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Evaluation of nutrition contents of tomatoes (*Lycopersicum esculentum* Mill.) due to the treatment of plant growth regulators and fertilizers

Muhammad Adli*, Rita Hayati, Yuliani Aisyah

Department of Agroecotechnology, Faculty of Agriculture, Syiah Kuala University, Darussalam, Banda Aceh, 23111, Indonesia

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Abstract

Tomato is one of the agricultural commodities that have a high enough nutrient content that is beneficial to the human body. Nutritional content in tomatoes is strongly influenced by factors using plant growth regulators (PGR) and fertilization. This study aims to determine the nutrient content in tomatoes due to the treatment of growth regulators and fertilization. This research was carried out in the Village of Meunasah Intan, District of Krueng Barona Jaya, Aceh Besar Regency from July to December, 2018. Tests on the parameters of the study were carried out at the Soil Science Laboratory and Analysis of Food and Agricultural Products Laboratory, Faculty of Agriculture, Syiah Kuala University. The experimental design used was a randomize block design 8×3, 2 factorial. The result this study indicate that the use of PGR has a significant effect on some nutritional parameters of tomato including; pH of fruit juice, total soluble solids, crude fat content, levels of vitamin C, content of lycopene and caratenoid, while organoleptic quality significantly influence the sour taste, sweetness, and overall acceptance. The Fertilizers have not significant effect on all parameters except for the sour taste and sweetness, although the quality attributes were both in the rather weak category. There is an interaction between the use of *hantu multiguna exclusive* and organic fertilizers on the surface color of the fruit, the color of fruit flesh, and the shape of the fruit. Whereas the interaction between atonik with inorganic fertilizer has an effect on the organoleptic test of fruit flesh.

* **Corresponding Author:** Muhammad Adli ✉ aldi.banda01@gmail.com

Introduction

Tomato is one of the agricultural commodities that have a high enough nutrient content that is beneficial to the human body. One characteristic of tomatoes is that they have a distinctive taste (sweet acid) containing vitamins A and C, attractive colors, and can be consumed in the form of fresh and processed products.(Handrian *et al.*, 2013).The content in tomatoes includes alkaloid solanine (0.007%), saponin, folic acid, malic acid, citric acid, biflavonoid, protein, fat, sugar (fructose, glucose), adenine, trigonelin, choline, tomatin, minerals (Ca, Mg, P, K, Na, Fe, sulfur, chlorine), vitamins (B1, B2, B6, C, E, niacin), histamine, and lycopene (Dalimartha, 2007). According to the Directorate General of Horticulture (2015), tomato production in 2014 reached 915.987 tons with a harvest area of 59.008 ha and an average yield of 15,52 tons/ha, where statistical data also showed a fluctuating amount of tomato production since 2009. Tomato production in 2016 as a whole amounted to 883,234 tons with a harvest area of 57,688 ha and an average yield of 15.31 tons/ha (BPS-statistic indonesia, 2017). On the other hand, tomato consumption in Indonesia tends to grow by 28.13% since 2011 to 2015 with consumption of 4,171 kg/capita/year (Data Center and Agricultural Information System, 2015).

Efforts to improve the nutritional quality of tomatoes are the right cultivation techniques, one of which is fertilization. For good growth and yield, this plant requires complete nutrients, both macro and micro, with a balanced composition supplied from fertilizer. Giving N which is too high for example can cause dense leaf growth, but has the effect of reducing the number and size of fruit (Nonnecke, 1989). Purwanto (2005) in his research suggested that the soil-fixing material and the compound dose of NPK fertilizer had a very real effect on the yield and quality of tomatoes except in terms of sugar content only in real terms. Gunadi *et al.* (2009) added that the administration of NPK 15-15-15 compound fertilizer dose of 1,000kg/ha gave the best influence on plant height, N, P and K uptake, wet and dry weight of plants and tomato yield.Research by Di Candela and Silvestre (1994) showed that administration of Sulfur (S), Calcium (Ca) and Magnesium (Mg) in tomato plants actually increased yield, improved maturation and dissolved solids. Tomato plants are also plants that are very sensitive to micronutrient deficiencies, especially Fe which has an impact on Ca mobility to be slow and resulting in increased blossom-end rot. on tomatoes.
In addition to providing fertilizer, the influence of both endogenous and exogenous hormones through the use of synthetic growth regulators (PGR) also has a huge impact on fruit nutrition improvement. Tjitrosoepomo (1993) states that sprayingGA_3(the type of exogenous gibberelins hormone) before harvest can affect the rate of development, ripening, maturation, increase in skin thickness and increase in ascorbic acid (vitamin C).As is the case with Handrian *et al.*, (2013) however by increasing the concentration of GA_3it does not have a significant effect on plant height and tomato production.

Based on the theory described above, it can be concluded that with the increase in growth of stems, roots, and leaves and fruits due to the use of PGR, more nutrients must be absorbed by the plants. Considering the dangers of synthetic materials contained in artificial fertilizers will affect the nutrient content synthesized by these plants, the researchers want to examine further by evaluating the use of commercial synthetic PGR and the type of fertilizer used during the cultivation stage on the growth and nutrient content of the tomato own. The purpose of this research is that the data obtained can be used by farmers so that the tomatoes produced also pay attention to the value of the nutritional content.

Materials and methods

Time and Place of Research

This research was carried out in Village of Meunasah Intan, District of Krueng Barona Jaya, Aceh Besar Regency, from July to December 2018.Tests on the parameters of the study were carried out in the Soil Science Laboratory and the Laboratory of Analysis of Food and Agricultural Products, Faculty of Agriculture, Syiah Kuala University.

Research Instrument

The tools used to analyze the nutritional quality of tomatoes are filter paper, aluminum foil, oven equipped with blower, hot plate, baking sheet, grinder, thermometer, beaker glass, measuring cup, burette, erlenmeyer, analytical balance, drop pipette, desiccator, test tubes, Kjeldhal flasks, pH meters, stopwatches, Abbe refractometers, UVVis spectrophotometers and all other equipment used for research.

Research Materials

The tomato seeds used in this study were F1 Servo varieties. Organic fertilizers used are compost with trademark of the MINEYA Orfe and compound NPK inorganic fertilizer, NPK Phonska (15:15:15). While the PGR used include the *Hantu Multiguna Exclusive*, Atonik, and Hormonik.

The material for the analysis used is K_2SO_4, H_2SO_4, NaOH, $Na_2S_2O_3$, H_2BO_3, HgO, HCl 0,02 N, metilen blue, aquadest, CaCl, Na Oksalat, Buffer peptone water 0,1%, RV broth, indicators of methyl red and other chemicals obtained from the Food Analysis Laboratory of the Faculty of Agriculture.

Experimental Design

This study used a factorial randomized block design (RBD) with 8 combinations and 3 replications, so that there were 24 experimental units. The first factor studied was the type of fertilizer (P) consisting of 2 levels, namely organic fertilizer (P1) and inorganic fertilizer (P2). The second factor is PGR consisting of 4 types, including control (Z0), *Hantu Multiguna Exclusive* (Z1), Atonik (Z2) and Hormonik (Z3).

Research Preparation

Planting preparation includes seeding of seeds where the seeds are used have good physical character, clean of dirt, skin integrity and uniform size, nursery is carried out for 20 days.Soil that has been sifted is mixed with organic fertilizer and put into polybag size width x length x thickness (40/20 x 40 x 0.1 cm). The number of polybag according to the number of treatments was 8 and repeated 3 times so that there were 24 polybags, each plant was planted with 1 plant.

Conducting Research

Organic and inorganic fertilizers are given based on the treatment in which organic fertilizers are given before planting or when preparing planting media. Giving inorganic fertilizer was given 3 times, namely when planting and 15 days after planting (DAP) and 30 days after planting, while spraying PGR was first applied at the age of 6 DAP, then repeated 3 times at 10-day intervals, until the plant was 36 days after planting (4 times the application) dose of 2 ml liter-1 of water according to the recommendation on the packaging label.

Plant maintenance activities in this study include: watering every day 2 times in the morning and evening. Weed weeding is carried out manually without determining the age of the plant, but every day all types of weeds that are grown are removed from the polybag (without using herbicides).

Parameter of Observation

The observed parameters included analysis of moisture content, pH of tomato juice, total dissolved solids, protein content, glucose content, crude fat content, level of vitamin C (ascorbic acid), content of lycopene and caratenoid, and organoleptic tests. Data were analyzed by analysis of variance (ANOVA), if it had a significant effect on the treatment carried out further tests with 5% LSD.

Result and discussion

Analysis of Tomato Fruit Water Content

The results of the analysis on the parameters of tomato water content found an interaction between the use of PGR and Fertilizers. In Table 1, it can be seen that the tomato water content in the *hantu multiguna exclusive* is higher than that of hormonik, atonik, and control on the addition of organic fertilizer, whereas in the addition of inorganic fertilizers, atonik use higher tomato water content compared to hormonik, control, and*hantu multiguna exclusive*.

Table 1. The average water content of tomatoes due to the interaction between the use of PGR and Fertilizers.

Treatment	Water content (%)	
	Organic fertilizer	Inorganic Fertilizer
Control	93,37 a A	93,77 a A
Hantu Multiguna Exclusive	94,34 b A	93,63 a A
Atonik	93,74 a A	94,30 b A
Hormonik	93,93ab A	93,81 a A
$LSD_{0,05}$	0,56	

Information :Numbers followed by the same letters (Capital letters in the same row, lowercase letters in the same column) show no significant difference in the 5% chance level.

Table 2. The average pH of tomato juice due to the use of PGR and Fertilizers.

Treatment	pH of Tomato Juice
PGR	
Control	4,02 a
Hantu Multiguna Exclusive	4,18ab
Atonik	4,25 b
Hormonik	4,26 b
$LSD_{0,05}$	0,20
Fertilizers	
Organic	4,15
Inorganic	4,21
$LSD_{0,05}$	-

Information : The numbers followed by the same letters in the same column are not significantly different at the 5% chance level.

The highest water content of tomatoes is found in the *hantu multiguna exclusive* with the addition of organic fertilizer which is 94.34% and the lowest is found in the control with the addition of organic fertilizer which is 93.37%. Although statistically there is an interaction effect on the water content of tomatoes, the average value of the percentage of tomato water content shown in Table 1 generally does not show a significant difference, where the average water content of tomatoes is above 93% and below 95%. The level of water content in tomatoes is probably not influenced by the presence of PGR and Fertilizers, but because water is one of the highest components of tomato constituents which can be more than 93%. Ho *et al.* (1987) states that more than 90% of the water taken by tomatoes enters through phloem tissue and furthermore, phloem water contributes to increase when the water taken is reduced by the salinity of nutrient solutions.

pH of Tomato Juice

The results of the analysis showed that Fertilizers had no effect on the pH of tomato juice, while PGR had an effect on the pH of tomato juice. The average pH of tomato juice presented in Table 2 shows that hormonik has a higher average pH value of 4.26 even

though it is not statistically different from atonik and *hantu multiguna exclusive* and different from the control. However, the average pH of tomato juice from the whole treatment is still classified as acid, which is in the range of values of 4.02-4.26. The same results were also obtained by Joshi and Vig (2010) who found that the addition of vermicompost fertilizer showed the pH value of tomatoes which was relatively the same as without giving vermicompost fertilizer.

Table 3. The average total soluble solids of tomatoes due to the use of PGR and fertilizers.

Treatment	Total Soluble Solids
PGR	.....%Brix.....
Control	3,97 b
Hantu Multiguna Exclusive	3,93 b
Atonik	3,60 a
Hormonik	3,70 ab
$LSD_{0,05}$	0,30
Fertilizers	.....%Brix.....
Organic	3,85
Inorganic	3,75
$LSD_{0,05}$	-

Information : The numbers received by the same letter in the same column are not significant at the 5% chance level.

Total Soluble Solids

Total soluble solids of tomatoes were not affected by fertilizers treatment based on the results of the analysis.On the other hand, the treatment of PGR significantly affected the total dissolved solids of tomatoes. The highest average total soluble solids were obtained in the control i.e. 3.97 %Brix even though it was not statistically different from the *hantu multiguna exclusive* and hormonik, and was different from the atonik with the total soluble solids values 3.93, 3.70 and 3.60%Brix, respectively (Table 3) .Based on the results of the observations in Table 3, the total soluble solids with tomatoes have relatively the same value between one treatment and the other treatments. This is different from Joshi and Vig (2010) study which stated that giving vermicompost influences the increase in total dissolved solids of tomatoes.

Table 4. Average protein content of tomato due to the use of PGR and Fertilizers.

Treatment	Protein Content (%)
PGR	
Control	3,00
Hantu Multiguna Exclusive	4,32
Atonik	3,74
Hormonik	4,02
$LSD_{0,05}$	-
Fertilizers	
Organic	3,73
Inorganic	3,82
$LSD_{0,05}$	-

Information : The numbers followed by the same letters in the same column are not significantly different at the 5% chance level.

ProteinContent

Analysis of variance showed that the treatment of PGR and fertilizers did not significantly affect the protein content of tomato. The average protein content of tomato for the highest treatment of PGR were obtained by *hantu multiguna exclusive* and the lowest on control. While the average protein content of tomato for the highest treatment of fertilizers was obtained from inorganic fertilizer. Based on the data presented in Table 4, the average protein content due to the treatment of PGR from the highest to the lowest starts from *hantu multiguna exclusive*, hormonik, atonik, and control protein content of 4.32%, 4.02%, 3.74% and 3.00 %, respectively. Whereas in the fertilizers, the average protein content of tomatoes organic and inorganic fertilizer were 3.82% and 3.73 %, respectively.

Table 5. The average glucose content of tomatoes due to the use of PGR and Fertilizers.

Treatment	Glucose Content
PGR	.....ppm.....
Control	58.33
Hantu Multiguna Exclusive	57.13
Atonik	54.43
Hormonik	58.82
$LSD_{0,05}$	-
Fertilizers	.....ppm.....
Organic	58.80
Inorganic	55.55
$LSD_{0,05}$	-

Information: The numbers followed by the same letters in the same column are not significantly different at the 5% chance level

Table 6. Average crude fat content of tomatoes due to the use of PGR and Fertilizers.

Treatment	Crude Fat Content (%)
PGR	
Control	1,48 a
Hantu Multiguna Exclusive	2,14 b
Atonik	1,73ab
Hormonik	2,16 b
$LSD_{0,05}$	0,50
Fertilizers	
Organic	1,84
Inorganic	1,92
$LSD_{0,05}$	-

Information: The numbers followed by the same letters in the same column are not significantly different at the 5% chance level.

Glucose Level

The results of the variance analysis showed that the use of PGR and fertilizers did not significantly affect the glucose level of tomatoes. The highest glucose content of tomatoes in PGR was obtained in hormonik, which was 58.82 ppm whereas in the treatment of the highest fertilizers it was obtained by giving organic fertilizer, 58.80 ppm (Table 5). The average glucose content of tomatoes due to control, hormonik, *hantu multiguna exclusive*, and atonik were 58.33, 58.82, 57.13 and 54.43 ppm respectively. While the average glucose content in the need for

organic and inorganic fertilizers are 58.80 and 55.55 ppm, respectively.

Crude Fat Content

The results of the analysis showed that the fertilizers had no effect on the average crude fat content of tomatoes. Conversely, the treatment of PGR affects the crude fat content of tomatoes. The results of further tests in Table 6 show that the highest average crude fat content was obtained by hormonik even though it was not different from the *hantu multiguna exclusive* and atonik, but was statistically different from the control.

Table 7. Average level of vitamin Ctomatoes due to the use of PGR and Fertilizers.

Treatment	Level of Vitamin C
PGR	.....mg/100 gram.....
Control	42,89 a
Hantu Multiguna Exclusive	64,01 b
Atonik	41,55 a
Hormonik	59,87 b
$LSD_{0,05}$	16,80
Fertilizers	.....mg/100 gram.....
Organic	51,02
Inorganic	53,14
$LSD_{0,05}$	-

Information : The numbers followed by the same letters in the same column are not significantly different at the 5% chance level.

The average crude fat content of tomatoes is hormonik, *hantumultiguna exclusive*, atonik, and control are 2.16%, 2.14%, 1.73%, and 1.48%, respectively. While the crude fat content treatment inorganic and organic fertilizer was 1.92% and 1.84%, respectively. Based on the results of observations in table 6 it can be seen that the use of PGR generally affects the levels of crude fat content of tomatoes. This is thought to be caused by the content of growth regulators given to tomato plants which can increase the crude fat content in tomatoes.

Table 8. The average content of lycopene and caratenoid tomatoes due to the use of PGR and Fertilizers.

Treatment	Lycopene	Caratenoid
PGR	.....mg/100 gram.....	
Control	7,79ab	30,57ab
Hantu Multiguna Exclusive	9,88 bc	36,84bc
Atonik	6,99 a	27,14 a
Hormonik	10,23c	37,94 c
$LSD_{0,05}$	2,20	7,20
Fertilizers	.....mg/100 gram.....	
Organic	8,65	33,14
Inorganic	8,80	33,11
$LSD_{0,05}$	-	-

Information : The numbers followed by the same letters in the same column are not significantly different at the 5% chance level.

Level of vitamin C

The results analysis of variance showed that PGRhave a role on the level of vitamin C of tomatoes, while the type of fertilizer does not affect the level of vitamin C of tomatoes. Table 7 shows the average the highest level of vitamin C of tomato vitamin C obtained in an *hantumultiguna exclusive* that is 64.01mg/100 gram and is no different from atonik, but is different from hormonik and control. Based on the results of the observation it was found that the average level of vitamin C of tomatoes can be influenced by the growth regulators. According to Handrian *et al.* (2013) administration of GA_3 growth hormone with a certain dose can increase level of vitamin C of lowland tomatoes. On the other hand, Worthington (2001) states that organic plant products have a higher amount of vitamin C than conventional plant products. In addition to the content of vitamin C, organic plant products also contain more iron, magnesium and phosphorus, and less nitrate content compared to conventional plant products.

Table 9. The average Color of Fruit Surface due to the interaction between the use of PGR and Fertilizers.

Treatment	Color of fruit surface	
	Organicfertilizer	Inorganicfertilizer
Control	7,31a A	7,64a A
Hantu Multiguna Exclusive	12,14c B	6,99a A
Atonik	9,43b A	10,58b A
Hormonik	9,95b A	9,76b A
$LSD_{0,05}$	1,01	

Information : Numbers followed by the same letters (Capital letters in the same row, lowercase letters in the same column) show no significant difference in the 5% chance level.

Content of Lycopeneand Caratenoid

The results analysis of variance showing the fertilizers did not contribute to the content of lycopene and caratenoid tomatoes, while the PGR regulated the composition of the content of lycopene and caratenoid tomatoes. The preferred content for hormonik, which is 10.23 mg/100 gram, is no different from the handling of *hantu* multiguna exclusive and controls, but it is different from atonik. For the highest caratenoid content obtained in hormonik, 37.94 mg/100 gram is not different from *hantu multiguna exclusive* but is different from control and atonik (Table 8).

The average lycopene content in hormonik, *hantamultiguna exclusive*, control, and atonik are 10.23, 9.88, 7.79, and 6.99 mg/100 gram, respectively. While the average caratenoid content of tomatoes on hormonik, *hantu multiguna exclusive*, control, and atonik were 37.94, 36.84, 30.57, and 27.14 mg/100 gram, respectively. Based on these results it can be seen that the use of PGR which contains a relatively complete growth hormone composition generally results in higher lycopene and caratenoid content compared to the control and use of PGR which contains only one type of growth hormone which produces better lycopene and caratenoid content than controls.

Product of hantu multiguna Exclusive are known to contain elements: organic growth regulators especially: Auxin, Giberellin, Cytokinin Kinetin, Zeatin Cytokinin and formulated from natural ingredients. On the other hand, product of hormonik contain organic growth regulators (PGR) which consist of auxin (IAA 46 ppm), gibberellins (GA3 78

ppm), and cytokines (85 ppm). While atonik products contain elements of the formation of Na + and phenol groups, although sodium is not a very essential element, it is known that sodium can reduce cell turgor and plant metabolism. Whereas phenol can activate various metabolic reactions in plants so that it stimulates growth because it implies natural IAA content in plants (Maharani, 2004).

Table 10. The average color of fruit flesh due to the interaction between the use of PGRand Fertilizers.

Treatment	Color of fruit flesh	
	Organicfertilizer	Inorganicfertilizer
Control	5,18a A	5,35a A
Hantu Multiguna Exclusive	11,47b B	6,66ab A
Atonik	9,15b A	11,47c A
Hormonik	9,58b A	8,28b A
$LSD_{0,05}$	1,28	

Information : Numbers followed by the same letters (Capital letters in the same row, lowercase letters in the same column) show no significant difference in the 5% chance level.

Organoleptic Test of Tomato

The results of analysis of variance showed that the use of PGR had a very significant effect on the average value of surface color, flesh color, sour taste, sweetness, shape of the fruit and significantly affected the overall acceptance test and did not significantly affect the tomato texture test. While the use of Fertilizers significantly affected the average value of sour taste, sweetness and overall acceptance of tomatoes, and did not significantly affect the average value of surface color, flesh color, texture and shape of tomatoes. There is an interaction between the use of PGR and Fertilizer Types on surface color, flesh color, and shape of the fruit.

Based on the data presented in Table 9, it was found that the treatment of organic fertilizers with the addition of *hantu multiguna exclusive* gave the average surface color of tomatoes higher and controls had lower values compared to other treatments, with an average value of the color surface of tomatoes. in a row from the treatment of *hantu multiguna exclusive*, hormonik, atonik, and controls (12.14, 9.95, 9.43, and 7.31), respectively. Whereas in the inorganic fertilizer treatment the highest average surface color of tomatoes was found in the atonik and the lowest was for the *hantu multiguna exclusive*, with an average value of the color surface of the tomatoes including atonik, hormonik, *hantu multiguna exclusive*and control (10.58, 9.76, 7.64 and 6.99), respectively.

The average value of the surface color of tomatoes in the treatment of organic fertilizer with atonik and control is in the range of values 5.9-9.5 meaning "medium red color", while with hormonik and *hantu multiguna exclusive* in the 9.5-13.5 value range meaning "red color rather strong". The average surface color of tomatoes in the treatment of organic fertilizers with the addition of *hantu multiguna exclusive* and controls including "medium red color", hormonik and atonik including "red color is rather strong".

The average color of fruit flesh due to the interaction between the use of PGR and Fertilizers is presented in Table 10. From the observations it was found that the treatment of organic fertilizers with the addition of *hantu multiguna exclusive*gave higher color of fruit flesh and controls had more value low compared to other treatments, with an average color of fruit flesh

in a row from the *hantu multiguna exclusive*, hormonik, atonik and control (11.47, 9.58, 9.15, and 5.18), respectively. Whereas in the inorganic fertilizer treatment the highest average color of fruit flesh was found in the atonik treatment and the lowest was in the control treatment, with the average color values of tomato meat in a row including atonik, hormonik, *hantu multiguna exclusive*, and controls (11.47 8.28, 6.66, and 5.35), respectively.

Table 11. The average tomato shape due to the interaction between the use of PGRand Fertilizers.

Treatment	Tomato shape	
	Organicfertilizer	Inorganicfertilizer
Control	10,33bc A	10,28a A
Hantu Multiguna Exclusive	12,38c A	10,52a A
Atonik	9,03b A	9,05a A
Hormonik	6,22a A	10,88a B
$LSD_{0,05}$	1,09	

Information : Numbers followed by the same letters (Capital letters in the same row, lowercase letters in the same column) show no significant difference in the 5% chance level.

The average Color of fruit flesh the treatment of organic fertilizer with the control treatment entered in the range of values 1.6-5.5 meaning "the red color is rather weak", and in the treatment of organic fertilizer with atonik included in the meaning range 5.5-9.5 "medium red color ", Whereas with hormonik and *hantu multiguna exclusive*, the range of values is 9.5-13.5 meaning" the red fruit is rather strong ". Next, the average color of fruit flesh in the treatment of organic fertilizers with the addition of the control is in the range of 1.6-5.5 meaning "the red color is rather weak", and the *hantu multiguna exclusive* and hormonik including "medium red color", while atonik includes "The red color is rather strong". The classification of the colors above generally shows that there is a match between the surface color of tomatoes and the color of tomato flesh.

The results of the observation showed that the treatment of organic fertilizers with the addition of *hantu multiguna exclusive* gave an average value of shape of the fruit higher and hormonik had a lower value compared to other treatments, with the average value of shape of the fruit successively from *hantu multiguna exclusive*, control, atonik, and hormonik (12.38, 10.33, 9.03, and 6.22), respectively. Whereas in the inorganic fertilizer treatment, the highest value of shape of the fruit was found in the hormonik and the lowest in the atonik, with the average values of shape of the fruit in a row including hormonik, *hantu multiguna ecxlusive*, control, and atonik (10.88, 10.52, 10.28 and 9.05), respectively (Table 11).

Based on organoleptic classification, the average value of shape of the fruit in the treatment of organic fertilizers with hormonik and atonik is in the range of 5.5-9.5 meaning "medium shape", while the control and *hantu multiguna exclusive* in the range of values 9.5-13.5 meaningful "shape somewhat oval ". The average value of shape of the fruit in the treatment of organic fertilizers with the addition of atonik including "medium form", while the control, hormonik and *hantu multiguna exclusive* included "somewhat oval".

In Table 12, the average value of sour taste, sweetness, texture and overall acceptance of tomatoes are used using PGR and Fertilizers. The results of the

examination on the average value of tomato texture obtained from the overall texture of tomatoes included in the category 9.6-13.5, namely "the texture is rather smooth".

Based on the table, the average value of sour taste in the highest PGR treatment was obtained in hormonik and the lowest was in atonik. In the treatment of Fertilizers, the highest average value of sour taste was obtained from inorganic fertilizer treatment. The average sour taste value from the observations can be classified into several categories, namely 1.6-5.5 "sour taste is rather weak" (atonik), 5.6-9.5 "medium sour taste" (control, hormonik and *hantu multiguna exclusive*, and organic fertilizer and inorganic fertilizer).

Table 12. Average value of sour taste, sweetness, texture, and overall acceptance of tomatoes due to the use of PGR and Fertilizers.

Treatment	Sour taste	Sweetness	Texture	Overall acceptance
PGR				
Control	8,27 bc	5,46 a	12,42	12,03 ab
Hantu Multiguna Exclusive	6,53 ab	8,48 bc	12,64	12,33 b
Atonik	4,94 a	10,00 c	12,36	12,32 b
Hormonik	8,48 bc	7,04 ab	12,48	11,31 a
$LSD_{0,05}$	0,94	0,92	-	0,38
Fertilizers				
Organic	6,24 a	8,54 b	12,44	12,31 b
Inorganic	7,87 b	6,95 a	12,51	11,69 a
$LSD_{0,05}$	0,66	0.65	-	0,28

Information : The numbers followed by the same letters in the same column are not significantly different at the 5% chance level.

The average sweetness value in the use of the highest PGR was found in the atonik and the lowest was the control. In the fertilizers treatment, the highest average sweetness value was obtained from organic fertilizer treatment. Classification of the average value of sweetness can be included in several categories, namely 1.6-5.5 "slightly sweetness" (control), 5.6-9.5 "moderate sweetness" (hormonik, *hantu multiguna exclusive*, and atonik, and organic fertilizer and inorganic fertilizer).

The observations on the average value of overall acceptance of the highest use of PGR were found in the *hantu multiguna exclusive* even though it was not statistically different from the control and atonik, and the lowest value was obtained in hormonik. Whereas for the treatment of Fertilizers, the highest overall value of overall revenue is in the treatment of organic fertilizer. The average value of the overall acceptance of tomatoes based on the panelist test as a whole treatment can be classified in the category of "panelists rather accept the results of the assessment of quality attributes" with a range of values 9.6-13.5.

Conclusion

The result this study indicate that the use of PGR has a significant effect on some nutritional parameters of tomatoes including; pH of fruit juice, total soluble solids, crude fat content, levels of vitamin C, content of lycopene and caratenoid, while organoleptic quality attributes significantly influence the attributes of sour taste, sweetness, and overall acceptance.The fertilizers have not significant effect on all parameters except for the attributes of the sour taste and sweetness of the organoleptic test, although the quality attributes were both in the rather weak category. There is an interaction between the use of *hantu multiguna exclusive* and organic fertilizers on

the surface color of the fruit, the color of fruit flesh, and the shape of the fruit. Whereas the interaction between atonik with inorganic fertilizer has an effect on the organoleptic test of fruit flesh.

References

BPS-Statistic Indonesia. 2017. Statistics of Indonesian Seasonal Vegetable and Fruit Plants, p 101.

Dalimartha, Setiawan. 2007. Atlas of Plants Indonesian Medicine 4. Depok: Puspa Swara.

Di Candilo M, Silvestri GP. 1994. Sulfur Calcium and Magnesium in Processing Tomatoes Grown in Sub-Alkaline or Sub-Acid Soils. Acta Horticulture **376,** 207-214.

Direktorat Jenderal Hortikultura. 2015. Horticultural Production Statistics 2014. Indonesian Ministry of Agriculture, p 285.

Gunadi N, Nurtika N, Subhan. 2009. Tomato Plant Response to the Use of Compound NPK 15-15-15 in Latosol Soil in the Dry Season. Jurnal Hortikultura **19(1),** 40-48.

Handrian RG, Meiriani M, Haryati H. 2013. Increased Level of Vitamin C Tomato Fruit (Lycopersicum esculentum MILL.) Lowland with Hormone Giving GA3. Jurnal Agroekoteknologi Universitas Sumatera Utara **2(1),** 333-339.

Ho LC, Grange RI, Picken AJ. 1987. An analysis of the accumulation of water and dry matter in tomato fruit. Plant Cell & Environment **10(2),** 157-162.

Joshi R, Vig AP. 2010. Effect of vermicompost on growth, yield and quality of tomato (Lycopersicum esculentum L). African Journal of Basic & Applied Sciences **2(3-4),** 117-123.

Kartika E, Gani Z, Kurniawan D. 2013. Response of Tomato Plants (Lycopersicum esculentum. Mill) to the Combination of Organic Fertilizers and Inorganic Fertilizers Jurnal Bioplantae **2(3),** 122-131.

Maharani A. 2004. Effect of Growth Regulatory Substance Concentration and Urea Fertilizer Dosage on Growth and Production of Young Ginger Plants (Zingiber officinale Rosc.). Essay. Faculty of Agriculture. University of North Sumatra, Medan.

Nonnecke IBL. 1989. Vegetable Production. An AVI Book Van Nostrand Reinhold. USA.

Purwanto. 2005. The Influence of NPK Compound Fertilizers and Soil Composite Materials on the Results and Quality of Diamonds Tomatoes. Research journal UNIB **XI(1),** 54-60.

Center for Agricultural Data and Information. 2015. Food Consumption Statistics 2015. Secretariat General, Ministry of Agriculture of the Republic of Indonesia, p 107.

Sundahri, Tyas HN, Setiyono. 2016. Effectiveness of Gibberellins on Tomato Growth and Production. Jurnal Ilmu-Ilmu Pertanian **14(1),** 42-47.

Tjitrosoepomo G. 1993. Plant Taxonomy (Spermatophyta). Gajah Mada University Press, Yogyakarta.

Worthington V. 2001. Nutritional Quality of Organic Versus Conventional Fruits, Vegetables, and Grains. The Journal of Alternative and Complementary Medicine **7(2),** 161-173.