SUST
Journal of Agricultural and Veterinary Sciences
Journal homepage:
http:// journals.sustech.edu

Effect of Chemical and Organic Fertilizers on Yield and Yield Components of Two Roselle (*Hibscussabdariffa*L) Cultivars

Elkheir Hassaballah AbdallahA hamed
Department of Agronomy, Faculty of Agriculture, Omdurman Islamic University, Sudan
Tel: +246-911117205 Fax: +246-911117205 E-mail: ahamedelkheir@yahoo.com

Elbager Idris Mohammed Ibrahim
Department of Agronomy, Faculty of Agriculture, Omdurman Islamic University, Sudan
Tel: +246-911117205 Fax: +246-911117205 E-mail: *Elbager86@gmail.com*

Abdelbagi Ahamed Abdelbagi
Department of Agronomy, Faculty of Agriculture, Omdurman Islamic University, Sudan
Tel: +246-911117205 Fax: +246-911117205 E-mail: *Elseemat0912294404@gmail.com*

*Corresponding author: E-mail: ahamedelkheir@yahoo.com

Received: March 2022 **Accepted: June 2022**

Abstract:
Afield experiment was conducted for two consecutive summer seasons namely 2011 and 2012 at the Demonstration Farm of the Faculty of Agriculture, Omdurman Islamic University (*Fitaihab*) to investigate the effect of chemical and organic fertilizers on yield and yield components of two roselle (*Hibscussabdariffa* L.) varieties. The experiment was carried out using split- plot design with four replications. The experiment involved two varieties and and six fertilizer treatments. The two varieties were Bulk (local variety) and Omshiback (improved variety) (designated as V_1 and V2, respectively) and laid out in the main plots. The fertilizer treatments were control (chick treatment), 40 kg N/ha, 80 kg N/ha, 40 KgN + 40 kg P_2O_5/fed, three tons cattle manure /fed (as compost) and two tons chicken manure/fed (as compost) Yield and yield components for calyces include number of fruits /plant, calyx dry weight/plant, dry calyx yield (kg/ fed), whereas for seeds (only for the 2nd season) involve number of seeds /capsule, 1000-seed weight, seed yield/ plant and seed yield (kg / fed). The findings of the study indicated that the two varieties were significantly different only in calyx dry weight/plant in the 1st season, when, V1 significantly exceeded V2. In general, the performance of V1 regarding components of calyx yield in both season was better than V2, whereas the reverse was true for components of seed yield. As for fertilizer treatments, the findings showed that all calyces components studied were not significantly affected by application of fertilizers, except number of fruits/plant in the 1st season, when both F1 and F2 treatments reported a significantly higher mean of this parameter than the other fertilizer treatments. Meanwhile, seed yield and seed components were not significantly affected by application of fertilizers, but in most cases F4 reported the insignificantly higher mean as compared to the other treatments.

Keyword: Chemical, Organic, Fertilizers, Yield, Yield components, Roselle (in the first season) and 1000-seed weight (in the first season) thus, Highest dry calyx

Introduction:

Roselle (*Hibiscus sabdariffa* L.) is a member of the Malvaceae family. It is a tropical annual shrub cultivated in tropical and subtropical zones (Sanoussi *et al*., 2010). The crop plays a considerable economic role, even though it is largely underutilized and underappreciated. The plant is valued for its stem fibers, edible calyces, leaves and seeds that have nutritional and medicinal uses (D'Heureux and Badrie, 2004).The leaves are consumed as a green vegetable (spinach), while the stem is a source of pulp for the paper industry (Rhoden and Small, 1991). Roselle calyces are used in producing drinks, jellies, sauces, chutneys, wines, preserves and are also a source of natural food colorants such as anthocyanin (Delgado-Vargas and Parcedes-Lopez, 2003). Consequently, the calyces have received industrial attention internationally (Egharevba and Law-Ogbomo, 2007). The drink obtained from calyces extract is readily available and is an inexpensive source of vitamin C (Babanjide, *et al*., 2004). Moreover, Roselle is one of the most popular folk medicinal plants due to its colored calyces which are also used in the pharmaceutical and cosmetic industries (Ibrahim and Hussein, 2006).

The seeds are subjected to a solid-state fermentation process, which produces a meat substitute condiment known as *dawadawa-botso* in Niger, *bi-kalga*in Central Burkina and *due* to in Mali (Sanoussi *et al*., 2010). In rural populations, this condiment is mostly used in sauces accompanying cereals and pastas. In Niger, roselle is grown traditionally,without chemical fertilization. Although roselle reacts favorably to N application by growing more vigorously (Van Damme and Viaene, 1987), little is known about the fertilizer requirements of it. However, many studies revealed thatroselleyield and yield components in form of calyx and seed yield, anthocyanin, protein content and oil content were significantly and insignificantly affectedwhen nitrogen and phosphorous applied (Laota, 1990; Osman, 1998; Abdelbagi, 2001; Atta *et al*., 2010; Gad, 2011; Hago and Osman (1999); Ahmed *et al* 1998; Abdelbagi *et al.*, 2001; Ibrahim *et al.*, 2020).The objective of this work was to investigate the effect of application of chemical and organic fertilization on yield and yield components of two roselle genotypes.

Materials and methods:

Description of the experimental layout:

Afield experiment was conducted during two consecutive summer seasons (2011 and 2012) at the Demonstration Farm on the Faculty of Agriculture, Omdurman Islamic University (*Alfitaihab*), latitude 15° 34 N, longitude 32° 34 E and about 393 m above sea the level. The soil suffers from low depth and fertility with pH ranging between 7.0 – 7.5 (Amin and Fadual, 2007).

Two varieties of roselle (*Hibscussabdariffa* L.) were used namely Bulk (local variety), which characterized by red stem and small seeds (referred to as V_1) and Om shiback (certified variety),which characterized by dark red stem and large seeds (referred to as $V_{2)}$. The seeds of both varieties were obtained from Elobaied Research Station, Agriculture Research Station – Sudan (production of 2009/2010 season). As for fertilization, two chemical fertilizers (N and P) and two organic fertilizers (cow and chicken manure), in addition to check treatment (F_0) were applied. Nitrogen treatments were 40 kg N/fed (referred to as F_1), 80 kg N/fed (referred to as F_2), and a combination of 40 kg N/fed + 40 kg

P_2O_5/fed (referred to as F_3). Cow and chicken fertilizers were firstly fermented inform of compost and then added as 3 tons/fed cow manure (F_4) and 2 tons/fed chicken manure (F_5). The process of formation of both cow and chicken manure as compost was done according to Billington (1943). The treatments were applied at planting in the 3rd week of July for both 2011 and 2012 seasons.

The experiment was laid-out in a split–plot design with for replications according to Gomez and Gomez (1984). The varieties were allotted to the main plots, whereas the fertilizer treatments were designated to the sub-plots. Mean separation for the experimental treatments was done by using Duncans Multible Range Test method (DMRT).

Husbandry:

Before sowing, the stable of the previous crops was removed from the experimental area. The land was then disc-ploughed, leveled and then ridged at 70cm spacing. The experimental unit was a plot of 12.5m^2 (5×2.5) each plot consists of 6 ridges, each 2.5m in length. The crop was sown on 20th July for the two seasons. Five seeds per hole were sown on the top of the ridge at 50 cm spacing between holes. Phosphorus, cow and chicken fertilizers were then applied at sowing in bands of one side of the ridge at the depth of nearly 3 inches, while nitrogen fertilizer was broad casted. The crop was immediately irrigated after sowing and then irrigated consequently every 7 days. Accordingly, the crop received 14 irrigations during the season, which extended to about 4 months. Thinning to 2 – 3 plants/hole and re-sowing were carried-out after the 3rd irrigation for both seasons. Three manual weeding were done after the 3rd, 5th and 7th irrigation. No pesticides or fungicides were used in both seasons

Yield and yield components:

At maturity, five plants from the three middle ridges were selected and used to determine the following yield components

Number of fruits/plant:

Number of fruit obtained by the five selected plants in each treatment was counted and then number of fruits/plant was determined.

Calyces dry weight/ plant (gm):

The fruits ofthe five selected plants were picked, then air dried and weighed to obtained calyx dry weight/ plant in gram.

Dry calyces yield (kg/fed)

After 120 days from sowing, most fruits reached maturity in both seasons, when their capsules turned from green to yellowish color and started to crack at the tip. At this stage, fruits of plants in an area of 4.2 m^2 (6.0 ×0.7 $m^{2)}$ in the 4 central ridges (1.5 m each) were picked from each plot. Then calyces were air dried and weighed to obtain calyces dry weight (kg/ fed) according to the equation:

$$\text{Dry calyx yield (kg/ fed)} = \frac{4200 \times \text{harvested area}}{4.2 \times 1000}$$

Number of seeds/capsule:

Parameters of seed attributes were taken only for the second season. Seeds of ten selected fruits were collected and counted to obtain the number of seeds/capsule.

1000-seed weight (gm):

A randomly sample of 3000 seeds was taken from the lot of the seeds obtained from the yield area. Then the seeds were weighted to determine this parameter.

Seed yield/plant (gm):

At maturity, seeds from capsules of the selected yielded area were collected and weighted to obtained seed yield/plant according to the formula:

Seed yield/plant = Seed weight of plants in harvested area

Number of plants for the harvested area

Seed yield (kg/fed.):

Seed from capsules of the selected yield area were collected and weighed to obtain Seed yield (Kg/fed.) according to the formula:

$$\text{Seed yield (kg/fed)} = \frac{4200 \times \text{seed yield of } 4.2\text{m}^2 \text{ (gm)}}{4.2 \times 1000}$$

Results and discussion:

1Number of fruits/plant:

Number of fruits/ plant was not significantly affected by genotypes well as fertilizers application in both seasons (table1), except fertilizer in the 1st season, when both F1 and F2 treatments (40 and 80 Kg N/fed., respectively) gave the significantly higher mean of this parameter (12.37 and 12.27 fruits/plant, resp.) as compared to the most other treatments, whereas F0 (check treatment) reported the significantly lower mean (9.08 fruits). F_1 treatment in the first season significantly increased number of fruits/plant as compared to F_0, F_3, F_4 and F_5 by about 36.2%, 24.1%, 28.6% and 33.0% respectively, whereas this treatment in the second season insignificantly increased this parameter compared to F_0, F_2, F_3, and F_5 by about 35.9%, 12.8%, 10.5% and 8.2%, respectively (Table1).

The significant increase in number of fruits/plant shown in this investigation due to application of fertilizers mainly F1 and F2treatments may be attributed to the effect of these treatments on production of reproductive branches as well as number of flowers. Similar results were also reported by El Gamal (1984); Van Damme and Viaene, (1987), Hago and Osman (1999); Abdelbagi (2001); Gigingu and Fagbayide (2009). Also, Okosun *et al.* (2006) observed that application of 20, 40 and 60 Kg N/ha and 10, 20, and 30 Kg P_2O_5/ha significantly increased number of pods/plant in roselle compared to control. Meanwhile, the finding of Oyewole and Mera (2010) showed that application of 0, 2.5, 5.0 and 7.5 ton/ha farmyard manure resulted in production of 33.8, 89.7, 44.6 and 48.4 pods/plant in which the mean differences were significant as level of manure increased. Laota (1990) showed that application of 200 kg P_2O_5/ha alone or in a combination with nitrogen did not significantly affect number of fruits/plant in roselle, whereas application of 185kg N/ha increased this character by about 50.1% compared to control.

Although, varieties showed no significant difference between them for the number of fruit/plant in this study, but V_1 in the first season increased this parameter by about 13.5% compared to V_2 (Table1).This result may reflect the adaptation ability of the local variety for expressing its potentiality regarding this character as compared to the improved variety.

Table (1): Effect of genotype and chemical and organic fertilizers on yield and yield components of rosellecalycesgrown during 2011 and 2012 seasons

Treatments	Number of fruits/plant		Calyx dry weight/ plant (gm)		Dry calyx yield (kg/fed.)	
	2011	2012	2011	2012	2011	2012
Varieties						
V_1	11.09[a]	6.04[a]	11.58[a]	5.00[a]	200.5 [a]	150.50[a]
V_2	9.77[a]	6.08[a]	9.17[b]	4.29[a]	168.58[a]	124.00[a]
S.E±	1.06	0.60	0.44	0.42	12.81	17.77
Fertilizers						
F_0	9.08[c]	4.88[a]	9.54[a]	3.88[a]	160.75[a]	114.75[a]
F_1	12.37[a]	6.63[a]	10.91[a]	5.25[a]	208.38[a]	150.88[a]
F_2	12.27[ab]	5.88[a]	13.70[a]	3.88[a]	200.38[a]	110.63[a]
F_3	9.97[bc]	6.00[a]	9.13[a]	5.00[a]	175.75[a]	156.75[a]
F_4	9.62[c]	6.88[a]	9.79[a]	5.25[a]	185.88[a]	153.63[a]
F_5	9.30[c]	6.13[a]	9.20[a]	4.63[a]	176.25[a]	136.88[a]
S.E±	0.83	0.66	1.26	0.57	21.28	46.91

Means within columns which having similar letters are not significantly different at0.05 level of probability according to DMRT

Calyx dry weight/ plant (gm):

In the first season calyx dry weight/plant as shown in table1 was significantly higher in V_1 (11.58gm) as compared to V_2 (9.17gm), with an increasing estimated by about 26.3%. In the second season, although there was no significant difference between the two varieties, but V_1 also reported a higher mean (5.00gm) of this character than V_2 (4.29gm), by about 16.6%. On the other hand, fertilizer treatments did not significantly affect calyx dry weight/Plant in both seasons(table1), however, it was higher for F_2 treatment (10.91 gm) in the first season and $F_1$and F_4treatments in second season(5.25 gm for each).The Percentage of increment in calyx dry weight/plant in the first season for F_2in comparison to F_0, F_1, F_3, F_4 and F_5 was about 44.2%, 25.7%, 48.9%,39.8% and 48.9% respectively, whereas in the second season both F2and 4 treatments increased this character compared to F_0, F_2, F_3, and F_5 by about 35.3%, 35.3%, 5.0% and 13.4% respectively. The insignificant differences in mean of dry calyx/plant among fertilizer treatments were in contrast to that reported by El Gamal (1984); Elshafie *et al* (1994); Laota (1990); Seleim *et al* (1993); Ramu *et al* (1995); Krishnamurthy *et al* (1994); Hago and Osman (1999); Abdelbagi (2001); Gigingu and Fagbayide (2009). Also, Okosun*et al.* (2006) recorded a positive response of dry calyx/plant and per unit area to application of N with highest yield obtained by application of 20 kg N/ha. At the same time Seleim et *al* (1993) reported 49.4g dry calyx yield/plant, when 160kg N/ha applied. Okosun (2000) and Babatunde (2001) attributed the increment of dry calyces yield in roselle due to application of nitrogen to its effect on crop photosynthetic ability as the result of good vegetative growth induced by N.

Dry calyx yield (kg/fed.):

Statistical analysis of the data shows that mean dry calyx yield (kg/ fed.) of roselle was not significantly affected by genotypes, but as shown in table1 that it was insignificantly increased in both seasons for V1 (200.50 and 150.50 Kg/fed., resp.) than in V2 (168.58 and 124.00 Kg/fed., resp.) by about 18.9 and 21.4%, respectively. This variation in calyx yield between the two varieties may be attributed to genetic variability. Meanwhile, application of

chemical and organic fertilizers in both seasons did not significantly affect the dry calyces yield, however, F1 treatment in the 1st season and F3 in the 2nd season obtained insignificantly higher mean of this parameter (208.38 and 156.75 Kg/fed. resp.) as compared to the other treatments. F_1 treatment in the first seasons increased dry calyces yield compared to F_0 , F_3 , F_4 and F_5 by about 29.6%, 18.6%, 12.1% and 18.2%, respectively, whereas, in the second seasons it increased this attribute compared to F_0 , F_2 and F_5 by about 31.5%, 36.4%, and 10.2% respectively. This result may indicate the effect of 40 Kg N/fed. in the 1st season and application of 40 Kg N + 40 kg P_2O_5/fed on plant dry matter. On the economic yield of roselle, this may be attributed to the effect of these treatments on plant vigorous vegetative growth. Sanoussi *et al*., (2010) stated that for roselle, the dry and fresh calyx yield are more sensitive to environmental changes than other characters such as plant height, number of branches/plant and number of fruits/plant. Meanwhile, Eqharevba and Ogbomo (2007) reported no variation in calyx dry weight among 0, 100, 150 and 200 kg N/ha treatments.

Number of seeds/capsule:

Table2 shows that genotypes and application of fertilizers did not significantly affect the number of seed /capsule in the second season; however,F_2treatment insignificantly increased it as compared to F_0, F_1,F_3, F_4 and$F_5$by about 50.7%, 34.6%, 27.8%, 24.7% and 33.0%respectively. Atta *et al* (2010) observed that application of 0, 50 and 100kg N/ha to three roselle genotypes resulted insignificant differences between nitrogen treatments for number of fruits /plant, Number of seed / capsule and 1000-seed weight (gm), but these characters showed variation among the genotypes. Oyewole and Mera (2010) found that the application of 0, 25, 50 and 75 kg N/ha resulted in production of 23.9, 24.1, 26.2 and 27.3 seeds/pod, respectively, whereas application of 0, 2.5, 5.0 and 7.5 ton/ha farmyard manure resulted in production of 23.9, 24.9, 26.0 and 27.5 seeds/pod, respectively. Similarly, Okosun *et al* (2006) reported that the lower nitrogen level (20 kg N/ha) did not significantly increase the number of fruits /plant and number of seeds/capsule.

Table (2): Effect of genotype and chemical and organic fertilizers on yield and yield components of roselle seeds grown during 2011 and 2012 seasons

Treatments	Number of seeds/capsule	1000-seed weight (gm)	Seed yield/ plant (gm)	Seed yield (kg/fed.)
Varieties				
V_1	9.50[a]	38.36[a]	2.33[a]	66.00[a]
V_2	10.46[a]	38.12[a]	2.58[a]	69.50[a]
S.E±	0.92	0.53	0.28	10.08
Fertilizers				
F_0	8.38[a]	35.32[b]	2.00[a]	52.63[a]
F_1	9.38[a]	38.45[a]	2.63[a]	63.75[a]
F_2	12.63[a]	38.40[a]	2.38[a]	55.63[a]
F_3	9.88[a]	39.14[a]	2.50[a]	74.25[a]
F_4	10.13[a]	39.28[a]	2.75[a]	77.63[a]
F_5	9.50[a]	38.98[a]	2.50[a]	70.13[a]
S.E±	1.35	0.61	0.36	9.12

Means within columns which having similar letters are not significantly different at 0.05 level of probability according to DMRT

1000-seed weight (gm):

This parameter was not significantly affected by genotypes, but it was significantly affected by fertilizers, when F_1, F_2,F_3, F_4 and F_5treatments significantly increased this parameter as compared to control (F_0) by about 8.9%, 8.7%, 10.8%, 11.2%, and 10.4%, respectively, whereas there were no significant differences between these treatments as shown in table2.

Seed yield/plant (gm):

Seed yield/plant in the second season was not significantly affected by neither genotypes nor fertilizers as shown in table2, however, there was insignificant increase in this parameter estimated by 10.7% obtained by V_2 compared to V_1. Meanwhile, F_4 treatment in the same season obtained the higher insignificant mean of this character (2.27gm), whereas the control obtained the lowest value (2.00gm), with an increasing estimated by about 37.5% (Table2). In contrast to the present study, Laota (1990); Osman (1998); Abdelbagi (2001); Gigingu and Fagbayide (2009) observed that seed yield of roselle significantly increased by application of nitrogen fertilizer. Okosun *et al* (2006) found that seed yield/plant and per unit area significantly responded to rate of nitrogen and the highest yield of both parameters obtained by application of 20 kg N/ha. The authors attributed this to the effect of N treatments on number of pods/plant as well as the number of seeds/pod.

Seed yield (kg/fed)

Seed yield per unit-area was not significantly influence by genotypes as well as by fertilizers (table2). Although, varieties showed no significant difference between them concerning with the above mentioned parameter, but V_2 in the second season recorded higher mean than V_1 with an increasing estimated by about 5.3% (table2).As for fertilizers, F_4 treatment reported the higher mean of seed yield (77.63 kg / fed), followed by F3 (74.25 Kg/fed.) and F_5 (70.13 Kg/fed.), while F_0 reported the lower value (52.63 Kg/fed.), but with no significant differences between them (table2). The former treatment (F_4) increased seed yield compared to the latter one (control) by about 47.5%.The effect of fertilizer treatments on the components of seed yield (particularly F4 treatment) may be behind the higher seed yield per-unit area under fertilizer treatments as compared to control.

Conclusion and recommendations:

In the present study, the effect of chemical (N and P) and organic (cow and chicken manure) fertilizers was investigated on yield and yield components of calyces and seeds of two roselle cultivars (Bulk and Omshiback). The findings of the study indicate that:

1. Calyces and seeds attributes statistically were not significantly different between the two studied varieties, except calyx dry weight/plant, when Bulk (V1) reported the significantly higher mean of this trial than Omshiback (V2).

2. Application of chemical and organic fertilizers did not significantly affect neither calyx attributes nor seed parameters, except 1000-seed weight, in which fertilizer treatments gave significantly higher mean of this parameter than control.

3. More investigations regarding types and levels of fertilizer application should be done for roselle cultivars in tropical zone.

Acknowledgement:

The authors acknowledge the Faculty of Agriculture, Omdurman Islamic University, Elobaied Research Station, Industrial Research and Consultancies Center, the Environmental and Natural Resources Research Institute for the conduction and supporting of this research.

References:

Abdelbagi, A. A. (2001). Effect of Nitrogen, Phosphorous, Sulfur and Season on Growth, Yield and Quality of Two Roselle (*Hibiscus sabdariffavarSabdariffa*) Genotype. Ph.D Thesis, Department of Agronomy, Faculty of Agriculture, University of Khartoum, Khartoum, Sudan.

Abdelbagi, A. A., Elkheir, H. A. A and Elbager, M. L. (2020). Effect of Chemical and Organic Fertilizers on Some Chemical Components of Calyces and Seed of Roselle (*Hibscussabdriffa*L). SUST Journal of Agricultural and Veterinary Sciences (SJAVS) 12(2).

Ahamed, A. A. S.; Abdelrahaman, M. and Abuelgasim E.H. (1998). Some genotypic traits of roselle (*Hibiscus sabdariffa* L.) and their practical implication. Agricultural Research Corporation. Elobaied Research Station, P. O. Box: 429 Elobaied, Sudan.

Amin, M. H. and Fadual, H.M. (2007). Preliminary description of soil profile at the old Farm of Faculty of Agriculture, Omdurman Islamic University. Journal of Islamic World Research Studies Institute (JIWRSI)PP:247-258.

Atta, Benoit.; Sanoussi and Bakasso,Yasoubou, Sarr, and B. Assia and Saaddoy, Mahamant, Issakalona and Dlew, H.; Report (2010). Roselle (*Hibiscus sabdariffavarSabdariffa*). Yield and yield components in response to nitrogen fertilization in Niger. *Indian J.Agri.res*., 44(2):96-103.

Babanjide, J.M.; Bodunde, J. G. and Salami, A.A. (2004). Quality and sensory evaluation of processed calyces of six varieties of roselle (*Hibiscus sabdariffa*L.*). Nigerian J. Hort. Sci., 9: 110 -115.*

Babatunde, F. E.(2001). Response of Red Variant Roselle (*Hibiscus Sabdariffa*L) to Some Agronomic Practices Unpublished. Ph. D thesis presented to post graduate school, AbubakarTafawaBalewa University, Baichi, Nigeria, pp. 116.

Billington, F. H. (1943). Compost for Garden Plot, Or Thousand Acre Farm Practical Guide To Modern Methods. 24 Russell Square London.

D'Heureux, F. and Badrie, N. (2004). Consumers acceptance and physicochemical quality of processed red sorrel/Roselle(Hibiscus sabdariffa L.) sauces from enzymatic extracted calyces. Food Serv. Technol.4: 141-148

Delgado-Vargas, F. and Parcedes-Lopez, O. (2003). Natural colourants for Food and nutraceutical uses. CRC Press, LLC:Boca Raton, FL.

Egharevba, R.K.A. and Ogbomo, K.E. (2007).Comperative Effect of Two Nitrogen Sources on the Growth and the Yield of Roselle (*Hibiscus Sabdariffa*L) in Rainforest Region: A case study of Benin- city, Edo state, Nigeria. J. of Agronomy 6(1): 142-146.

El Gamal, E. S. A.; Mahmoud, M. M.and Omar, F. A.(1984).Effect of nitrogen fertilization on the growth and yield of Roselle ((*Hibiscus sabdariffa L). annual of agric. Sci*. Ain Shams University, 28(2): 839-850.

El Shafie, S. A; Mazrou, M. M.; Iraki, M. A. and Saafan, S. A (1994). Physiological studies (*Hibiscus sabdariffa*L.*)* plant (A) Effect of watering interval, nitrogen fertilization levels and their combination on the growth, yields and the uptake of some nutrients. Zagzig J. Agric.Res. 21(1): 209 – 226.

Gad, N. (2011). Productivity of roselle (*Hibiscus sabdariffa*L.*)* plant as affected by cobalt and organic fertilizer. *Journal of Applied Science Research*, 7(12): 1785-1792.

Giginyu, Bala, M and Fagbayide, J. A. (2009). Effect of nitrogen fertilizer on growth and calyx yield of two cultivars of roselle in Northern Guinea Savanna. Middle East Journal of Scientific Research, 4(2):66-71, 2009- ISSN 1990-9233. National Horticultural Research Institute, Bagauda Station, Kon State, Department of Agronomy, University of Ibadan, Nigeria.

Gomez, K.A. and A.A. Gomez. (1984).Statistical Analysis of Factorial System. In: Statistical Procedures for Agricultural Research. John Willy and Sons, New York.

Hago, T. E. M and Osman, B. M. (1999). A note on the effect of nitrogen and phosphorus on growth of Roselle under irrigation U. of. K. *J. Agric. Sc*. 7(1).

Ibrahim, E. I. M., AbdElbagi, A. A and Ahamed, E. H. A. (2020). Effect of chemical and organic fertilizers on growth and yield of two roselle (*Hibiscus sabdariffa*L.) cultivars. IC-FSSAT. IOP Conf. Series: Earth and Environmental Science 486 (2020) 012109

Ibrahim, M.M. and Hussein, R.M. (2006). Variability, heritability and genetic advance in some genotypes of Roselle(*Hibiscus sabdariffa*L.). World J. Agric. Sci.2: 340-345.

Krishnamurthy, N.; Hunsign, G. Rudraradhya,M. and Singlachar, M.A. (1994). Effect of nitrogen level and spacing regime in physiological parameters and biomass production Mestra. Current Research, University of Agricultural Sciences, Bangalore, 23(90:102-103

Laota, S. A. (1990). Agronomic Studies on Roselle (*Hibiscus sabdariffa*L.*)* M.Sc. Thesis, Fac. of.Agric.U. of. K., Sudan.

Okosun, L.A (2000). Effect of Plant Density, *Sowing Date And Fertilizer On The Growth And Yield Of Roselle (Hibiscus sabdariffa L)* in The Sudan Savanna. Ph.D. Thesis presented to the post graduate school, Usmanu Danfodiyo University, Sokoto, Nigeria. pp. 186

Okosun, L.A.;Magaji, M. D And Yakubu, A. I. (2006). The Effect of nitrogen and phosphorus on growth and yield of Roselle (*Hibiscus sabdariffa var.sabdariffa)*. in the semi- arid agro-ecology of Nigeria. *J. Plant Sci* 1(2): 154-160.

Osman, B. M. (1998).Effect of Nitrogen and Phosphorus on Growth and Yield of Roselle (Hibiscus sabdariffa L) Under Irrigation. M. Sc. Thesis, Faculty of Agric., University of Khartoum, Sudan.

Oyewole, C. I. and Mera, M. (2010). Response of roselle (*Hibiscus Sabdariffa*L.*)* to rates of inorganic and farmyard fertilizers in the Sudan savanna ecological zone, Nigeria. Faculty of Agriculture, Rogi State University. *Afric.JAgric Research* 5(17) 2305-2309.

Ramu, B. S.; Farooqi, A.A. and Shankaralingappa, B.C. (1995).Nutrientsuptake and yield of dry calyces in roselle(*Hibiscus Sabdariffa*var*Sabdariffa L.)* as influenced by different nitrogen levels and row spacings. Mysore Journal of Agricultural Sciences, 29(3) 256-260.

Rhoden, E.G.; and Small, T. (199I).Production and Nitrogen Uptake of Roselle. *Hort-Sci.*-26 pp:738.

Sanoussi A.; Benoit S.;Yacoubou B.;Aissa B. D.;Issaka L.;Mahamane S.; and Robert H. G. (2010). Roselle (Hibiscus Sabdariffa L.) Yield and Yield Components in Response to Nitrogen Fertilization in Niger. *Indian J. Agric. Res*., 44 (2) : 96 - 103, 2010

Seliem, S. M.; Rokba, A. M.; Hassan, M. R. and Hassanain, M .A. (1993). Effect of sowing date, nitrogen and potassium fertilization on roselle plant. 1-Effect on vegetable growth, flowering and chemical composition. *Egyption Journal of Horticulture*, 20 (1): 87-96.

Van Damme, P. and Viaene, N. (1987). Optimal Proportions Between N,S and P; and Between K, Ca and Mg In The Fertilization of Roselle (*Hibiscus Sabdariffa*L.). *Trop.Agric*., 64:279-28.

اثر الاسمدة الكيميائي والعضوية علي الانتاجية ومكوناتها لصنفين من محصول الكركدي (*Hibscussabdariffa* L)

الخير حسب الله عبد الله احمد

قسم انتاج المحاصيل الحقلية – كلية الزراعة – جامعة ام درمان الاسلامية

الموبايل 249911117204+ الايميل ahamedelkheir@yahoo.com

رقم ORCID ID: 0000-0003-1292-4449

الباقر ادريس محمد ابراهيم

قسم انتاج المحاصيل الحقلية – كلية الزراعة – جامعة ام درمان الاسلامية

الموبايل 249916510575+ الايميل *Elbager86@gmail.com*

عبد الباقي احمد عبد الباقي

قسم انتاج المحاصيل الحقلية – كلية الزراعة – جامعة ام درمان الاسلامية

الموبايل 249912294404+ الايميل *Elseemat0912294404@gmail.com*

المستخلص

اجريت تجربة حقلية لموسمين متتاليين هما 2011 و2012م بغرض التحقق من اثر الاسمدة الكيميائي والعضوية علي الانتاجية ومكوناتها لصنفين من محصول الكركدي (*Hibscussabdariffa* L). نفذت التجربة باستخدام تصميم القطاعات المنشقة باربعة مكررات. اشتملت التجربة علي صنفيت وست معاملات اسمدة. الصنفان هما صنف محلي يسمي Bulk و اخر محسن يدعي Omshiback ويرمز لهم فيما بعد بالرمز V1 و V2 علي التوالي وقد وضعت بالقطع الرئيسية. اما معاملات السماد فهي الشاهد (المعاملة الضابطة) ، 40 كجم N/الفدان، 80 كجم N/الفدان ، 40 كجم N/للفدان و(40 كجم N /الفدان + 40 كجم P_2O_5/ الفدان، 3 طن روث ابقار/للفدان (خليط مخمر) و2 طن زرق دواجن/الفدان (خليط مخمر). الانتاجية ومكوناتها للسبلات شملت عدد الثمار/النبات، وزن السبلات الجاف /النبات وانتاجية السبلات الجافة (جرام/فدان). في حين شملت الانتاجية ومكوناتها للبذور (فقط للموسم الثاني) عدد البذور/الكبسولة، وزن ال1000بذرة ، انتاجية البذور للنبات الواحد والانتاجية لوحدة المساحة (كجم /فدان).

دلة نتائج الدراسة علي وجود فرق ذو دلالة معنوية في وزن السبلات الجاف /النبات بالنسبة للموسم الاول عندما معنوية فاق الصنف V1 الصنف V2. بصورة عامة فان اداء الصنف V1 فيما يخص مكونات السبلات كان افضل في الموسمين مقارنة

بالصنف V2 في حين ان العكس صحيح فيما يخص مكونات البذور. اما فيما يختص بمعاملات السماد فقد اظهرت نتائج الدراسة ان جميع مكونات السبلات لم تتاثر معنويا بمعاملات السماد ما عدا عدد الثمار/ النبات للموسم الاول، حيث ان المعاملتين F1 و F2 سجلتا اعلي متوسط معنوي لهذا المعيار مقارنة بمعاملات السماد الاخري. علاوة علي ذلك فان انتاجية البذور ومكوناتها لم تتاثر معنويا باستخدام الاسمدة غير انه في كثير من الحالات فان المعاملة F4 سجلت اعلي متوسط غير معنوي لهذه المكونات مقارنة بالمعاملات الاخري.