ISSN: 2287-688X

Annals of
Plant Sciences

Volume 11, Issue 09 (2022) pp. 5358-5366

Review Article

Effect of Fertilization Role on Sugar Crops Productivity in Egypt

Nofal, O.A., El-Sayed, S.A.A. and Abbas, M.M

Plant Nutrition Department, Agricultural &Biological Research Institute, National Research Centre 33El- Buhouth St., 12622-Dokki, Cairo, Egypt

Abstract

Egypt suffers from a severe shortage in the productivity of sugar crops, whether sugarcane or sugar beet, especially in light of the large population increase. Therefore, it is working hard in the framework of solving this multilateral problem of providing fertilizers, irrigation pesticides and high-yield varieties and strengthening the specialized agricultural extension system. The focus in this research will be on one of these factors affecting productivity, which is fertilization, as we find it plays a vital and influential role in this field. Whether the fertilizers used are chemical or biological, and light will be shed on each of them to show the importance and efficiency of these fertilizers and their impact on increasing the productivity of these crops in Egypt within the protection of the environment.

Keywords: *Sugarcane, Sugar beet, Macronutrients, Micronutrients, Nano-fertilizers.*

Introduction

Sugar crops are considered one of the strategic crops and they are the source of sugar in Egypt. Sugarcane is the most important economic source for sugar production with cultivating in old lands, however sugar beet is contain the supplementary crop sugar production with cultivating in new lands. According to the results of Economic Affairs Sector of the Ministry of Agriculture for the season 2019/2020, the total area of sugar cane is about 340 thousand fed., with an average productivity of 47 tons/fed., and the amount of raw sugar of it is 950 thousand tons, while the area of sugar beet for the same season is about 520 thousand fed., with an average productivity of 20 tons/fed. With raw sugar has 2 million tons, and if we know that Egypt's consumption is 3,200 million tons, then there is a deficit of 400,000tons. In this connection, Onwueme and Sinha, (1999) indicated that sugarcane contributes about 60% of the total world sugar requirement while the remaining 40% came from sugar beet. As a result of the inability of local production to meet the needs of the production, it is necessary to increase sugar productivity by increasing the area of sugar crops on the one hand and increasing its productivity on the other hand. With regard to sugarcane, there is no tendency to expand its agricultural area, especially because it consumes a large amount of water and needs fertile land. Therefore, focus must be placed on devising high-productivity varieties, increasing the efficiency of fertilizer use, developing cultivating methods, using lasers in its cultivation to reduce productivity costs as well as the use of agricultural mechanization and to overcome the problem of scarcity of high-paid labor. While with regard beet, it is possible to expand the area of newly reclaimed lands, as well as to devise modern hybrid varieties with paying attention to irrigation methods and fertilization rates to raise the economic return.

Fertilization is one of the most important agricultural processes that affect productivity (Gaballah, *et al*., 2020). In addition, Rezk, *et al*., (2005) mentioned that the optimizing use of

***Corresponding Author:**
Nofal, O.A;
DOI: http://dx.doi.org/10.21746/aps.2022.11.09.6

fertilizers will improve the nutritional status of crops, which will reflect on productivity. From another point, El-Kholy, *et al*., (2006) added that in many regions of Egypt, the fertilizers use is highly unbalanced in favour of N and P at the expense of K. The consequences of such unbalanced fertilization on crop production, are declining fertilizer efficiency, which impact on both the economy and the environment, and will ultimately lead to a loss of soil fertility. In this regard, Kochl, (1977) indicated that the major factor responsible for the deterioration in sugar beet yield, and technological quality, was the unbalanced N, P and K fertilization. Therefore, the current study aims to identify the effect of different types of fertilizers on sugar crops to raise their production efficiency.

Effect of the Combination between the Mineral and Biological or Organic Fertilizers

As a result of the excessive use of chemical fertilizers, this is considered one of the most important causes of environmental pollution, as the trend now tends to reduce dependence on these fertilizers and increase the use of environmentally friendly bio and organic fertilizers. Generally, Mahmoud, *et al*., (2014) supported that in the case of using bio-fertilization, in Egypt, the fertility of the soil and enrichment of its biological activity are improved.

Sugarcane

Concerning sugarcane, Bokhtiar and Sakurai, (2005) showed that when FYM was applied in combination with chemical fertilizer, the maximum number of tiller and millable cane stalks was observed. Such improvement in tiller and millable cane production might be for the reason that inorganic nutrients applied in combination with organic sources were better utilized than from inorganic source alone. These results are in harmony with Chatterjee, *et al*., (1979). In addition, under Luxor governorate conditions, in Egypt, Ahmed, (2017) indicated that with using G.T.54-9; G.98-28 and G99-103 varieties and raising P-biofertilizer levels up to 600g/fed. significantly increased in number of millable cane/m2, millable cane height, diameter, Brix% sucrose %, sugar recovery%, cane and sugar yields in plant cane and its ratoon crops.

Sugar Beet

With respect to sugar beet, previous studies emphasized that fertilization is one of the most important agricultural processes affecting sugar beet yield (Nofal, *et al*., 2021). Where, the inoculation of plants with *Azospirillum sp*., *Azotobacter sp*., and *Bacillus sp*., single or in dual or in different combinations with mineral fertilizers improved the yield, yield components and root quality in treated sugar beet plants. In this regard Aboshady, *et al*., (2009) investigated that microbial inoculation with *Azotobacter sp*.+ *Bacillus sp*. increased top, root fresh weight and sugar yield, while there was no significant influence on percentage of Na, K, sucrose, recoverable sugar and amino nitrogen. In addition with using nitrogen levels (0,30,60 and 90kgN/fed.) and bio fertilization (*Rhizobbacteren, Biogen*, *Microben, Nitrogen and Cerialen*). Okasha (2013) indicated that top, root and sugar yields achieved with application of *Rhizobacteren*+ 60kgN/fed., *Nitroben* + 30kgN/fed.,*Biogen*+60kgN/fed., *Cerialen*+ 90kgN/fed. and *Microben*+60kgN/fed. In this connection, Mahmoud, *et al*., (2014) confirmed that application of 100 kgN/fed. and / or 600g *phosphorin*+ *Azoto*+*Azosp*.with80kgN/fed could optimize root and sugar yield/fed. and decrease mineral fertilizer costs and environmental pollution. On the other hand, Abd El- aziz, *et al*., (2019) reported that using growth regulators (*IAA or Kainten*) as foliar application with combination with 50% mineral fertilizer and biofertilizers (*Cerealine and Nitrobine*) or 75% mineral fertilizer with biofertilizer (*Nitrobine*) maximumed the yield, yield components and improved quality of sugar beet crop.

From another point, Habib,(2021) studied the effect of organic manure on four species of sugar beet cultivars where, he found that the highest yield of roots and top fresh weight (69.8 and 19.8 ton ha-1) was obtained under addition 20m3ha-1 organic manure + 285kgNha-1with Salama and / or Faten cultivars in the means of 1st and 2nd seasons. In addition, the highest N,P,K uptake and sucrose yield of roots was gained under fertilization with (20m3 organic manure+ 285 kg N ha-1 with Salama cultivar). While, the highest P and K uptake of foliage was obtained with (20m3 organic manure+285 kgN ha-1 +Faten and/or Sahar cultivars). These results are in line with those obtained by Aly (2006); Ismail, *et al*., (2006); Ahmad and Rasool (2011); Ahmed, *et al*., (2012) and Hozayen (2013). Where they concluded that because of the possibility the gene make-up action which plays an important role in plant structure and morphology that the differences may occur between the tested sugar beet varieties. On the other hand, Mehanna, *et al*., (2017) revealed that the encouraging results had obtained with using compost (5ton/fed.) under using sprinkler irrigation system.

The scientists are constantly searching for everything new and safe to improve plant growth and increase productivity while reducing environmental pollution. For this reason, Thalooth, *et al*., (2019) studied various biologically active matters such humic and yeast and their effects on sugar beet. These researches found that combination application of yeast and humic acid has enhancing effect on root characters, length and diameter than single application of either yeast or humic acid. Where Eyheraguibel, *et al*., (2008) clarified that humic acid may have various biochemical effects either at cell wall, membrane level or in the cytoplasm. However, Shehata, *et al*., (2012); Agamy, *et al*., (2013) emphasized that yeast as a natural bio-substance has stimulating, nutritional and protective function. The same finding has occurred with Pyakural, *et al*., (2019) where they using by-product of yeast production (CMS). Its protective and stimulatory effects might be attributed to its content that enriched with the sources of phyto-hormones especially cytokinins, vitamins, enzymes, amino acids and minerals. For another point, Neseim, *et al*., (2014) studied the effect of combination between potassium and yeast under the drought stress where, they revealed that the highest yield, sucrose%, water use efficiency and the lowest impurities % were obtained with using k dose (70kg/fed.) in combination with yeast(14g/L). Meanwhile, under sufficient irrigation, with using rate (100 kg/fed.) of potassium fertilizer in combination with (10g/L) of yeast, they gained that the highest root yield and sugar yield and water use efficiency.

Effect of Macronutrient Fertilizers

Nitrogen Fertilizer

Nitrogen is one of the macronutrients and necessary nutrient for plant growth, as it has an important role in photosynthesis, protein synthesis and enzyme action in sugar crops. Furthermore, many researchers showed the harmful effect of exceeding nitrogen fertilization levels and the number and timing of fertilization periods (Mehar, *et al*., 2004; Nigade, *et al*., 2006; Mokadem, *et al*., 2008 and Yousif, *et al*., 2015).

Sugarcane

In this connection Conab, (2017) mentioned for sugarcane that N is the second macronutrient most absorbed, extracting about 94 to 260kg ha-1 varying with soil, fertilization and genotype., increasing nitrogen fertilization levels obtained the highest values of the number of millable cane/m2.(El-Geddawy, *et al*.,2004 and Ahmed, *et al*., 2008). On the other side, Nassar, *et al*., (2005) and Mokadem, *et al*., (2008) noticed that stalk diameter was significantly affected by nitrogen levels. Moreover, Lakshmi, *et al*., (2003) reported that fertilization in 4 split doses caused enhances in millable canes number/hectare. In addition, Nigade, *et al*., (2006) suggested that number of N doses in both seasons affected significantly on stalk fresh weight. Concerning the effect of doses number on productivity, Mokadem, *et al*., (2008) stated that sugarcane yield /fed. Was accompanied the increasing N application from 2 to 4 doses. In another context, Ahmed, *et al*., (2008) confirmed that enhancing the yield was associated with increasing the addition of nitrogen fertilization from 100 to 200kg N ha.

Sugar Beet

With respect to nitrogen, Mekdad, (2015) reported that the growth, physiological and chemical characteristics of the yield and quality of sugar beet has affected by nitrogen fertilizer. Similar to and Gobarah Mirvat, (2001) and Nawar and Saleh, (2003) showed that a positive effects were obtained as results of increasing nitrogen application as soil fertilizer i.e., length, diameter, weight of roots that observed by Abdel-Motagally and Attia, (2009) and Mekadad, (2012). Furthermore, El-Harriri, root top and sugar yield t/fed. In addition, some reports indicated that decrease sugar %, lowering the recoverable sugar and increasing the impurities such as proteins, Na contents and amino N has been happened as the result of excess N fertilizer. These results are in line with those obtained by Tsialtas and Mastaris, (2005); Mekdad, (2015) and Mekdad and Rady, (2016). While, Jaforina, *et al*., (2013) reported that by raising the nitrogen rates up to 200kg/ha(ha=2.4 fed.), the percentage of extractable sugar and pure sugar in root pulp were achieved.

Phosphorus Fertilizer

Sugarcane

As for Phosphorus, it is well known that (P) is one of the critical nutrients required by sugar cane for healthy growth. Where, Goundar, *et al*., (2014) mentioned that this element as an integral component of complex nucleic acids, which play an important role not only in cell division and protein synthesis but also in promoting early root formation and development of the crop. Many researchers noticed to varying results concerning the function of this element and its effect on productivity such as Devi, *et al*., (2012); Tsado, *et al*., (2013) and Caione, *et al*., (2015).

According to the results of Mehareb, *et al*., (2018) where he indicated that variety G2003-47 (Giza) recorded highest values for cane and sugar yield under treatment 30kgP2O5/ fed. Similar results were previously obtained by Yousif, *et al*., (2015) and Ahmed, (2017).

Sugar Beet

Regarding the effect of phosphorus on sugar Beet, the results of El-Moursy, *et al*., (1998) clarified that increasing the additions of phosphorus fertilizers from (15 to 45 kg P2O5 /fed.) was accompanied the improving of root length and diameter, root and sugar yields as well as TSS%. In addition, Mehanna, *et al*., (2017) supported that there was a positive relationship between increasing phosphorus rates from (50 to 150 kg/ha) on growth and yield of sugar beet. Moreover, several reports showed that the increasing rate of P up to(30kg/P2O5/fed.) stimulated fresh and dry weight, leaf area index and root and sugar yields as well as sucrose % and sugar loss to molasses (Ismail, *et al*., 2007 and Ouda, 2007).

Potassium Fertilizer

Sugarcane

Concerning the effect of potassium, Khader, *et al*., (2004) studied the effect of this nutrient on sugarcane at to private locations (El-Sheikh Makram and Shandaweel El-Balad) in Sohag Governorate (Upper Egypt) where, they found that its crop known as a potassium devourer, its need reaching 600 to 800kg K2O per hectar per harvest (1 hr=2.4 fed.). However, Fahmy, *et al*., (2017) found in another experiment that the sugarcane increased by an 6.47% and 7.51% during the first and the second seasons, with fertilizing the crop by 24 and 48kg K2O/fed. These results are in harmony with Abd El-Hadi, *et al*., (1992).

Sugar Beet

Regarding the potassium element and its usefulness in relation to the sugar beet crop, previous scientists reported that it has a pivotal role in regulation both yield and quality for its sharing in many metabolic activities such as carbohydrate, protein synthesis, translocation of sugar in plants and improving the nutritional status (El-Kholy, *et al*., 2006; Oshea, *et al*., 2009. and Kandil, (2016). Furthermore, Mostafa and El-Masry, (2006) and Shaaban, *et al*., (2008) concluded that potassium (K) has regulator role in respiration and conversion of intermediate sugar to sucrose in sugar crops. in this respect, Khalil, *et al*., (2001); Ismail, *et al*., (2007); Nofal, *et al*., (2014) and El-Eila, *et al*., (2014) confirmed that potassium fertilization enhanced the quantity and quality of sugar in sugar beet roots, where the additions of potassium contributed to an enhance in both sucrose%, purity, T.S.S%, extractable sugar yield and recoverable sugar%.

Effect of Micronutrient Fertilizers

Sugarcane

In this connection, El-Fouly, *et al*., (1995) indicated that the yield of agronomic crops increases by 22% as a result of spraying with micronutrient fertilizers. These results are in line with those obtained by Abou Zied, *et al*., (2008); Nofal and Rezk, (2009); Nofal, *et al*., (2011); Nofal, *et al*., ((2013); Nofal, *et al*., (2014) and Gaballah, *et al*., (2020). According to obtained results of Santos, *et al*., (2018) where they revealed that the utilize of Mo in fertilization combined with N can enhance agricultural and sugar yield. In addition, they clarified that Mo regulates the activity of nitrogenase (AN) where this enzyme in diazotrophic bacteria associated with sugar is responsible for the reduction of atmospheric N2 to NH3 and its assimilation in plants. On the other hand, Ismail, *et al*., (2000) reported that in the second season, the cane yield positively enhanced as affected to zinc levels while in the first season number of millable cane positively affected for the same element.

Sugar Beet

In this respect, Mekdad and Rady, (2016) confirmed the importance of micronutrients in plant nutrition and productivity of sugar beet where they play an co- factor to activate enzymes which its necessary for the vital processes inside the plant, including sugar translocation (Yarnia, 2008). In addition, Fayed, *et al*., (2011) suggested that the indirect role of boron is promoting the increasing of the nitrogenous compounds through the plasma membrane to the interior cells.

It is well known that boron is by far the most important trace elements needed for sugar beet because without an adequate supply, the yield and quality of roots is very depressed. In this regard, Barker and Pilbeam, (2007) indicated that sugar beet crop needs high amount of boron. Where, Gobarah Mirvat and Mekki, (2005) proved that not only the highest sugar yield (6.611 t/acre) obtained by increasing boron fertilizer up to 2.0 kg/ acre but also sucrose and juice purity percentages were increased. These results may by due to reduce Na and K uptake in root juice. These observation supported those described by Gezgin, *et al*., (2001); Dordas, *et al*., (2007); Hellal, *et al*., (2009) and Nofal, *et al*., (2014).

Effect of Nano Fertilizers

Sugarcane

There is a great passion for using everything new to improve agricultural production, including addressing the use of nanotechnology. In this context, Biswas and Wu, (2005); Wiesner, *et al*., (2006); mazaherinia, *et al*., (2010) Dewdar, *et al*., (2018) and El-Nasharty, *et al*., (2021) studied the using nanotechnology to optimizing use fertilizers. Naderi and Danesh-Shahraki, (2013) indicated that technological advances have improved methods for handling nano particles of physiologically important metals on wide scale which are now used as "smart distribution systems" to optimize fertilizer formulation by reducing nutrient loss and plant cell uptake. While, El- Nasharty, *et al*., (2021) and Rezk, *et al*., (2021) reported that nano fertilizer have some specific properties that enable increased nutrient utilization efficiency

Sugar Beet

Nanotechnology is the new generation technology that has major place in progress in many different fields, including agriculture and food industries. Considering global climate changes Nanotechnology is the way foodsecurity can be achieved increasing food productivity in a sustainable development (Panpatte& Jhala, 2019). In the last few years, Nano-fertilizers considered as one of sustainable development for increasing crop productivity in the developing countries (Veronice, *et al*., 2015). Interesting approach in application of necessary elements, including Nano-macronutrients had a major impact on production both in quantity and quality. Nano fertilization of sugar beet has been studied by many authors such as Dewdar, *et al*., (2018) where, he found the best results for root length and diameter, dry matter per plant as root, top and sugar yield in two seasons under nano-microelements fertilization using 200mg/L+urea 1%.

Conclusion

Finally, it could be concluded that there is a positive relationship between fertilizers quantity and growth as well as production of sugar crops. For achieving a high yield production of sugar crops,it is very important to using balanced macro and micronutrients fertilizers, moreover, the bio-fertilizers for saving the environment.

References

1. Abdel-Motagally, F.M. and Kamal, K.A. "Response of sugar beet plants to nitrogen and potassium fertilization in sandy calcareous soil." *Int. J. Agric. Biol* 11.6 (2009): 695-700.
2. El-aziz, A., Essam, K. and Hassan, Y. "Sugar beet yield and quality as affected by growth regulators, mineral and bio-fertilization in Nubaria Region." *Alexandria Science Exchange journal* 40 (2016): 419-426.
3. Abd El-Hadi, A.H., El-Akabawy, M.A., Negm, A.Y. and Seleem, M.M. "Effect of phosphours and potassium fertilization on sugarcane production in Upper Egypt." *Proc. 5th Conf. Agron. Zagazig*, 13-15 Sept. 1992 (2009).
4. Aboshady, K.A., El-Said, M.N. and Ibrahim, M.F.M. "Effect of bacterial biofertilization and N-levels on yield and quality of sugar beet (variety lola)." *Journal of Agricultural Chemistry and Biotechnology* 34.12 (2009): 10815-10823.
5. Agamy, R., H. Mohamed. and A. Saad. "Effect of soil amendment with yeasts as bio-fertilizers on the growth and productivity of sugar beet." *African Journal of Agricultural Research* 8.1 (2013): 46-56.
6. Ahmed, A.Z., Osman, M.S.H. and Ahmed, A.M. "Effect of excessive nitrogen application on yield and quality of three sugarcane varieties." *Proc. 3rd Int. Conf. IS Sinai Univ., Al Arish, Egypt* (2008): 34-39.
7. Ahmed, S. and A. Rasool. "Evaluation of sugar beet varieties for their adaptability in different soil and environmental conditions of Punjab." *Final Report (2008-11) Agricultural linkages Program (ALP), National Agricultural Research Center, Islamabad, Pakistan* (2011).
8. Ahmad, S., Muhammad, Z., Nasir, I., Nasir, M. C. and Khalid, M. "Evaluation of sugar beet hybrid varieties under Thalkumbi in Pakistan." *j. Agric. Biol*. 14.4 (2012): 605-608.
9. Ahmed, Z.A. "Response of three sugar cane varieties to phosphorus bio fertilization." *Egyptian Journal of Agronomy* 39 (2017):149-158.
10. Aly, E.F. "Effect of environmental conditions on productivity and quality of some sugar beet varieties." *Ph.D.Thesis.Fac. of Agric. Benha Univ.Egypt* (2006).
11. Biswas, P. and Chang-Yu, W. "Critical review nanoparticles and the environment." *Journal of the air & waste management association* 55.6 (2005): 708-746.
12. Bokhtiar S.M. and K, Sakurai "Effects of organic manure and chemical fertilizer on soil fertility and productivity of plant and ratoon crops of sugarcane." *Archives of Agronomy and Soil science* 51.3 (2005): 325-334.
13. Caione, G., Renato, D.M.P., Cid, N. S. C., Leandro, R.M., Ricardo, D.L.V. and João, M.P.J. "Response of sugarcane in a Red Ultisol to phosphorus Rates, phosphorus source and filter cake." *Hindawi Publishing Corporation, The Scientific World Journal* 2015 (2015).
14. Chatterjee, B.N., Singh, K.I., A. Pal. and S. Maiti. "Organic manures as substitute for chemical fertlizers high – yielding rice varieties." *Indian J. Agric Sci*. 49 (1979): 188-192.
15. Conab, companhia Nacional de abastecimento. "Boletim cana." http://www.conab.gov.br/OlalaCMS/ (2017).
16. Dewdar, M., Mohamed, S. A., Adel, S.E. and Hamdy, A. A.E. "Effect of nano micronutrients and nitrogen foliar applications on sugar beet (Beta vulgaris L.) of quantity and quality traits in marginal soils in Egypt." *International Journal of Current Microbiology and Applied Sciences* 7.08 (2018): 4490-8.

17. El-Eila, H.I., Nofal, O.A. and El Sayed, S.A.A. "Nutrient response of three sugar beet varieties grown under new reclaimed soils to potassium and boron fertilization." *International Journal of Academic Research* 6.6 (2014): 269-273.
18. El-Fouly, A.F., Fawzi, A.F. and El-Sayed, A.A. "Optimization fertilizer use in orange through fertilization, a case study." *Proc. Dahlia Geridinger interest I.Symp. "A Fertilization" Technion, Hifa,* (1995): 6030-1040.
19. El-Geddawy, H., Shafshak, S.E., Hammam, G.Y.M. and El-Shafai, A.M.A. "Irrigation regimes and nitrogen fertilization effect on sugar cane yield and its components." *Egyptian Journal of Agricultural Research* 82.4 (2004): 1721-1732.
20. El-Harriri, D.M. and Gobarh, M.E. "Response of growth, yield and quality of sugar beet to nitrogen and potassium fertilizers under newly reclaimed sandy soil." *J. Agric. Sci. Mansoura Univ* 26.10 (2001): 5895-5907.
21. El–Kholy, M.H., Abdelhamid, M.T. and Selim, E.H.H. "Effect of soil salinity, nitrogen fertilization levels and potassium fertilization forms on growth, yield and quality of sugar beet crop in East Northen Delta of Egypt." *J. Agric.Sci.Mansoura University* 31 (2006): 4049-4063.
22. Rezk, A.I., El-Nasharty, A.B., El-Nwehy, S.S. and Nofal, O.A. "The role of nanotechnology in Plant Nutrition. A.Review." *Middle East Journal of Agriculture Research* 10.2 (2021): 577-587.
23. Eyheraguibel, B., Jérôme, S. and Philippe, M. "Effects of humic substances derived from organic waste enhancement on the growth and mineral nutrition of maize." *Bioresour Technol*. 99.10 (2008):4206-4212.
24. Fahmy, A.M., Osman, M.A.M. and Galal, M.O.A. "Yield, quality and natural infestation with insect and disease of four sugarcane varieties as affected by different levels of potassium fertilization." *Journal of Plant Protection and Pathology* 8.12 (2017): 687-693.
25. Gaballa, M.S., Hani, A. M. and Osama, A. N. "Balanced fertilization of major crops in Egypt." *Plant Archives* 20.2 (2020): 2453-2458.
26. Habib, A. "Response of some sugar beet (*Beta vulgaris L.*) cultivars to organic manure and mineral fertilizers under sandy calcareous soil condition at south Sinai-Egypt." *Alexandria science Exchange Journal* 42(2021): 191-207.
27. Hozayn, N. "Screening of some exotic sugar beet cultivars grown under newly reclaimed sandy soil for yield and sugar quality traits." *J.Appl.Sci. Res*., 9.3 (2003): 2213-2222.
28. Ismail, A.M.A., Al-Labbody, A.H.S. and Shalaby, N.M.S. "Variability and traits relationship in nine sugar beet varieties under three sowing dates." *Egypt. J. Plant Breed* 10.1 (2006): 387-406.
29. Ismail, A.M.A., Al-Labbody, A.H.S. and Shalaby, N.M.S. "Evaluation of some sugar beet varieties under different combinations of NPK fertilizers." *Egypt. J. of Appl. Sci* 22.3 (2007): 77-90.
30. Jafarnia, B., Reza, G., Feizabady, A.Z. and Ali, R.G. "Impact of crop density and soil fertilization on sugar beet." *International Journal of Agriculture and Crop Sciences (IJACS)* 5.24 (2013): 2991-2999.
31. Kandil, A.A. "Response of some sugarbeet varieties underb salinity, topotassic fertilizers, towards the ration use of high salinity tolerant plants." *Series: Tasks for Vegetation Science* (2016: 199- 207.
32. Khadr, M.S., Negm, A.Y., Khalil, F.A. and Antoun, L.W. "Effect of potassium chloride in comparison with potassium sulfate on sugarcane production and some soil chemical properties under Egyptian conditions." *IPI regional workshop on Potassium and Fertigation development in West Asia and North Africa: Rabat, Morocco* (2004): 24-28.
33. Khalil, S.M., Mostafa, S.N. and Mostafa, Z.R. "Influence of potassium fertilizer and soil salinity on chemical composition of sugar beet root." *Minufiya J. Agric. Res* 26.3 (2001): 583-594.
34. Kochi, A. "The effects of nitrogen and potassium nutrition on yield and quality of sugar beet." *Proc. 13th Colloq. Intern. Potash. Inst*. (1977): 209-219.

35. Likshmi, M.B., Devi, T.C., Narasimha Rao, I.V. and Rao, K.L. "Effect of time of nitrogen application on yield and quality of early maturing sugarcane varieties under rainfed conditions." *India. Sugar-Tech*. 5.1/2 (2003): 73-76.
36. Mahmoud, E.A., Ramadan, B.S.H., El-Geddawy, I.H. and Korany, S.F. "Effect of mineral and bio-fertilization on productivity of sugar beet." *Journal of Plant Production* 5.4 (2014): 699-710.
37. Mazaherinia, S., Ali Reza Astaraei, Amir Fotovat, and A. Monshi. "Nano iron oxide particles efficiency on Fe, Mn, Zn and Cu concentrations in wheat plant." *World Applied Sciences Journal* 7.1 (2010): 36-40.
38. Mehanna, H.M., Safi-naz, S.Z. and Hussien, M.M. "Influences of irrigation and fertilizer on growth and yield of two sugar beet varieties in Egypt." *Meddle East Journal of Agriculture Res* 6.4 (2017): 1295-1300.
39. Chand, M., Srivastava, S.N.L. and Tamak, J.C. "Nitrogen management for sugarcane seed crop." *India. Haryana. J. Agron*. 20.1/2 (2004): 96-97.
40. Mekdad, A.A.A. "Sugar beet productivity as affected by nitrogen fertilizer and foliar spraying with boron." *Int. J. Curr. Microbiol. App. Sci* 4.4 (2015): 181-196.
41. Mekdad, A.A.A. and Rady, M.M. "Response of Beta vulgaris L. to nitrogen and micronutrients in dry environment." *Plant, Soil and Environment* 62.1 (2016): 23-29.
42. Mokadem, S.A., AtaAllah, S.A.A., Bekheet, M.A. and Gadalla, A.F.I. "Effect of sources, levels and number of applications of nitrogen fertilizer on yield and quality of sugarcane." *Minia J. Agric. Res., Develop* 28.4 (2008): 767-783.
43. Shafika, N.M. and El-Masry, A.A. "Effect of nitrogen and potassium fertilization with or without spraying by Fe combined with Mn on some physic and chemical properties, productivity and quality of sugar beet crop." *Ann. Agric. Sci. Moshtohor* 44.4 (2006): 1431-1446.
44. Naderi, M.R. and A. Danesh-Shahraki. "Nanofertilizers and their roles in sustainable agriculture." *International Journal of Agriculture and Crop Sciences (IJACS)* 5.19 (2013): 2229-2232.
45. Nassar, A.M., Kamal, S. E. And Badawy, S. R. "Effect of nitrogen levels on yield and juice quality of some sugarcane varieties (*Saccharum spp., L.*)." *Egyptian Journal of Agricultural Research* 83.2 (2005): 681-692.
46. Nassar, A.M., El-Sagheir, K.S. and Jadhav, B.S. "Response of sugarcane varieties to the time of fertilizer application and earthing-up." India. Coop. Sugar. 38.3 (2006): 31-34.
47. Nawar, F.R.R. and Saleh, S.A. "Effect of plant spacing and nitrogen fertilizer levels on yield and yiel,d componts of sugar beet under calcareous soil condition." *J. Adv. Agric. Res*. 8.1 (2003): 47-57.
48. Neseim, M.R., Amin, A.Y. and El-Mohammady, M.M.S. "Effect of potassium applied with foliar spray of yeast on sugar beet growth and yield under drought stress." *Global Advanced Research Journal of Agricultural Science* 3.8 (2014):1-12.
49. Nigade, R.D., Kadam, U.A. and Ramadan, B.S.H. "Response of sugarcane varieties to the time of fertilizer application and earthing-up." *India. Coop. Sugar.* 38.3 (2006): 31-34.
50. Nofal, O.A. and Rezk, A.I. "Role of fertilization in improving quality of some agricultural crops." *International Journal of Academic Research* 1.2 (2009): 59-65
51. Nofal, O.A., Rezk, A.I. and El-Nasharty, A.B. "Status of Zn availability in soils and evaluation the efficiency of some wheat cultivars under stress condition of zinc deficiency." *World Applied Sciences Journal* 25.11 (2013): 1519-1524.
52. Nofal, O.A., El Eila, H.I. and El-Sayed, S.A.A. "Balanced potassium and boron fertilization management for maximizing tield and quality of some sugar beet varieties." *International journal of Academic Research* 6.6 (2014): 229-234.
53. Nofal, O.A., Zedian, M.S. and Bakry, B.A. "Flax yield and quality traits as affected by zinc foliar application under newly reclaimed sandy soils." *Journal of Applied Sciences Research* September 7.9 (2011): 1361-1367.
54. Nofal, O.A., El-Sayed, S.A., Gaballa, M.S. and Mansour, H.A. "Sugar beet crop is an icon of new cultivation lands: A Review."

Plant Cell Biotechnology and Molecular Biology 22.71&72 (2021):19-26.

55. Okasha, N.M. "Effect of nitrogen and bio fertilization on yield and quality of sugar beet in North Africa." *Ph. D. Thesis., Natural Resources, African Researches and Studies Institute, Cairo Unvi*. (2013).
56. Onwueme, I.C. and Sinha, I.T. "CTA-Field Crop Production in Tropical Africa." *CTA, Wageningen, Netheflands* (1999): 401-411.
57. Oshea, C.G., B. lynech., Lynch, M.B., Callan, J.J. and O'Doherty, J.V. "Ammonia emissions and dry mater separated pig manure fractn as affected by crude protein concentration and sugar beet pulp inclusion in finishing pig diet." *Agric. Ecosyst. Environ*. 131.3-4 (2009): 154-164.
58. Panpatte, D.G. and Yogeshvari, K.J. "Nanotechnology for Agriculture: Crop Production & Protection." (2019).
59. Pyakurel, A., Bhishma, R.D. and Swodesh, R. "Effect of molasses and organic fertilizer in soil fertility and yield of spanich in Khotang, Nepal." *Int.J.Appl. Sci.Biotechnol*. 7 (2019):49-53.
60. Rezk, A.I., El-Nasharty, A.B., El-Nwehy, S.S. and Nofal, O.A. "Nano fertilizers their role and uses in crop production. A Review." *Current Science International* 10.2(2021): 295-308.
61. Rezk, A.I., Nofal, O.A. and El-Masri, MF. "A comparative study on fruit quality parameters and yield of four olive cultivars grown in sandy soil." *Arab Universities Journal of Agricultural Sciences* 13.3 (2005): 891-899.
62. Santos, R.L.D., Fernando José Freire, Emídio Cantídio Almeida de Oliveira, Djalma Euzébio Simões Neto, Maércio Rodrigo Farias Amaral de Medeiros, Patrícia da Costa Bezerra, Maria José Alves de Moura, José de Arruda Barbosa, Nayara Rose da Conceição Lopes, and Nayara de Lima Santos. "Productivity and technological quality of sugarcane under fertilization of nitrogen and molybdenum." *Journal of soil science and plant nutrition* 18.4 (2018): 1002-1020.
63. Shaban, Sh A., M. Shehata., Gaber, S.I. and Abdel Fatah, E.M. "6 Effects of harvest dates and potassium rates and timing of application, on sugar beet yield and quality." *Egyptian Journal of Agronomy* 30 (2008): 89.
64. Shehata, S.A., Fawzy, Z.F. and El-Ramady, H.R. "Response of cucumber plants to foliar application of chitosan and yeast under greenhouse conditions." *Australian Journal of Basic and Applied Sciences* 6.4 (2012): 63-71.
65. Thalooth, A.T., Tawfik, M.M., Elham, A. B. and Magda, H. M. "Yield and quality response of some sugar beet (*Beta vulgaris L.*) varieties to humic acid and yeast application in newly reclaimed soil." *Middle East J. Agric. Res* 8.1 (2019): 56-65.
66. Tsialtas, J. T. and N. Maslaris. "Effect of n fertilization rate on sugar yield and non-sugar impurities of sugar beets (*Beta vulgaris*) grown under mediterranean conditions." *Journal of Agronomy and Crop Science* 191.5 (2005): 330-339.
67. Veronica, N., Tulasi, G., Ramesh, T. and Reddy, N.S. "Role of Nano fertilizers in agricultural farming." *Int. J. Environ. Sci. Technol* 1.1 (2015): 1-3.
68. Yousif, E.M.M., Ibrahim, M.M., Kh, A.E.A. and Ahamed, A.Z. "Management of nitrogen fertilization for sugar cane on a sandy Soil: I yield and its components." *Egypt. J. Appl. Sci* 30.11 (2015): 498-511.

Source of support: Nil;
Conflict of interest: The authors declare no conflict of interests.

Cite this article as:
Nofal, O.A., El-Sayed, S.A.A. and Abbas, M.M. "Effect of Fertilization Role on Sugar Crops Productivity in Egypt." *Annals of Plant Sciences*.11.09 (2022): pp. 5358-5366.

DOI: http://dx.doi.org/10.21746/aps.2022.11.9.6