East African Scholars Journal of Agriculture and Life Sciences
Abbreviated Key Title: East African Scholars J Agri Life Sci
ISSN 2617-4472 (Print) | ISSN 2617-7277 (Online)
Published By East African Scholars Publisher, Kenya

Volume-5 | Issue-6 | Jun-2022| DOI:10.36349/easjals.2022.v05i06.003

OPEN ACCESS

Original Research Article

Effect of Nitrogen and Elixr on Soybean (Glaycine Max) Attributes, in New Halfa Agriculture Scheme

Abdalla Mohamed Hussein[1*]

[1]Department of Horticulture sciences, Faculty of Agriculture and Natural Resources, University of Kassala, Sudan

Article History
Received: 26.04.2022
Accepted: 04.06.2022
Published: 12.06.2022

Journal homepage:
http://www.easpublisher.com

Quick Response Code

Abstract: To find out the effect of nitrogen and elixr on soybean attributes, this experiment is set up in (RCBD), with four replications. The treatments are zero fertilizer (Z_0), two doses of both nitrogen (N_1=50; N_2 =100 Kg fed^{-1}) and elxir (E_1=10; E_2=20 L fed^{-1}). The findings show that the treatments have no effect on the plant height, number of branches and days to reach 50% flowering, however the number of leaves increased significantly with increasing nitrogen (N_2) and declined with increasing of elixr (E_2). The lower nitrogen dose (N_1) enhnce plant fresh and dry weight, however treatments of elixr (E_1; E_2) deteriorated both weights. Number of pod per plant, seeds per pod and seed weight have a liner increase with increasing nitrogen (N_1; N_2), followed by the higher dose of elxir (E_2), however the low dose of elxir (E_1) record the minimum. The yield per plant and hectare are a greatest with lower (N_1) and higher (N_2) dose of nitrogen respectively, followed by control (Z_0), however yield attributes fail with applying elxir.

Keywords: Nitrogen Elixr, Glaycine max, Growth Yield.

INTRODUCTION

Soybean [*Glycine max* (L.) Wilczek] is a globally important oilseed crop and source of high quality protein for human consumption, used as fodder for animal and is also important in improved crop rotation systems (Manyong *et al.*, 1996). The world average yield of soybean is 2.80 MT/ha (Langemeier and Purdy, 2019). A well-established fact is that when legumes are grown in low and high available nitrogen, the nitrogen fixation rate is reduced (Solomon *et al*., 2012). Handarson *et al*., (1989) reported that nitrogen fixation ability of the soybean crop is influenced by several factors such as plant varieties, soil types, climatic conditions, crop management practices, availability of organic matter (Kundu *et al*., 1996) and the availability of Phosphorus and Sulfur (Kris Joko, 2001). Bio fertilizer is a natural substances include many of the benefit micro-organisms which are improving characters and fertility of the soil, from the enzyme and amino- acid excretion and some claw materials, growth regulators and some anti-biotic that repel the growth of pathogens (Javaid and Mahmood, 2010). The application of bio-fertilizer into the soil leads to increase soil fertility and crop productivity (Yadav and Sarkar, 2019). Islam *et al*., (2021) detect that the bio-fertilizers enhances the metabolism of plants which increases the growth and yield of soybean and noticed that the effects of bio-fertilizers were found to be significantly higher than in control treatment. In soils with low nitrogen, a moderate amount of 'starter nitrogen' would be required by the legume plants for nodule development, root and shoot growth. In order to optimize soybean growth, farmers tend to add excessive dosage of chemical fertilizer to this crop. Furthermore, a continuous chemical fertilizer application without organic fertilizer addition may cause a rapid depletion of nutrients in the soil (Ratih and Zainal, 2021). Rashid *et al*., (1999) stated that Rhizobium inoculation with nitrogen significantly increased pod yield. As most of soils are poor in organic matter, response to fertilizer has not been higher due to the rapid fixation of nutrients (Rabiul *et al*., 2020). Intensification of land use, especially by small-scale farmers with minimal nutrient inputs has lead to declining crop yields and increased nutrient removal (Fahadul *et al*., 2021). There is a continuous conflict between the use of chemical fertilizer, which is increases productivity and a bio-activator that improve the yield quality. Several studies in the chemical and a bio-activator were made as either separately or as a mixed dose of both fertilizers. Due to lack of sufficient researches in an individual application of nitrogen and bio-fertilizer therefore, the objective of

***Corresponding Author:** Abdalla Mohamed Hussein
Department of Horticulture sciences, Faculty of Agriculture and Natural Resources, University of Kassala, Sudan

this study is to find the effect of nitrogen and elxir on soybean growth and yield.

2. MATERIAL AND METHODS

This experiment is carried out in winter season (30 October) of the year 2013/ 2014 in the demonstration farm of the Faculty of Agriculture and Natural Resources, University of Kassala, Sudan. Two plants per hole were sown, in the northerner part of the ridge, with 15 cm apart. The experiment applied in Randomized Complete Block Design (RCBD), replicated four times. The unit of the experiment is 3x4 m^2 with four ridges of three meters in length and eighty cm apart between them. The treatments consisted of zero fertilizer (Z_0) as control, two levels of Nitrogen; (N_1 50; N_2 100 Kg N Fed^{-1}) as chemical fertilizer, and two levels of elixr; (E_1 10; E_2 20 L E Fed^{-1}), as bio-activator, added as sprayed solution of 5 ml E per 300 ml water. Nitrogen applied as two equal doses, the earl dose after three weeks from sowing and the second with one week interval from the previous, while elixr applied as thee doses the earl one after three weeks from planting and the others with intervals of a week. The data recorded were, plant height, leaves and branches number, plant fresh and dry weight, days to reaching 50 flowering, number of pods per plant, seeds per pod, seed weight, yield per plant and ton per hectare. The data statistically analyzed using computer software program (MSTAT-C) and the means were separated using the Least Significant Difference (LSD) at $P \leq 0.05$.

RESULTS

Effect of nitrogen and elixr on plant height and number of leaves and branches per plant

Table (1) presented the effect of nitrogen and Elixr fertilizers on plant height and number of the leaves and branches per plant. There is no significance effect noticed due to treatments on plant height and number of branches per plant. The plant height have a slightly increased with increasing dose of nitrogen (N_2), while the lower dose of elixr (E_1) providing the highest number of branches. The number of leaves per plant were significantly increased with increasing of nitrogen fertilizer (N_2) and declined with the increasing dose of elixr (E_2). In spite of the intensive applying of nitrogen and elixr were slightly increased plant height and branches per plant, respectively, whereas the difference was no significant, a similar to this, but with a greatest increase was noticed by Begum *et al*., (2015) who registered a significantly increase in a plant height influenced by nitrogen, while, the control produced the shortest plants, and Hussein *et al*., (2018) they noticed no significant effect in the number of branches due to the nitrogen fertilizer. The increase in nitrogen fertilizer increased number of leaves significantly, but had significant differ on the number of branches per plant among all treatments. Obaidur Rahman *et al*., (2001) reported a significant influence on the number of leaves and branches due to fertilizer.

Table 1: Effect of nitrogen and elixr on plant height and number of leaves and branches per plant

Treatment	Pant height (cm)	No. of leaves per plant	No. of branches per plant
N_1	60.40	34.58	5.25
N_2	60.83	34.90	5.33
E_1	57.97	30.63	5.18
E_2	56.96	26.13	5.75
Z_0	57.43	33.60	5.50
Cv %	9.510	8.240	12.01
LSD at 0.05	8.600	4.060	0.960

Effect of nitrogen and elixr on plant fresh and dry weight and days to reach 50% flowering

As they shown in Table (2), the lower dose of nitrogen (N_1) significantly increased both attributes of plant fresh and dry weight followed by the control (Z_0), which is increased plant fresh weight and the higher dose of nitrogen (N_2) which is enhance the plant dry weight. The lower higher doses of elixr (E_1; E_2) have a lightest fresh and dry weight of the plant, respectively. Otherwise, the days needs to reaching 50% flowering were not significantly affected, despite of the plants received both doses of nitrogen especially the high one (N_2) need a long time to reach 50% flowering, while the plants treated by both dose of elixr (E_1; E_2) reach flowering early. The increase in the plant fresh and dry weight is related with neutral dose of nitrogen, this in agree of findings of Hussein *et al*., (2018) they indicated that the lower dose of nitrogen gave the greatest fresh and dry weights of the plant, they regarded that the higher rate of nitrogen promotes vine growth, delayed flowering. The result of this work are in agreement with that of Nasri and Khalatbari, (2015) who reported an increase in the period of the vegetative drowt had became longer in the higher nitrogen application.

Table 2: Effect of nitrogen and elixr on plant fresh and dry weight and days to reach 50% flowering

Treatment	Plant fresh weight (gm)	Plant dry weight (gm)	Days to 50% flowering
N_1	56.63	10.98	50.50
N_2	45.65	10.40	53.00
E_1	36.33	8.100	49.25
E_2	38.72	7.900	49.50
Z_0	55.8	9.600	50.75
Cv %	14.90	10.95	5.56
LSD at 0.05	10.70	1.58	4.35

Effect of nitrogen and elixr on number of pods per plant and seed per pod and seeds weight

High and lower doses of nitrogen (N_1; N_2) fertilizer had a highly considerably increase on number of pods per plant and seeds yield pod, pursue by the higher dose of elixr (E_2) and control (Z_0), subsequently, while the lower treatment of elxir (E_1) came late. The seed weight shown a similar face of the above mentioned increase but without significance difference (Table 3). Regardless of higher decline in the number of pods per plant and seeds per pod that is casing by the lower dose of elixr, there were no significant different in the above mentioned attributes between the plant treated by the higher dose of elixr (E_2) and non treated plant (Z_0), this result is inconsistent with that of Singh (2005) who reported no significant difference between pod yield of non-inoculated and inoculated soybean seeds with B. japonicum. The applying of nitrogen fertilizer in both lower and higher dose in addition to higher dose of elixr increased number of pod per plant and seeds per pod compared with control, however, the control slightly increased seed weight as regarded with both dose of elixr. The seed weight was increased with lower dose of nitrogen and have a minimum decline due to increasing nitrogen dose, Morshed (2008) found a similar result and they noticed that the increase in rates of nitrogen increased seed weight and thereafter it reduced. The seed weight were relatively constant and having no significant effect, this is whith in line of Touchton and Rickerl (1986), they indicated that the seed quality did not vary among residual fertility levels, but was improved by the starter fertilizers. This result is typically in the item of nitrogen fertilizer and confirmed by findings of Begum *et al*., (2015) who indicated that the greatest number of seeds pod, 1000 seed weight, were observed with lower dose of nitrogen followed by the higher application whereas, the crops showed poor performance with no nitrogen application. Pod weight increased with enhancing chemical fertilizer application for non-inoculated seeds (Manochehr *et al*., 2013). The result of Hussein *et al*., (2018) presented that the greatest number of pods per plant was obtained by plant treated with the higher and lower dose of nitrogen and the pair doses were statistically similar.

Table 3: Effect of nitrogen and elixr on number of pods per plant and seed per pod and seeds weight

Treatment	No. of pods per plant	No. of seeds per pod	1000 seeds weight (gm)
N_1	90.30	2.60	101.1
N_2	94.90	2.65	101.0
E_1	55.90	2.32	90.50
E_2	79.75	2.60	95.40
Z_0	68.88	2.57	98.87
Cv %	8.040	7.11	8.08
LSD at 0.05	9.990	0.27	12.11

Effect of nitrogen and elixr on yield of seed per plant and per hectare

The analysis of variance reflected that the lower treatment of nitrogen (N_1) make a significance differences on seed yield per plant compared with higher dose of elixr (E_2) and positive increase beside other treatments, the excessively dose of both fertilizers (N_2; E_2) had a negative effect on seed yield per plant and this reflected typically on seed yield per hectare (Table 4). The ultimate objective of crop production is its economic yield, seed yield is the major concern for soybean Islam *et al*., (2021). The highest seed yield per hectare was obtained in lower nitrogen amount, might have resulted due to cumulative favorable effects of 1000 seed weight and yield of seed per plant. Difference between control and lower dose of urea was not significant, a similar result reported by Manochehr *et al*., (2013) they indicated that the increase in chemical fertilizer application and with no significant deferent enhanced grain yield. They also mentioned that the inoculated seeds by phosphate solubilizing bacteria bio-fertilizer grain yield was similar to that of control. Moreover, Hussein *et al*., (2018) get that the half dose of nitrogen had superior means in term of plant yield per hectare.

Table 4: Effect of nitrogen and elixr on yield of seed per plant and per hectare

Treatment	Yield seed per plant (gm)	Yield seed per hectare (Ton ha^{-1})
N_1	8.28	1.32
N_2	7.56	1.21
E_1	6.19	0.99
E_2	5.81	0.93
Z_0	8.06	1.29
Cv %	21.36	2.1
LSD at 0.05	2.37	0.38

CONCLUSION

The study was conducted to detect the effect of two doses of nitrogen and elxir against the control on soybean growth and yield. The results demonstrate that the nitrogen doses used in this study was effective in soybean growth and yield, while the bio-activator of elxir application had a negative effect in most attributes compared with nitrogen and control.

REFERENCES

- Begum, M. A., Ahmed, Q. M., Islam, M. A., & Rahman, M. M. (2015). Effect of nitrogen and phosphorus on the growth and yield performance of soybean. *Res Agric Livest Fish*, 2(1), 35-42.
- Fahadul, H., Tariq, H. M. M., Farooque, A. M. Subrota, P., Abdul Karim, M. D., & Abu Zafur, A. (2021). Effect of bio-fertilizer on growth and productivity of soybean varieties. *International Journal of Agriculture and Environmental Research*, 7(1). ISSN: 2455-6939. DOI: https://doi.org/10.51193/IJAER.2021.7101.
- Handarson M, Golbs, Danso S. K. A. (1989). Nitrogen Fixation in soybean pattern. *Soil Biology and Chemistry*, 21, 783-787.
- Hussein, A., Benmoussa, M., & Abbad, M. (2018). Effect of population density and dose of nitrogen and potassium fertilizers on performance of green bean (*phaseolus vulgaris* L.*). J Fundam Appl Sci*, 10(1), 46-58. doi: http://dx.doi.org/10.4314/jfas.v10i1.4. ISSN 1112-9867. http://www.jfas.info
- Islam, M. D. N., Shaila, S., & Mohammed, A. R. (2021). Effects of Different Biofertilizer on Soybean (Glycine max) Production. *American Journal of pure and Applied Biosceiences*, 3(3), 55-59. https://doi.org/10.34104/ajpab.021.055059.
- Javaid, A., & Mahmood, N. (2010). Growth, nodulation and yield response of soybean to Bio-fertilizers and organic manures. *Pakistan Journal of Botany*, 42(2), 863-871.
- Kris Joko, S. (2001). Efektivitas Nodulasi Rhizbium japonicum pada Kedalai yang Tumbuh di Tanah Sisa Inokulasi dan tanah dengan Inokulasi Tambahan. *Jurnal Ilmu-Ilmu Pertanian Indonesia*, 3, 31-35.
- Kundu, M., Singh, H., Tripathi, A. K., Manna, M. C., & Takkar P. N. (1996). Effect of farmyard manure on nitrogen fixation soybean (Glicine max) and it net potential contribution of N balance as measured by-N.tracer methodology. *Indian Journal of Agricultural Science*, 66, 509-518.
- Langemeier, M., & Purdy, R. (2019). International Benchmarks for Soybean Production. Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, farmdoc daily, 9, 94. https://farmdocdaily.illinois.edu/2019/05/internatio nal. l-benchmarks-for-soybean-production-3.html.
- Manochehr, S. J., Yaegoob, R., Kazem, G. G., & Nasser, A. (2013). Soybean response to biological and chemical fertilizers. *Intl J Agri Crop Sci*, 5(3), 261-266. IJACS/2013/5-3/261-266. ISSN 2227-670X ©2013 IJACS
- Manyong, V. M., Dashiell, K. E., Oyewole, B., & Blahut, G. (1996). Spread of new Soybean varieties in a traditional soybean growing area of Nigeria. A Seminar Paper in the Second Symposium of the African Association of Farming Systems Research Extension and Training (AAFSRET), 20–23, Ouagadougou, Burkina Faso, pp. 151-162.
- Morshed, R. M., Rahman, M. M., & Rahman, M. A. (2008). Effect of Nitrogen on Seed Yield, Protein Content and Nutrient Uptake of Soybean (Glycine max L.). *J Agric Rural Dev*, 6(1&2), 13-17. ISSN 1810-1860. Available online at http://www.banglajol.info/index.php/jard
- Nasri, M., & Khalatbari, M. (2015). The effect of different values of nitrogen, potassium and zenc fertilizer on physiological characteristics of grean bean (Phaseolous vulgaris gen. sunray) in Iran. *Biological forum – An International Journal*, 7(2), 467-472.
- Obaidur Rahman, M. D., Rabbani, M. G., & Nasiruddin, K. M. (2001). Effect of different level of nitrogen and plant spacing on the growth and yield of French bean (Phaseolus vulgaris L.). M. Sc. Bangaladesh Agricultural university. Examination rol No. 59 Registration No. 18338 (1991-2001).
- Rabiul, I., Uddin, M. E., & Alam, M. F. (2020). Isolation, identification and characterization of Rhizobium species from soil of Cicer arietinum field of Faridpur in Bangladesh, *Intern. J of Curr Res*, 12(4), 10322-10325. https://doi.org/10.24941/ijcr.38456.04.2020.
- Ratih, S., & Zainal, A. (2021). Effect of organic and chemical fertilizers on the growth and production of soybean (*Glycine max*) in dry land.

Rev Fac Nac Agron Medellín, 74(3). https://doi.org/10.15446/rfnam.v74n3.90967

- Touchton, J. T., & Rickerl, D. H. (1986). Soybean Growth and Yield Responses to Starter Fertilizers. *Soil science society of America Journal*, https://doi.org/10.2136/sssaj1986.03615995005000010045x
- Yadav, K. K. and Sarkar, S. (2019). Bio-fertilizers, impact on soil fertility and crop productivity under sustainable agriculture. Environment and Ecology, 37(1), pp.89-93. https://www.researchgate.net/publication/329238918

Cite This Article: Abdalla Mohamed Hussein (2022). Effect of Nitrogen and Elixr on Soybean (Glaycine Max) Attributes, in New Halfa Agriculture Scheme. *East African Scholars J Agri Life Sci, 5*(6), 107-111.