg and 75mM	15.68^{ab}	24.82^{bc}	
10g^{-}kg and 75mM	14.53^{bc}	23.50^{c}	
5g^{-}kg and 75mM	13.58^{bc}	22.28^{c}	
0g^{-}kg and 75mM	12.23^{c}	21.75^{c}	
Varieties			
TGX1987-10F	17.87^{a}	29.47^{a}	(29.0)
TGX1951-3F	15.61^{ab}	25.78^{b}	(19.7)
TGX1904-6F	16.63^{a}	26.05^{ab}	(65.8)
Silba	15.32^{ab}	24.40^{bc}	(43.35)
TGX1987-62F	12.96^{b}	21.97^{c}	(76.7))
TGX1835-10E	12.52^{b}	21.32^{c}	(34.1)
Treat x Var.	NS	*	

Means with different letters in the column indicate significant ($p < 0.05$) inc. SB= percentage increased in Shoot Biomass

Table 3 presents result of rhizobia inoculations on chlorophyll contents of soybean varieties under salt stress conditions. Significant difference ($p<0.05$) was observed within treatments at 28 DAS, 46 DAS and 63 DAS. No significance difference was recorded within the varieties. However, there is no interaction effect between the treatment and varieties at 28, 46, and 63 DAS.

Table 3: Main effect of chlorophyll contents in soybean varieties inoculated with different level of rhizobia under salinity stress

Treatment	28 DAS	46 DAS	63 DAS
25g^{-}kg and 75mM	45.45^{a}	54.66^{a}	59.33^{a}
20g^{-}kg and 75mM	36.07^{b}	43.79^{b}	45.03^{b}
15g^{-}kg and 75mM	32.80^{b}	37.80^{c}	39.48^{c}
10g^{-}kg and 75mM	31.96^{c}	32.99^{d}	32.83^{d}
5g^{-}kg and 75mM	30.23^{c}	28.83^{d}	25.74^{e}
0g^{-}kg and 75mM	25.62^{d}	22.08^{e}	19.60^{f}
Varieties			
TGX1987-10F	33.48^{a}	37.95^{ab}	38.36^{a}
TGX1951-3F	33.26^{a}	35.81^{ab}	36.00^{a}
TGX1904-6F	36.35^{a}	39.33^{a}	39.06^{a}
Silba	33.26^{a}	35.88^{ab}	36.24^{a}
TGX1987-62F	33.10^{a}	36.96^{ab}	37.37^{a}
TGX1835-10E	32.69^{a}	34.22^{b}	34.99^{a}
Var x Treat.	NS	NS	NS

Means with different letters in the column indicate significant ($p<0.05$).

At 28, 46 and 63 DAS, treatment of 25 g/kg recorded the highest chlorophyll value (45.45, 54.66, 59.33) while the least chlorophyll contents were observed on the control treatment (19.60, 22.08, and 25.62). Silba variety showed the highest chlorophyll value (36.35, 39.33 and 39.06) at 28, 46 and 63 DAS, while the lowest chlorophyll value was observed on TGX1835-10E (32.69, 34.22, and 34.99).

No significant difference ($p>0.05$) observed in both treatments and varieties for testing the effect of different rhizobia inoculations on the RGR of soybean varieties under salt stress conditions (Table 4). Even though slight numerical differences were observed but they appeared to be statistically insignificant.

Table 4: Relative Growth Rate (RGR) of some soybean varieties inoculated with different level of rhizobia under salinity stress

Treatment	50 DAS
25g$^-$kg and 75mM	0.0068
20g$^-$kg and 75mM	0.0065
15g$^-$kg and 75mM	0.0063
10g$^-$kg and 75mM	0.0055
5g$^-$kg and 75mM	0.0055
0g$^-$kg and 75mM	0.0054
Varieties	
TGX1987-10F	0.0059
TGX1951-3F	0.0062
TGX1904-6F	0.0056
Silba	0.0056
TGX1987-62F	0.0056
TGX1835-10E	0.0071
Treat x Var.	NS

Means with different letters in the column indicate significant ($p<0.05$).

The result in Table 5 indicated a significant difference ($p<0.05$) in treatments only. Greater LRWC (1.02) was observed in 10 g/kg treatment, while 20 g$^-$kg recorded the lowest value of LRWC (0.84). Among the soybean varieties, TGX1835-10E recorded the highest LRWC (0.96) and the lowest LRWC was recorded in TGX1987-62F (0.86).

Table 5: Leaf relative water content (LRWC) of soybean varieties inoculated with different level of rhizobia under salinity stress

Treatment	62 DAS
25g$^-$kg and 75mM	1.02^a
20g$^-$kg and 75mM	0.93^{ab}
15g$^-$kg and 75mM	0.91^{ab}
10g$^-$kg and 75mM	0.89^{ab}
5g$^-$kg and 75mM	0.86^{ab}
0g$^-$kg and 75mM	0.84^b
Varieties	
TGX1987-10F	0.92^a
TGX1951-3F	0.92^a
TGX1904-6F	0.87^a
Silba	0.91^a
TGX1987-62F	0.86^a
TGX1835-10E	0.96^a
Treat. x Var.	NS

Means with different letters in the column indicate significant ($p<0.05$).

The results on the effect of different rhizobia inoculations treatments on seed number of the soybean varieties and their interaction effect were presented in Table 6. There is significant difference ($p<0.05$) in treatments, varieties, and their interaction. The result indicated that the treatment 25 g/kg had higher seed number (93.61) followed by 20 g/kg (78.83) and lower (38.44) value was observed in the control. The soybean variety TGX1904-6F recorded the highest number of seed (74.61) followed by TGX1987-10F (71.55) and the lowest is TGX1835-10E (52.77).

Table 6: Main effect of number of seeds in soybean varieties inoculated with different level of rhizobia under salinity stress

Treatment	114 DAS	% incr.SN
25g-kg and 75mM	93.61[a]	
20g-kg and 75mM	78.83[b]	
15g-kg and 75mM	75.05[b]	
10g-kg and 75mM	50.38[c]	
5g-kg and 75mM	49.16[c]	
0g-kg and 75mM	38.44[d]	
Varieties		
TGX1987-10F	71.55[a]	(80.7)
TGX1951-3F	71.33[a]	(74.0)
TGX1904-6F	74.61[a]	(80.9)
Silba	57.16[b]	(70.3)
TGX1987-62F	58.05[b]	(76.3)
TGX1835-10E	52.77[b]	(80.0)
Treat. x Var.	NS	

Means with different letters in the column indicate significant ($p<0.05$). SN = percentage increased in number of seed

The interaction effect between treatment and varieties showed that the highest seed number was observed in treatment level 25 g/kg and the highest percentage increased in shoot biomass was recorded in variety TGX1904-6F (80.9 %) and the least percentage increased in seed number was recorded on Silba (70.3 %).

The result of the effect of different rhizobia inoculations on seed weight of soybean varieties showed that there is significant difference ($p<0.05$) in both treatments and varieties (Table 7). The treatment 25 g/kg recorded the highest seed weight (11.36 g) followed by 20 g/kg (9.64 g) and lowest seed weight (4.21 g) was observed in the control. The soybean variety TGX1987-10F recorded the highest seed weight (8.36 g) followed by TGX1904-6F (8.08 g) and the lowest seed weight was recorded on TGX1987-62F (6.59 g).

The result on the number of nodules of soybean varieties and the interaction between treatments and soybean varieties were presented in Table 8. There is significant difference ($p<0.05$) in treatment, varieties and their interactions. The result showed that the treatment 25 g/kg recorded the highest number of nodules (95.77) followed by 20 g/kg (68.0) and the lowest number of nodules (16.66) was recorded in the control. The variety TGX1987-10F recorded higher number of nodules (62.66) followed by TGX1951-3F (57.44) and the lower number of nodules was recorded in TGX1835-10E (46.16). The result of the interaction effect between treatment and varieties showed that the highest number of nodules was observed on treatment level 25 g-kg/75mM and the highest percentage (%) increased in number of nodules was recorded on Variety TGX1951-3F (92.3 %) and the least percentage increased in Pod weight was recorded on TGX1835-10E (69.0 %).

Table 7: Seed weight of soybean varieties inoculated with different level of rhizobia under salinity stress

Treatment	Weight (g)
25g-kg and 75mM	11.36[a]
20g-kg and 75mM	9.64[b]
15g-kg and 75mM	8.72[b]
10g-kg and 75mM	6.09[c]
5g-kg and 75mM	5.89[c]
0g-kg and 75mM	4.21[d]
Varieties	
TGX1987-10F	8.36[a]
TGX1951-3F	7.96[a]
TGX1904-6F	8.08[a]
Silba	7.28[ab]
TGX1987-62F	6.59[b]
TGX1835-10E	7.63[ab]
Treat. x Var.	NS

Means with different letters in the column indicate significant ($p<0.05$).

Table 8: Main effect of number and percentage increased in nodules of soybean varieties inoculated with different level of rhizobia under salinity stress

Treatment	115 DAS	(% incr. NN)
25g-kg and 75mM	95.77[a]	
20g-kg and 75mM	68.00[b]	
15g-kg and 75mM	56.83[c]	
10g-kg and 75mM	47.47[d]	
5g-kg and 75mM	41.94[d]	
0g-kg and 75mM	16.66[e]	
Varieties		
TGX1987-10F	62.66[a]	(4.48)
TGX1951-3F	57.44[b]	(6.96)
TGX1904-6F	52.00[cd]	(2.64)
Silba	56.61[bc]	(1.20)
TGX1987-62F	51.33[de]	(2.02)
TGX1835-10E	46.16[e]	(8.51)
Treat. x Var.	*	

Means with different letters in the column indicate significant ($p<0.05$).

DISCUSSION

Rhizobia inoculation has been regarded as a sustainable and cost-effective tool used to supplement the plants' nitrogen needs, and several studies have reported that inoculation with rhizobia improves legume growth, nutrition, and production (Tena *et al*., 2016; Koskey *et al*., 2017; Nyaga *et al*., 2020). In this study, the effect of different level Rhizobium inoculation and their potential to promote growth and yield of soybean varieties grown under salinity condition was assessed. We found that Rhizobium inoculation had positive effects on the leaf area, plant biomass, relative water content and chlorophyll contents in all the treatment except control which expressed relatively poor growth in all parameters measured. Inoculation with Rhizobium strains significantly increased the soybean growth by enhancing nutrients availability to supplement tissue development such as leaf area and chlorophyll integrity. Similar assertions reported that increase in plant growth following bacteria treatment can be as a result of production of phytohormones and the enhancement of nutrient availability (Gholami *et al*., 2009; Ghorbanpour *et al*., 2013; Ghorbanpour and Hatami, 2013; 2014). Karlidag *et al.* (2011) reported that the relative water content increased in the leaf samples of strawberries due to inoculation with plant growth promoting Rhizobium (PGPR) under salinity stress. Similar findings were reported on maize and radish (Nadeem *et al*., 2006; Yildirim *et al*., 2008).

According to the results obtained, root and shoot dry weight increased significantly upon inoculation with bacteria. The increased plant biomass observed in the study might be due to symbiotic relationship between the inoculated Rhizobium and root nodules of legumes which fix atmospheric nitrogen into a usable form to be utilized by the plant for growth. Bioenhancers such as arbuscular mycorrhizal fungi and plant growth promoting bacteria interactions increase supply and access to other nutrients (Osman *et al*., 2021). Similar finding on herbaceous and cereal crops were reported by Viscardi *et al.* (2016) on tomato inoculated with selected plant growth promoting strains of *A. chroococcum* (67B and 76A) which increased growth and biomass accumulation under salinity stress. Banerjee *et al.* (2017) reported that the inoculation of rice plants with bacterial isolate SB5 (IAA and ammonia producing, and phosphate solubilizing strain) and fungal isolate SF4 (IAA and siderophore producing, and phosphate solubilizing strain) remarkably increased root and shoot length. Studies by other researchers have declared that PGPR has positive effects on root and shoot weight, plant growth and yield under salinity condition (Cakmakci *et al*., 2007). Mayak *et al*. (2004) studied the potential of rhizospheric bacteria in increasing the durability of tomatoes under salinity stress. Bacteria treatment significantly increased the fresh and dry weight of the seedlings due to reduction in ethylene content. They also reported that the increase in plant biomass under stress conditions is due to the development of the root system, which facilitates the absorption of nutrients and water.

In the present study, results obtained showed that, the chlorophyll content significantly decreased with decreasing inoculation level. This can be as a consequence of the increase in concentration or accumulation of some plastid pigments due to stress induction (Bano and Fatima, 2009). However, the highest SPAD value was observed on inoculated treatment compared to the non-inoculated treatment (control). These improvements could be accredited to improved biological nitrogen fixation by rhizobial inoculants which increased nitrogen supply to the plants and subsequently increased total leaf chlorophyll contents of the legumes. The promising results attained from this study conclude that rhizobia inoculation compliment the expensive inorganic N fertilizers in improving plant growth and chlorophyll synthesis under salinity condition. However, the result from the present research indicates that the highest RGR was higher in all the inoculated treatment, and this could be due to fact that the rhizobial inoculation does not affect the relative growth rate as it directly affects the rate of the growth of all legumes.

Seed number and seed weight showed higher performance per plant, and this could presumably be due to salinity effect which may reduce nodulation, inhibit N fixation and poor seed filling consequently. Seed number and yield were influenced by number of nodules, number of branches, number of leaves and dry matter (Ewansiha *et al.*, 2022). But when treated with *Bradyrhizobium japonicum* inoculation it increased the mean seed number and seed weight per plant. Improvement of N availability at the early growth stage of soybean may result in more nodule mass formation and adequate N fixation during growing season specifically seed setting. The significant increase in number of seed number and yield may be attributed to ability and uptake of nitrogen, phosphorous and potassium by plants in soil which positively has effect on vegetative growth (Abdulkadir *et al*., 2022).

CONCLUSION

Results from the present studies have shown that soybean inoculation with rhizobia is effective in improving growth, BNF, yield and yield components of soybean varieties in a saline soil. Selection and development of efficient soybean varieties that are responsive to inoculant *Rhizobia* strain(s) form the basis increased soybean yields and BNF while all inoculants enhance nodulation, TGX987-10F and TGX1904-6F varieties at 25 g/kg concentration showed superiority in leaf area, shoot and root biomass, chlorophyll and yield components.

Variety TGX1987-10F was found to record highest in most of the parameters measured despite the present of salinity in the soil used thus recommend for planting. Field testing and identification of best inoculation strategies on TGX1987-10F soybean variety under natural saline conditions that will augment sustainable soybean production.

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