International Journal of Agriculture System
Vol. 10 Issue 1, June 2022
Nationally Accredited Journal Decree No. 48a/E/KPT/2017
P-ISSN: 2337-9782, E-ISSN: 2580-6815. DOI: 10.20956/ijas.v10i1.3789

The Application of Several Organic Fertilizers for Production Increase and Brix Content of Sweet Corn (*Zea mays* L. Saccharate)

Andi Adya Ramadhan Agussalim[1], Rafiudin[2], Amir Yassi[2*]

[1] *Master Student, Agrotechnology, Faculty of Agriculture, Universitas Hasanuddin, Jl. Perintis Kemerdekaan KM 10, Makassar 90245, Indonesia*
[2] *Department of Agronomy, Faculty of Agriculture, Universitas Hasanuddin, Jl. Perintis Kemerdekaan KM 10, Makassar 90245, Indonesia*

[*] *Corresponding author's e-mail: yassi.amir@yahoo.com*

ABSTRACT

The tendency of chemical fertilizers used (inorganic) in food crop cultivation farming by the farmers is caused by their practicality. However, the continuous use of chemical fertilizers can damage the crops and their environment, including sweet corn. Sweet corn (Zea mays L. Saccharate) contains high sugar content because it naturally mutates to a recessive gene that controls sugar conversion to starch in corn endosperm. The purpose of this research were to know the effect of several organic fertilizers on productivity increase as well as Brix content of sweet corn. This research was conducted from June to August 2021 in Waempubbu Village, Amali District, Bone Regency and Laboratory of Food Process, Agriculture Faculty, Hasanuddin University, South Sulawesi. This research used the design of a split plot by using completely randomized design (CRD). The main plot was sweet corn varieties: Talenta (v1) and Bonanza (v2). Meanwhile, the subplot was organic fertilizers which are control (p0), compost (p1), soil ameliorant (p2), compost + soil ameliorant (p3), liquid organic fertilizer/LOF (p4), compost + LOF (p5), soil ameliorant + LOF (p6) and compost + soil ameliorant + LOF (p7). According to the results, the Bonanza variety showed high average productivity, 22.50 tons per hectare. The treatment of organic fertilizer that reveals the high average productivity is combines compost + soil ameliorant + LOF (p7). The interaction of treatment that reveals the highest productivity is an interaction between Bonanza variety with the treatment of soil ameliorant + LOF (p6), which is 27.07 tons per hectare with Relative Agronomic Effectiveness (RAE) value is 1366.67%. The treatment of compost fertilizer + soil ameliorant + LOF (p7) exhibits the content of Brix (10.50%) and becomes the highest productivity.

Keywords:
Sweet corn; Brix; variety; organic fertilizer

1. Introduction

Sweet corn (Z. mays L. Saccharate) is the one of the most cultivate vegetables (Huang et al., 2019). It has become popular in the global market (Emam et al., 2020), especially in Indonesia, due to its high nutrition content such as carbohydrates, fructose, water, vitamins, and amino acids (Kumar et al., 2020), as well as protein and low fat. Besides, sweet corn also contains zeaxanthin which is suitable for body health (O'Hare et al., 2015) and has a good flavor (Riadi et al., 2015). Therefore, sweet corn farming has a lucrative chance if effectively and efficiently undergone (Zaevie et al., 2014). This corn is also available to be consumed in raw, processed foods and is the primary source for the food industry and animal feed (Coskun et al., 2005; Isaak et al., 2020). Indonesians commonly consume sweet corn in the form of *Nasi Jagung* (corn with rice), grilled corn, corn porridge, boiled corn, *Perkedel*, and many other local foods.

Sweet corn has high sugar content because, naturally, a recessive gene mutation controls the conversion of sugar to starch in the corn endosperm (Kumar et al., 2020). Sweet corn seeds that are still young and fresh also contain carotenoids and phenols, which are essential for health and can be functional food ingredients (Khampas et al., 2013). Directorate General of Horticulture of Indonesia (Dirjen Hortikultura) (2018) reported that the import of sweet corn in 2017 was 1,122 tons. Importing corn indicates that the sweet corn production has not fulfilled the market demand. Meanwhile, the Indonesian national productivity of sweet corn was about 8.31 tons ha-1 which could hit 14-18 tons ha-1 (Supriyatna et al., 2020).

Cultivation technique such as fertilizing technology management can increase sweet corn production. We can do the fertilizing technology engineering by adding organic materials (Mayadewi, 2007), soil ameliorant, and liquid fertilizer. According to Asroh (2010), bio-fertilizers have micro-organisms that can provide crops nutrients. The content in bio-fertilizers usually uses micro-organisms that chain N and dissolve P and K. The availability of nutrients is an essential factors that affect the crops' growth and development. The soil nutrient supply could degrade due to intensive farming, especially macro-nutrients such as Nitrogen, Phosphor, and Potassium. A decrease in soil nutrients can happen as a result being transported during harvest.

Farmers currently tend to utilize chemical fertilizers (inorganic) for their practicality. Even so, the continuous use of inorganic fertilizers can adversely affect crops and the environment in the long term (Zhang et al., 2010). The alternative increase the fertility of agricultural land sustainably is by the application of organic materials. The organic materials can support nutrient, and also useful in repairing land's physical, chemical, and biological factors (Lumbanraja, 2012). Organic fertilizers are aggregation agents that bind soil particles because of humic acid and fulvic acid as sedimentation of soil particles to form metal-humus. Organic fertilizers also contain growth hormones by the auxin and gibberellin groups in the soil that stimulate crop growth from sprouting to fruiting (Purba et al., 2019). Several researchers have published the use of organic fertilizers that use elevate crops' productivity, such as Brust et al. (2003); Zhai et al. (2009) and Haytova D. (2013) for fruit crops, Fahrurrozi et al. (2015) for carrots, and Fahrurrozi et al. (2016) for sweet corns. The effect of the combination of several organic fertilizers about the growth, production, and the brix content of sweet corn is still lacking information. Based on these results, this research was conducted to axamine some combinations of organic fertilizers to increase the brix content and the production of the sweet corn.

2. Materials and Methods

This research was conducted in Waempubu Village, Amali District, Bone Regency, and Laboratory of Food Processing Agriculture Faculty Hasanuddin University, South Sulawesi, in June to August 2021. This research used the design of a split plot by using completely randomized design (CRD). The main plot was sweet corn varieties: Talenta (v1) and Bonanza (v2). Meanwhile, the subplot was organic fertilizers which are control (p0), compost (p1), soil ameliorant (p2), compost + soil ameliorant (p3), liquid organic fertilizer/LOF (p4), compost + LOF (p5), soil ameliorant + LOF (p6) and compost + soil ameliorant + LOF (p7). The treatment was repeated in three times, so there were 48 plots experimented with in total.

Land processing using a tractor then the beds is made with a size of 3 m x 1.4 m with a distance between the beds is 1 m. The application of compost is carried out at the time of land preparation at a dose of 5 tons/ha.. The soil ameliorant was given one week before transplanting by dissolving 85 grams of soil ameliorant in 5 liters of water and watered evenly in every plot of the experiment. LOF has sprayed it on 14 DAP (Days after planting), 28 DAP, 42 DAP, and 56 DAP of concentration 100 cc per 15 liters of water. The control includes irrigation, weeding, root covering, and crop removal. Harvesting was conventionally done at age 70 DAP. The data obtained were analyzed by variance analysis, correlation analysis, factor analysis, and LSD exam with a standard 5%.

3. Results and Discussion

3.1 Results

Table 1 shows that the treatment of organic fertilizer reveals a tangible effect on the parameter of the age of flowering males, the diameter of corncob with husk, and the height of corncob as well as the content of the brix, the chlorophyll A, and the productivity of sweet corn with husk. The interaction between variety and organic fertilizer only has a tangible effect on the parameter of productivity.

Table 1. The middle quadrate of variance analysis of organic fertilizer

Variable	Variety	Error (a)	Fertilizer	P x V	Error (b)	CV (a) %	CV (b) %
UBJ	0.36 ^{ns}	0.33	0.56 *	0.17 ^{ns}	0.17	1.18	0.83
DTB	3.47 ^{ns}	2.17	1.07 *	0.38 ^{ns}	0.33	2.91	1.14
KB70	4.08 *	0.15	1.75 **	0.89 ^{ns}	0.47	4.07	7.34
TLT	167.48 ^{ns}	17.41	24.12 *	3.81 ^{ns}	10.19	3.63	2.78
Chl_A	1613.56 ^{ns}	444.48	163.80 **	55.82 ^{ns}	24.62	6.63	1.56
PDK	0.05 ns	0.12	0.04 **	0.02 *	0.01	16.02 ^{tr}	3.80 ^{tr}

Remarks: *: Signification in 5%, **: signification in 1%, tn: not significant, tr: transformation resulted in $\sqrt{x}$, UBJ: age of males flowering, DTB: diameter of corncob with husk, KB70: Brix content 70 DAP, TLT: height of corncob, Chl_A: chlorophyll A, PDK: productivity with husk; CV: coefficient of variance.

The analysis (Table 2) shows that the character of Brix content, chlorophyll A, and productivity per hectare with husks is the first factor that creates a variety of growth and production of sweet corn on the application of organic fertilizer. This is indicated by the correlation values, which are 0.37, 0.49, and 0.36. Meanwhile, the second factor is the character of the male flowers with the correlation value 0.51. The determination of the main character in the factor analysis is based on the factor score above 0.32 (Yong dan Pearce, 2013) with the result that not all characters are chosen to be the determiner of variance in the total conflict of early data. Meanwhile, the result of pearson correlation value on several parameters of observation are shown in table 3.

Table 2. Factor analysis of characters identified

Variable	Factor1	Factor2	Factor3	Factor4	Communality
UBJ	0.08	**0.51**	0.05	-0.20	0.87
DTB	-0.10	0.02	-0.31	-0.10	0.73
KB70	**0.37**	0.06	-0.19	0.28	0.85
TLT	-0.11	-0.14	-0.32	0.01	0.83
Chl_A	**0.49**	0.16	0.13	-0.10	0.95
PDK	**0.36**	0.29	-0.47	0.19	0.91
Variance	3.74	2.36	2.36	2.05	10.50
% Var	0.31	0.20	0.20	0.17	0.88

Remarks: *: UBJ: age of males flowering, DTB: diameter of corncob with husk, KB70: brix content 70 DAP, TLT: height of corncob, Chl_A: chlorophyll A, PDK: productivity with husk.

Table 3. Pearson correlation value on the parameter of observation

Variable	UBJ	DTB	KB70	TLT	Chl_A	PTK
UBJ	1.00					
DTB	-0.09	1.00				
KB70	**-0.38** **	0.11	1.00			
TLT	**-0.35** *	**0.51** **	0.06	1.00		
Chl_A	**-0.37** **	-0.09	**0.31** *	-0.17	1.00	
PDK	-0.23	0.27	0.15	0.27	**0.36** **	1.00

Remarks: *: significant in 5%, **: significant in 1%, UBJ: age of males flowering, DTB: diameter of corncob with husks, KB70: the content of Brix 70 DAP, TLT: height of corncob, Chl_A: chlorophyll A, PDK: productivity with husks.

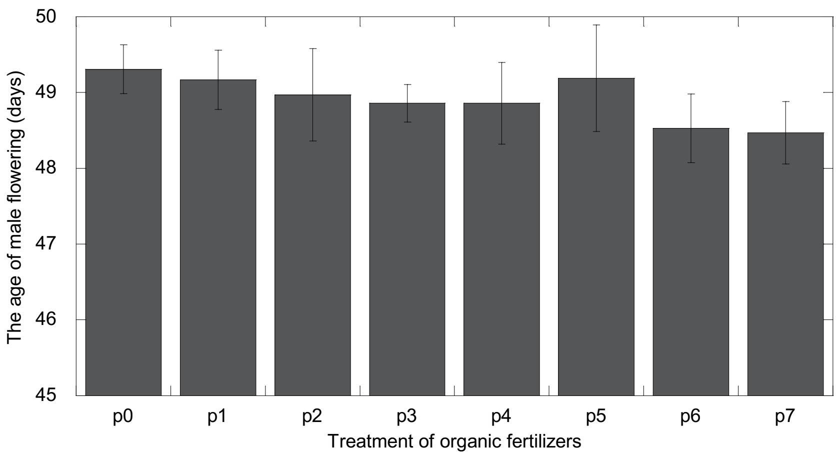

Figure 1. Graph of flowering of males of 2 varieties of sweet corn

Figure 1 showed that the treatment of the application of compost + soil ameliorant + LOF (p7) makes the average fastest age of males flowering 48.47 days. Meanwhile, the average most extended period is on the treatment (p0), which is 49.31 days. Meanwhile the average age of the longest flowering in the control treatment (p0) which is 49.31 days.

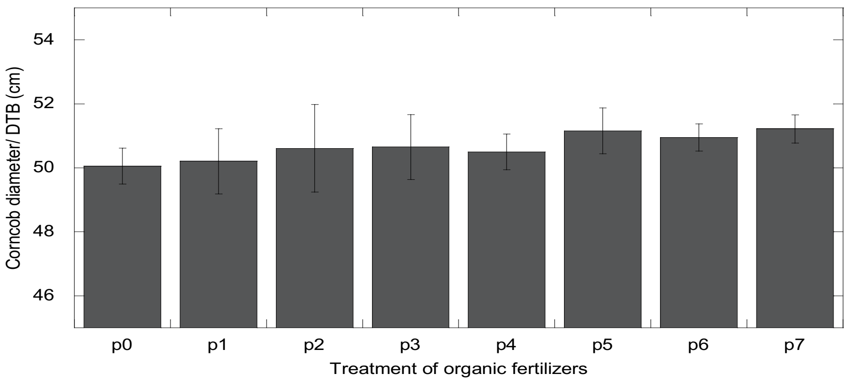

Figure 2. The graph of corncob diameter of 2 varieties of sweet corn

Figure 2 showed that the application of compost + soil ameliorant +LOF (p7) makes the average highest corncob diameter on two types of sweet corn 51.22 mm. Meanwhile, the average lowest corncob on two kinds of sweet corn occurs in treatment control (p0) which is as much as 50.06 mm.

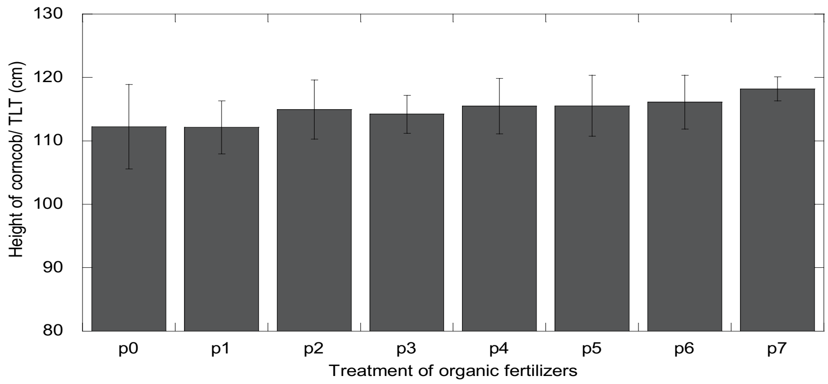

Figure 3. The graph of corncob height of 2 varieties of sweet corn

Figure 3 showed that the application of organic fertilizer + soil ameliorant + LOF (p7) makes the average highest corncob location 118.22 cm on two varieties of sweet corn. Meanwhile, the average lowest place of corncob occurs in the application of compost (p1) which is 109.39 cm on two types of sweet corn.

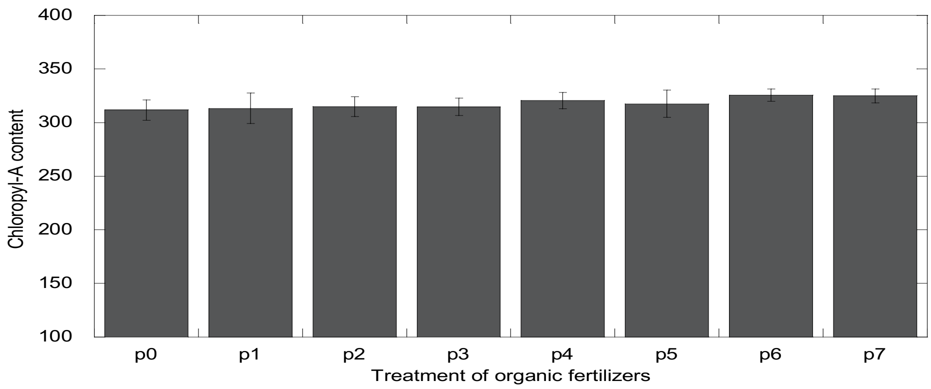

Figure 4. The graph of chlorophyll-A content of 2 varieties of sweet corn

Figure 4 showed that the application of soil ameliorant + LOF (p6) on two types of sweet corn make the average highest content of chlorophyll A 325.66. The lowest chlorophyll-A content occurred at the zero fertilization approach (p0) that is 311.97 on two varieties of sweet corn

Table 4. The average content of Brix of 2 varieties of corn through the application of organic fertilizer at the age of 70

Organic Fertilizers Treatment	Varieties		Average	NP LSD (p) 0.05
	Talenta (v1)	**Bonanza (v2)**		
Control (p0)	9.33	8.33	8.83 b	
Compost (p1)	9.00	9.00	9.00 b	
Soil Ameliorant (p2)	9.33	9.00	9.17 b	
Compost + Soil Ameliorant (p3)	9.33	9.33	9.33 ab	
LOF (p4)	10.00	8.33	9.17 b	1.29
Compost + LOF (p5)	10.00	8.33	9.17 b	
Compost + LOF (p6)	9.67	10.00	9.83 ab	
Compost + Soil Ameliorant + LOF (p7)	10.67	10.33	10.50 a	
Average	**9.67 p**	**9.08 q**		
NP LSD (v) 0.05		**0.47**		

Remarks: The numbers followed by equal letter in the same column (a, b) and row (p, q) mean that they are significantly indifferent to the LSDα = 0.05.

LSD test (Table 4) demonstrates that the treatment of fertilizer giving the average highest Brix content (10.50) occurs in the treatment of compost + soil ameliorant +LOF (p7). It is significantly different from the other treatments except the treatment of compost + soil ameliorant (p3) and soil ameliorant +LOF (p6). The treatment of fertilizer, causing the average lowest Brix content (9.83) is the treatment without organic fertilizer. The variety that resulted the highest Brix content (9.67) is Talenta, and it is significantly different from Bonanza (9.08).

Table 5. Average production per hectare with corncob (ton ha^{-1}) of 2 corn varieties with the application of organic fertilizer.

Organic Fertilizers Treatment	Varieties		Average	NP LSD (p) 0.05
	Talenta (v1)	**Bonanza (v2)**		
Control (p0)	18.36^{b}_{p}	20.69^{c}_{p}	19.52	
Compost (p1)	20.22^{ab}_{p}	21.15^{bc}_{p}	20.69	
Soil Amelirant (p2)	22.09^{ab}_{p}	23.49^{abc}_{p}	22.79	
Compost + Soil ameliorant (p3)	21.47^{ab}_{p}	21.16^{bc}_{p}	21.31	
LOF (p4)	21.93^{ab}_{p}	19.60^{c}_{p}	20.77	6.63
Compost + LOF (p5)	21.00^{ab}_{p}	21.62^{bc}_{p}	21.31	
Soil Ameliorant + LOF (p6)	20.69^{ab}_{p}	27.07^{a}_{p}	23.88	
Compost + soil ameliorant + LOF (p7)	23.80^{a}_{p}	25.20^{ab}_{p}	24.50	
Average	21.20	22.50		
NP LSD (p) 0.05		4.32		

Remarks: The numbers followed by equal letter in the same column (a, b, c) and row (p, q) mean that they are significantly indifferent to the LSDα = 0.05.

LSD test in the (Table 5) showed that the production per hectare with the highest corncob (27.07 ton ha^{-1}) is of the interaction of Bonanza with the application of soil ameliorant + LOF (v2p6). It is significantly different from the other treatments except the variety of Bonanza with the application of compost + soil ameliorant + LOF (v2p7) and the composition of Bonanza with soil ameliorant (v2p2). The interaction treatment that gave the lowest production corncob per hectare (18.36 ton ha^{-1}) was the interaction of the Talenta variety without organic fertilizer (v1p0).

Table 6. The average of relative agronomic effectivity (RAE) (%)

Organic Fertilizers Treatment	RAE Variety of Talenta (%)	RAE Variety of Bonanza (%)
Control (p0)	-	-
Compost (p1)	100.00	100.00
Soil ameliorant (p2)	200.00	600.00
Compost + Soil ameliorant (p3)	166.67	100.00
LOF (p4)	191.67	-233.33
Compost + LOF (p5)	141.67	200.00
Soil ameliorant + LOF (p6)	125.00	1366.67
Compost + Soil ameliorant + LOF (p7)	291.67	966.67

Table 6 showed the relative agronomic effectivity (RAE) value in each combination of variety with the application of organic fertilizers. The RAE value on the productivity parameter with the highest corncob occured in the Bonanza variety which used soil ameliorant + LOF (v2p6), was 1366.67%. The lowest RAE value was found in the application LOF (v2p4) variety of Bonanza, which was -233.33%.

3.2 Discussion

This study used two varieties of sweet corn (Talenta and Bonanza) so that the varietal approach did not have a significant effect other than the parameter for observing Brix levels. This is indicated that genetic factors affect the Brix content of sweet corn. Tracy et al. (2006) reported that one or more eight genes characterize sweet corn features. The genes are Shrunken-2 (sh2) on chromosome 3, Fragile (bt) and Amylose Extender (ae) on chromosome 3, Sugar Enhancer (se), Sugary (su) and brittle-2 (bt2) on chromosome 4; Dull (du) on chromosome 10, and Wax (wx) on chromosome 9. After that, Dagla et al. (2014) also reported that there are two more genes, namely Sugary 2 (su2) and Shrunken 4 (sh4). Genes have been identified to alter the higher sugar content in the sweetcorn seed endosperm.

The application of organic fertilizers is significantly affected all the observed characteristics. This is indicated that the variety of sweet corn gave a fairly good response to the application of organic fertilizers. Syafruddin et al. (2012) stated that hybrid varieties have advantages such as a fast response to fertilizers. As a result, with that advantage, the technical engineering of fertilizers can be conducted to obtain fertilizing technologies that can increase the productivity and quality of sweet corn. Lingga and Marsono (2008) stated that applying fertilizers can also fulfill crops' nutrition needs for optimal growth. Moreover, Kakabouki et al. (2020) discovered that adding organic fertilizers of composting manure and tomato pomace can elevate the growth parameter and crop productivity. Pangaribuan et al. (2018); and Lazcano et al. (2011) also discovered that organic fertilizers could increase the quality of the post-harvesting quality of sweet corn.

The analyzed factor (Table 2) indicates that the first factor that forms a variance of sweet corn growth is the characteristics of Brix content, chlorophyll-A, and corncob production per hectare. The second determinant of varianceis the character of the male flowering age. This analysis is used to identify the correlation beetwen random variables internally (Mattjik and Sumertajaya, 2011; Farid et al. (2020). in addition, this analysis aims to reduce internal variance or small co-variance, then large internal covariance in a dimension is increased by the rotation function (Acquaah. 2007; Dormann et al., 2012; Rocha et al., 2017).

The brix content is one of the indicators of sweetness level measurement for sweet corn, which is the leading indicator of the quality of sweet corn. The higher of the Brix content, then the sweetness level of the sweet corn will be higher. Zarei et al., (2019) reported that the sweetness level of every sweet corn is different, which depends on the sugar level. The result data (Table 1) demonstrates that the approach of compost has a significant effect on the Brix content. The highest Brix content occurs in the process of compost + soil ameliorant + LOF, which is 10.50 (Table 4). Macro-nutrient and micronutrient content in fertilizer can be a trigger for metabolic processes and optimal synthesis processes of carbohydrates, protein, as well as sugar. Application of organic fertilizers to soil would reconstruct the physical, chemical, and biological figures of land, providing a better crop environment (Simanungkalit et al., 2006; Marlina et al., 2015). Application of soil ameliorants would encourage micro-organisms to support soil fertility, soil health, nutrition storage, organic acid, and growing control substances (Keeling et al., 2003; Edwards et al., 2006).

The application of solid compost need to be balanced with the provision of liquid fertilizer. This is because solid fertilizers required the time for the mineralization process (Foth and Ellis. 1997), because the liquid fertilizer application to the leaves can accelerated the absorption of nutrients and minerals without soil mediators that can inhibit the root absorption process. Moreover, applying fertilizer to the leaves can stimulate the roots to absorb soil nutrients (Fernández and Eichert. 2009; Haytova D., 2013; Kannan. 2010). The liquid fertilizers in closed production systems also complements the absorption of solid organic fertilizers (Fahrurrozi et al., 2017).

The interaction of the treatments causing the highest productivity is the interaction between the Bonanza variety with the combination of soil ameliorant + LOF was average productivity of 27.07 ton ha-1. This is also supported by chlorophyll-A, which is the highest among others. The high chlorophyll content can maximize the photosynthesis process. Moreover, Emam et al. (2020) stated that the existence of beneficial micro-organisms can increase the quantity and quality of sweet corn. Other than those statements, Tani et al. (2020) reported that the application of cow manure mixed with LOF can increase the productivity of sweet corn. It is supported by the measurement of organic fertilizer effectivity score (Table 6) that showed the approach of Bonanza variety with the application of soil ameliorant + LOF has an RAE score of as much as 1366.67% compared to control. Hartatik et al. (2015) said that the score of RAE could be used to determine the effectiveness degree of fertilizer in crops' productivity. Therefore, using Bonanza combined with soil ameliorant + LOF can be recommended to encourage sweet corn's productivity.

4. Conclusion

The Bonanza variety provides high average productivity of 22.50 tons per hectare. The organic fertilizer treatment that gave high average productivity was a combination of compost + soil ameliorant + LOF (p7). The highest productivity treatment interaction was 27.07 tons per hectare resulting from the interaction between the Bonanza variety with the soil ameliorant + LOF treatment (p6) with the Relative Agronomic Affectivity (RAE) value of 1,366.67%. The Application of compost + soil ameliorant + LOF (p7) showed the highest brix content (10.50%) and productivity.

Acknowledgments

We would like to thank the Department of Food Crops and Horticulture, Bone Regency, as well as the Agriculture Extension Center of Amali District for supporting me in taking a master's program at Universitas Hasanuddin. Thank you to Mrs. Maharani, who helped me finish this manuscript.

References

Acquaah, G. (2007). *Principles of Plant Genetics and Breeding*. Blackwell Publishing, Oxford, United Kingdom, pp. 130-134.

Asroh A. (2010). Pengaruh takaran pupuk kandang dan interval pemberian pupuk hayati terhadap pertumbuhan dan hasil tanaman jagung manis (Zea mays saccharata Linn). AgronobiS, 2(4): 1-6.

Brust, G.D.S., Egel, and Maynard, E.T. (2003). Organic Vegetable Production. Purdue University Cooperative Extension Service. Bulletin # 316.

Coskun, M.B., Yalcin, I., Ozarslan, C. (2005). Physical properties of sweet corn seed (*Zea mays* saccharata Sturt.). J Food Eng, 74(4): 523–528. https://doi.org/10.1016/j.jfoodeng.2005.03.039

Dagla, M.C., Gadag, R.N., Kumar, N., Ajay, B.C. and Ram, C. (2014). A Potential Scope of Sweet Corn for Peri-Urban Farmers in India. Popular Kheti. 2(1): 69-73.

Directorate General of Horticulture of Indonesia (*Dirjen Hortikultura*). (2018). Volume Impor & Ekspor Sayuran Th 2018. Retrieved from http://horti.pertanian.go.id

Dormann, C.F., Elith, J., Bacher, S., Buchmann, C., Carl, G., Carré, G., Marquéz, J.R.G., Gruber, B., Lafourcade, B., Leitão, P.J., Münkemüller. T., McClean, C., Osborne, P.E., Reineking, B., Schröder, B., Skidmore, A.K., Zurell, D., and Lautenbach, S. (2012). Collinearity: a review of methods to deal with it and a simulation study evaluating their performance. Ecography, 36(1): 27-46. https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/j.1600-0587.2012.07348.x

Edwards, C.A., Arancon, N.Q., and Greytak, S. (2006). Effects of vermicompostt teas on plant growth and disease. Biocycle. 47: 28-31.

Emam, M.S.A., Elsayed, T.R., and Hamed, L.M.M. (2020). Sweet corn performance and rhizosphere microbial densities in response to mineral and organic amendments. Egypt J Soil Sci. 60(1). pp. 43-52 (2020). https:doi.org/10.21608/ejss.2019.19528.1324.

Fahrurrozi, Z., Muktamar, N., Setyowati, S., Sudjatmiko, and Chozin, M. (2015). Evaluation of Tithonia-enriched liquid organic fertilizer for organic carrot production. International JAgric Tech. 11(8):1705-1712. Retrieved from http://www.ijat-aatsea.com.

Fahrurrozi, Muktamar, Z., Dwatmadji., Setyowati, N., Sudjatmiko, S., and Chozin, M. (2016). Growth and yield responses of three sweet corn (Zea mays L. var. Saccharata) varieties to localbased liquid organic fertilizer. Int J AdvSciEng Inform Technol. 6(3): 319–323. https://doi.org/10.18517/ijaseit.6.3.730.

Fahrurrozi., Sariasih, Y., Muktamar, Z., Setyowati, N., Chozin, M., and Sudjatmiko, S. (2017). Identification ofnutrient contents in six potential green biomassesfor developing liquid organic fertilizer in closedagricultural production system. IntJAdvSci, Eng Inform Technol. 7(2): 559–565. https://doi.org/10.18517/ijaseit.7.2.1889.

Farid, B.D.R., M, Nasaruddin., Anshori, M.F., Chaerunnisa, A.N.J. (2020). Evaluation on reproductive and productivity characters of wheat (Triticumaestivum L.) genotypes grown in the lowlands. IOP Conf. Ser.: Earth Environ. Sci. 575: 012123. doi:10.1088/1755-1315/575/1/012123.

Fernández, V., and Eichert, T. (2009). Uptake of hydrophilic solutes through plant leaves: current state of knowledge and perspectives of foliar fertilization. Critical Rev Plant Sci. 28 (1-2): 36-68.https://doi.org/10.1080/07352680902743069.

Foth, H.D., and Ellis, B.G. (1997). Soil fertility (2nd ed.).Boca Raton: CRC Press.

Hartatik, W., Husnain., Widowati, L.R. (2015). Peranan pupuk organik dalam peningkatan produktivitas tanah dan tanaman. Jurnal Sumberdaya Lahan. 9 (2): 107-120. Retrieved From http://ejurnal.litbang.pertanian.go.id/index.php/jsl/article/view/6600.

Haytova, D. (2013). A Review of Roliar Fertilization of Some Vegetable Crops. Annual Rev Res Biol. (4):455-465. Retrieved from www.sciencedomain.org.

Huang, M., Zhang, Z., Zhu, C., Zhai, Y., and Lu, P. (2019). Effect of biochar on sweet corn and soil salinity under conjunctive irrigation with brackish water in coastal saline soil. Scientia Horticulturae. 250 (2019) 405–413. https://doi.org/10.1016/j.scienta.2019.02.077.

Isaak, M., Yahya, A., Razif, M., and Mat, N. (2020). Mechanization status based on machinery utilization and workers' workload in sweet corn cultivation in Malaysia.Computers and Electronics in Agric. 169 (2020) 105208. https://doi.org/10.1016/j.compag.2019.105208.

Kakabouki, I., Efthimiadou, A., Folina, A., Zisi, C., and Karydogianni, S. (2020). Effect of different tomato pomacecomposttasorganic fertilizer in sweet maize crop.Communication in Soil Sci Plant Analysis. https://doi.org/10.1080/00103624.2020.1853148.

Kannan, S. (2010). Foliar fertilization for sustainable Crop Production.Genetic Engineering, Biofertilization, Soil quality and Organic Farming.SustAgric Review 4: 371-402. https://doi.org/10.1007/978-90-481-8741-6_13.

Khampas, S., Lertrat, K., Lomthaisong, K., Surihan, B. (2013) Variability in phytochemicals and antioxidant activity in corn at immaturity and physiologicalmaturity stages. Int Food Res J. 20(6): 3149-3157. Retrieved from http://www.ifrj.upm.edu.my/volume-20-2013.html.

Keeling, A.A., Mc-Callum, K.R., and Beckwith, C.P. (2003). Mature green waste compost enhances growth and nitrogen uptake in wheat and oilseed rape through the action of water extractable factors. Biores Tech.90: 127-132. https://doi.org/10.1016/S0960-8524(03)00125-1.

Kumar, N., Kachhadiya, S., and Nayi, P. (2020). Storage stability and characterization of biochemical, rehydration and colour characteristics of dehydrated sweet corn kernels. J Stored Prod Res. 87 (2020) 101619. https://doi.org/10.1016/j.jspr.2020.101619.

Lazcano, C., Revilla, P., Malvar, R.A., and Dom´inguez, J. (2011). Yield and fruit quality of four sweet cornhybrids (*Zea mays*) under conventionaland integrated fertilization with vermicompost. J Sci Food Agric. 2011; 91: 1244–1253. https://doi.org/10.1002/jsfa.4306.

Lingga, P., and Marsono. (2008). Guidance of Fertilizer Utilizaton. Penebar Swadaya, Jakarta.

Lumbanraja, P. (2012). Pengaruh Pemberian Pupuk Kandang Sapi dan Jenis Mulsa Terhadap Kapasitas Pegang Air dan Pertumbuhan Tanaman Kedelai (Glycine max L.) var. Willis Pada Tanah Ultisol Simalingkar. J Ilmiah Pend Tinggi. 5 (2): 58-72. Retrieved from https://adoc.pub/dimuat-pada-jurnal-ilmiah-pendidikan-tinggi-juridikti-propsu.html

Marlina, N., Aminah, R.I.S., Rosmiah., Setel, L.R. (2015). Aplikasi Pupuk Kandang Kotoran Ayam pada Tanaman Kacang Tanah (Arachishypogeae L.). Biosaintifika, J Biol & Biol Edu 7(2):136-141. Retrieved from http://journal.unnes.ac.id/nju/index.php/biosaintifika.

Mattjik, A.A., dan Sumartejaya, I.M. (2011). Sidik Peubah Ganda dengan Menggunakan SAS. Bogor. Penerbit IPB Press. ISBN 978-602-96772-5-6

Mayadewi, N.N.A. (2007). Pengaruh Jenis Pupuk Kandang dan Jarak Tanam terhadap Pertumbuhan Gulma dan Hasil Jagung Manis. Fakultas Pertanian Udayana Denpasar Bali. J. Agritop, 26(4):153-159. https://ojs.unud.ac.id/index.php/agritrop/article/view/3069. In Indonesia.

O'Hare, T.J., Fanning, K.J., and Martin, I.F. (2015). Zeaxanthinbiofortification of sweet-corn and factors affecting zeaxanthin accumulation and colour change. Archives Biochem Biophysics, 572: 184–187. http://dx.doi.org/10.1016/j.abb.2015.01.015

Pangaribuan, D.H., Hendarto, Elzhivago, S.R., and Yulistiani, A. (2018). The effect of organic fertilizer and urea fertilizer on growth, yield and quality of sweet corn and soil health. Asian J Agri & Biol., 6(3): 335-344. https://www.asianjab.com/showissue/?vol=Volume%206,%20Issue%203&quarter=July%20-%20September,%202018.

Purba, J.H.N., Sasmita, L.L., Komara, dan Nesimnasi, N. (2019). Comparison of seed dormancy breaking of Eusideroxylonzwageri from Bali and Kalimantan soaked with sodium nitrophenolate growth regulator. Nusantara Bioscience, 11(2): 146-152. https://doi.org/10.13057/nusbiosci/n110206.

Riadi, M., Jaya, A.M., Makkulawu, A.T., Said, M.H. (2015). Pertumbuhan dan Produksi Jagung Hibrida Hasil Persilangan antara Jagung Manis Komersial dengan Jagung Pulut. J. Agrotan, 1(1): 88-99. Retrieved from https://ejournals.umma.ac.id/index.php/agrotan/issue/view/59.

Rocha, J.R.D.A.S.D.C., Machado, J.C., Carneiro, P.C.S. (2017). Multitrait index based on factor analysis and ideotype-design: proposal and application on elephant grass breeding for bioenergy. Bioenergy. 10: 52-60. https://doi.org/10.1111/gcbb.12443.

Simanungkalit, R.D.M., Suriadikarta, D.A., Saraswati, R., Setyorini, D., dan Hartatik, W. (2006). Organic Fertlzer and Bofertilizer, Agricultural Research and Development Council, Bogor.

Supriyanta, B., Padmini, O.S., Wicaksono, D., dan Kundarto. (2020). Pengaruh konsentrasi pupuk organik cair terhadap pertumbuhan dan hasil beberapa galur jagung manis di lahan marginal dengan system irigasitetes. Agrivet, 26 (1): 8-16. http://jurnal.upnyk.ac.id/index.php/agrivet/article/view/4305.

Syafruddin., Nurhayati., Wati, R. (2012). Effect of kinds of fertilizer on growth and yield of several sweet corn varieties. J Floratek, 7(1): 107-114. Retrieved from http://jurnal.unsyiah.ac.id/floratek/issue/view/140.

Tani, S.A.A., Elymaizar, Z., Musnandar, E. (2020). The modification of beef cattle's feces and urine as the source of organic fertilizer to increase sweet corn's productivity (*Zea mays saccharatasturt*). Adv. Eng. Res., 205: 66-70. Retrieved from http://creativecommons.org/licenses/by-nc/4.0/.

Tracy, W.F., Whitt, S.R., and E.S. Buckler. (2006). Recurrent mutation and genome evolution: example of Sugary1 and the origin of sweet maize. Crop Science, 46 (1):1-7. https://doi.org/10.2135/cropsci2006-03-0149tpg.

Yong, A.G., and Pearce, S. (2013). A Beginner's Guide to Factor Analysis: Focusing on Exploratory Factor Analysis. Tutorials in Quantitative Methods for Psychology, 9: 79-94. https://doi.org/10.20982/tqmp.09.2.p079

Zeavie, B., Napitupulu, M., dan Astuti, P. (2014). Respon Tanaman Kacang Panjuang (Vigna sintesis L.) Terhadap Pemberian Pupuk NPK Pelangi dan Pupuk Organik Cair Nasa. Agro Media Pustaka, Jakarta.

Zarei, T., Moradi, A., Kazemeini, S.A., Farajee, H., and Yadavi, A. (2019). Improving sweet corn (Zea mays L. varsaccharata) growth and yield using Pseudomonas fluorescens inoculation under varied watering regimes. Agric Water Manag, 226: 105757. https://doi.org/10.1016/j.agwat.2019.105757.

Zhai, Z., Ehret, D.L., Forge, T., Lin, W., Dorais, M., and Papadopoulos, P.A. (2009). Organic fertilizers for greenhouse tomatoes: productivity and substrate microbiology. Hort Science, 44 (3): 800–809.

Zhang, Q.L., Chen, Y.X., Jilani, G., Shamsi, I.H., and Yu, Q.G. (2010). Model AVSWAT apropos of simulating non-point source pollution in Taihu lake Basin. J Hazardous Materials, 174(1-3): 824–830. htpps://doi.org/10.1016/j.jhazmat.2009.09.127.