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The Effect of Watering on Rice Washing Water,MSG Water, and AC (Air Conditioner) Wastewater on Yields Components and Tomato Yields (*Lycopersicon esculentum* L.) in the Deep Peatland

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Abstract

The purpose of this study is to determine the effect of rice washing water, MSG water, and AC waste water (air conditioner) on yield components and yields of Tomato (Lycopersicon esculentum L.) plants planted in the Deep Peat Soil. This study used a randomized block design (RBD) with 3 factors: rice washing water of 3 levels (0 ml.liter-1; 500 ml.liter-1; 1000 ml.liter-1); MSG water in 3 levels (0 g.liter-1; 3 g.liter-1; 6 g.liter-1); and AC wastewater as much as 2 levels (0 ml.liter-1; 200 ml.liter-1). The parameters observed were the first flowering, fruit diameter, number of fruit plants, fruit weight per plant, average fresh fruit weight, and fruit weight per hectare of tomato plants. The results showed that the interaction of rice washing water and MSG water significantly affected the parameters at first flowering and fruit weight per tomato plant.

The single factor of rice washing water and MSG water each had a significant effect on all yield component parameters and yield of tomato plants. The single factor of AC wastewater has a significant effect on all parameters of yield and yield components of tomato plants except on the number of fruits and fruit weight per hectare of tomato plants. Provision of the best rice washing water with a dose of 1000 ml.liter-1; MSG water at a dose of 6 g.liter-1; and AC wastewater at a dose of 200 ml. liters-1.

Keywords: air conditioner, MSG, peat, rice washing water

Introduction

Tomato (Lycopersicon esculentum L) is a fruit vegetable which is a source of vitamins and minerals that can be consumed as fresh tomatoes, cooking spices, even in the form of processed food industry. The Association for Cancer Research found that consuming ripe tomatoes every day can prevent prostate cancer, shrink tumors and slow their spread, and can reduce the risk of breast cancer and uterine cancer because tomatoes contain lycopene (Nazari, 2012).

The use of organic fertilizer is currently being developed in the cultivation of agricultural crops. However, the lack of organic fertilizer is the slower response of plants compared to inorganic fertilizers. Duaja, et al (2012) state that the provision of organic fertilizer in the form of liquid is more easily absorbed by plants. Organic liquid fertilizer can come from household waste including rice washing water, Monosodium Glutamate (MSG) water, also known as vetsin, and AC waste water.

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Rice washing water is used water from washing milk white rice, which contains carbohydrates as well as protein and vitamin B which are abundant in pericapus and aleurons which are eroded (Rachmat and Agustin, 2010). According to Wulandari, et al. (2011) rice washing water contains macro and micro nutrients which can support plant growth and production. Istiqomah (2012) shows that the concentration of brown rice washing water affects the number of branches, pod length, number of pods and dry weight of seeds in green bean plants.

MSG (Monosodium Glutamate) is known as an additive for flavor generation. The term flavor generator is used for ingredients that can increase the pleasant taste of a food (Eka, 2004). MSG is known to the public as a seasoning that causes a savory taste. Chemically, MSG is the sodium acid of glutamate acid, a hydrogen ion (from the -OH group associated with the C-alpha atom) is replaced by sodium ions, it tastes amazingly delicious so many people are always addicted to it. MSG is a sodium salt (Na) that binds with amino acids in the form of glutamate acid (Nuryani and Jinap, 2010). Sodium (Na) can improve plant growth due to deficiency of the element Potassium (K). Besides containing Na, according to Pearson (2007) MSG also contains N elements. The N element is useful for stimulating plant growth especially stems, branches, and leaves. Microscopically the element N is needed for the formation of proteins, fats, and various organic compounds.

Air conditioners that are often used in homes or offices have waste water left-over from AC condensation. In general, the wastewater is only waste that will be discharged into waterways or special pipes and has no other uses. However, the wastewater turned out to have several benefits that are not yet widely known, one of which is to water the plants. Sutiyono (2008) uses AC waste water in aglonema and anthurium plants. The same thing was done by Ogansyah (2015) utilizing AC waste water to water ornamental plants in the yard of the house.

Based on the description above the effect of watering rice washing water, MSG water, and ac waste water (air conditioner) to increase tomato productivity needs to be further known, so it is necessary to do a study with the title " Effects of Watering from Rice Washing Water, MSG Water, and AC Wastewater on Component Results and Tomato Plant Products (*Lycopersicon esculentum* L.) in the Deep Peatland.

The purpose of this study was to determine Effects of Watering from Rice Washing Water, MSG Water, and AC Wastewater on Component Results and Tomato Plant Products (*Lycopersicon esculentum* L.) in the Deep Peatland.

Methods

The study was carried out on peatlands on Jalan Parawei, Menteng, Jekan Raya District, Palangka Raya City, Central Kalimantan Province. The study began in March - September 2019. The treatment design used in this study was a randomized block design (RBD) with 3 factors, namely rice washing water of 3 levels (0 ml.liter-1; 500 ml.liter-1; 1000 ml .liter-1); MSG water in 3 levels (0 g.liter-1; 3 g.liter-1; 6 g.liter-1); and AC wastewater as much as 2 levels (0 ml.liter-1; 200 ml.liter-1). The parameters observed were plant height, number of leaves, stem diameter of tomato plants. There were 18 treatment combinations with each treatment consisting of 2 replications so that there were 36 experimental units. Each unit of experiment there are 20 plants with 6 plant samples. The analysis uses the F test, if it has a

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real or very significant effect then it is continued with a comparison test of the mean value of the treatment using the Duncan Multiple Range Test / duncan multiple range test (DMRT) at a significant level of 0.05.

Results

At first flowering

Observation of the first flowering is done when the sample plant is flowering for the first time, so that only one observation is made. The results of the analysis of variance showed that single factors such as rice washing water, MSG water, and AC waste water each had a significant effect on the first flowering time of tomato plants. The interaction of rice washing water and MSG water significantly affected the first flowering time of tomato plants.

The mean influence of single factors of rice washing water, MSG water, and AC waste water on the first flowering time of tomato plants are presented in Table 1 to Table 3. The average effect of the interaction of rice washing water and MSG water is presented in Table 4.

Table 1. Average effects of rice washing water on the first flowering of tomato plants

Rice Washing Water (ml.liter-1)	At First Flowering (hst)
b_1 (0)	52,33 c
b_2 (500)	49,08 b
b_3 (1000)	45,33 a

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 1, it is known that the first flowering time of tomato plants is found in the administration of 1000 ml rice washing water. Liter-1 which is significantly different from other treatments.

Table 2. Average effects of MSG water on first flowering of tomato plants

MSG Water ($g.liter^{-1}$)	At First Flowering (hst)
m_1 (0)	50,25 c
m_2 (3)	48,92 b
m_3 (6)	47,58 a

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 2, it is known that at the first flowering the tomato plants were found to be the fastest in giving water MSG 6 g.liter-1 which was significantly different from the other treatments.

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Table 3. Average effects of AC waste water on the first flowering of tomato plants

Waste water AC (ml.liter^{-1})	At First Flowering (hst)
c_1 (0)	49,33 b
c_2 (200)	48,50 a

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 3, it is known that the first flowering time of tomato plants is found in the provision of 200 ml AC waste water. Liter-1 which is very significantly different from other treatments.

Table 4. Mean influence of interaction of rice washing water and MSG water on the first flowering of tomato plants

Rice Washing Water X Air MSG	At First Flowering (hst)
b_1 m_1	53,50 I
b_1 m_2	52,25 H
b_1 m_3	51,25 G
b_2 m_1	50,25 F
b_2 m_2	49,00 E
b_2 m_3	48,00 D
b_3 m_1	47,00 C
b_3 m_2	45,50 B
b_3 m_3	43,50 A

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 4 it is known that the first flowering of tomato plants is most quickly found in the interaction of 1000 ml.liter-1 rice washing water with MSG water 6 g.liter-1 (b3 m3) which is very significantly different from other treatments.

Fruit Diameter

Observation of the diameter of the fruit made at the time of harvest of tomato plants. The results of the analysis of variance showed that the single factors such as rice washing water, MSG water, and AC waste water each had a significant effect on the diameter of tomato fruit. The mean influence of single factor rice washing water, MSG water, and AC waste water on the diameter of the tomato fruit are each presented in Table 5 to Table 7.

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Table 5. Average effects of rice washing water on the fruit diameter of tomato plants

Rice Washing Water (ml.liter^{-1})	Fruit Diameter (cm)
b_1 (0)	4,15 A
b_2 (500)	4,78 B
b_3 (1000)	5,38 C

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 5 it is known that the diameter of the tomato plants is the widest in the administration of 1000 ml rice washing water. Liter-1 which is very significantly different from other treatments.

Table 6. Average effects of MSG water on the fruit diameter of tomato plants

MSG Water (g.liter^{-1})	Fruit Diameter (cm)
m_1 (0)	4,56 A
m_2 (3)	4,81 B
m_3 (6)	4,94 B

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 6, it is known that the diameter of the tomato plants is the widest in the provision of water MSG 6 g.liter-1 which is significantly different from other treatments.

Table 7. Average effects of AC wastewater on the diameter of tomato fruit

Wastewater AC (ml.liter^{-1})	Fruit Diameter (cm)
c_1 (0)	4,71 a
c_2 (200)	4,83 b

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 7 it is known that the diameter of the tomato plants is the widest in the provision of 200 ml AC wastewater. Liter-1 which is very significantly different from other treatments.

Number of Fruits Per Plant

Observation of the number of fruits per plant is done at the time of harvest of tomato plants. The results of the analysis of variance showed that the single factor in the form of rice

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washing water and MSG water each significantly affected the number of fruits per tomato plant. The mean influence of single factors of rice washing water and MSG water on the number of fruits per tomato plant each presented
in Table 8 and Table 9.

Table 8. Average effects of rice washing water on the number of fruits per tomato plants

Rice Washing Water ($ml.liter^{-1}$)	Number of Fruits per Plant (Fruits)
b_1 (0)	20,84 a
b_2 (500)	31,92 b
b_3 (1000)	40,60 c

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 8, it is known that the number of fruit per tomato plant is most abundant in the administration of 1000 ml rice washing water. Liter-1 which is very significantly different from other treatments.

Table 9. Average effects of MSG water administration on the number of fruits per tomato plants

MSG Water ($g.liter^{-1}$)	Number of Fruits per Plant (Fruits)
m_1 (0)	27,07 a
m_2 (3)	30,00 a
m_3 (6)	36,29 b

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 9, it is known that the number of fruit per tomato plant is highest in the administration of MSG 6 g.liter-1 water which is significantly different from other treatments.

Fruit Weight Per Plant

Observation of fruit weight per plant is done at the time of harvest of tomato plants. The results of the analysis of variance showed that the single factors such as rice washing water, MSG water, and AC waste water each had a significant effect on fruit weight per tomato plant. The interaction of rice washing water and MSG water has a significant effect on fruit weight per tomato plant.

The mean influence of single factors of rice washing water, MSG water, and AC waste water on fruit weights per tomato plant are presented in Tables 10 through Table 12.

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The mean effects of interaction between rice washing water and MSG water are presented in Table 13.

Table 10. Average effects of rice washing water on fruit weight per tomato plants

Rice Washing Water (ml.liter^{-1})	Fruit Weight per Plant (gram)
b_1 (0)	1.086,28 a
b_2 (500)	1.346,22 b
b_3 (1000)	1.640,72 c

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 28 it is known that the weight of fruit per tomato plant is the heaviest in the administration of 1000 ml rice washing water. Liter-1 which is significantly different from other treatments.

Table 11. Average effects of MSG water administration on fruit weights per tomato plants

MSG Water (g.liter^{-1})	Fruit Weight per Plant (gram)
m_1 (0)	1.249,54 a
m_2 (3)	1.355,00 b
m_3 (6)	1.468,69 c

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 11, it is known that the highest fruit weight per tomato plant is found in the administration of MSG 6 g.liter-1 water which is significantly different from other treatments.

Table 12. Average influence of AC waste water supply on fruit diameter of tomato plants

Wastewater AC (ml.liter^{-1})	Fruit Weight Per Tomato Plant (gram)
c_1 (0)	1.327,49 a
c_2 (200)	1.387,99 b

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

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Based on Table 12, it is known that the weight of fruit per tomato plant is the heaviest in the provision of 200 ml AC wastewater. Liter-1 which is significantly different from other treatments.

Table 13. Average influence of interaction of rice washing water and MSG water on fruit weight per tomato plants

Rice Washing Water X MSG Water	Fruit Weight Per Tomato Plant (gram)
b_1 m_1	935,13 a
b_1 m_2	1.133,49 b
b_1 m_3	1.190,23 bc
b_2 m_1	1.271,38 c
b_2 m_2	1.356,40 cd
b_2 m_3	1.410,89 d
b_3 m_1	1.542,11 e
b_3 m_2	1.575,11 e
b_3 m_3	1.804,95 f

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 13 it is known that the weight of fruit per tomato plant is the heaviest in the interaction of 1000 ml.liter-1 rice washing water with MSG water 6 g.liter-1 (b3 m3) which is very significantly different from other treatments.

Average Weight of Fresh Fruits and Weight of Fruits per Hectare

Observations on the average weight of fresh fruit and weight of fruit per hectare were made at the time of harvest of tomato plants. The results of the analysis of variance showed that the single factors such as rice washing water, MSG water, and AC waste water each had a significant effect on the average weight of fresh fruit of tomato plants. The single factor in the form of rice washing water and MSG water each had a significant effect on fruit weight per hectare of tomato plants.

The mean influence of single factors of rice washing water, MSG water, and AC waste water on the average weight of fresh fruit and weight of fruit per hectare of tomato plants are respectively presented in Table 14 to Table 16.

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Table 14. Average effects of rice washing water on average fresh fruit weights and fruit weights per hectare of tomato plants

Rice Washing Water (ml.liter^{-1})	Average Weight of Fresh Fruits (gram)	Fruit Weight per Hectare (ton)
b_1 (0)	34,74 a	36,02 a
b_2 (500)	45,55 b	45,11 b
b_3 (1000)	59,25 c	54,64 c

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 14 it is known that the average fresh fruit weight and fruit weight per hectare of tomato plants are the heaviest in the provision of 1000 ml rice washing water. Liter-1 is significantly different from other treatments.

Table 15. Average effects of MSG water administration on average fresh fruit weights and fruit weights per hectare of tomato plants

MSG Water (g.liter^{-1})	Average Weight of Fresh Fruits (gram)	Fruit Weight per Hectare (ton)
m_1 (0)	41,85 a	41,69 a
m_2 (3)	46,32 ab	45,41 b
m_3 (6)	51,37 b	48,67 c

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 15 it is known that the average weight of fresh fruit and weight of fruit per hectare of tomato plants is the heaviest in giving water MSG 6 g.liter-1 which is significantly different from other treatments.

Table 16. Average effects of AC wastewater on average fresh fruit weight and fruit weight per hectare of tomato plants

Wastewater AC (ml.liter^{-1})	Average Weight of Fresh Fruits (gram)	Fruit Weight per Hectare (ton)
c_1 (0)	44,78 a	44,48 ns
c_2 (200)	48,25 b	46,03 ns

Note: The numbers followed by the same letters indicate no significant difference according to the DMRT test at 5% significance level.

Based on Table 16, it is known that the average weight of fresh fruit of tomato plants is the heaviest in the provision of 200 ml AC wastewater. Liter-1 which is significantly different from other treatments.

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Discussion

Yield components are parameters that directly affect the high and low yields of plants. The yield component parameters in the study were the first flowering time, fruit diameter, and number of fruits per plant. Crop yields are the average weight of fresh fruit, weight of fruit per plant, and weight of fruit per hectare.

The interaction of rice washing water and MSG water significantly affected the time of first flowering and fruit weight per plant. While the single factor of each treatment affected all parameters of the yield and tomato yield components.

The parameter when flowering is fastest in the interaction of rice washing water and MSG water with the highest dose, this shows that the washing water of rice and MSG water has a positive influence on the initiation of flowering on tomato plants. Dewantri, et al. (2017) states MSG 6 g.liter-1 water (6000 ppm) can be used as a substitute for NPK 1.5 g per plant per 2 weeks with an increase in the number of flower buds by 54% compared without fertilizer. Gresinta (2015) reports that administration of MSG at a dose of 3 gr and 6 gr per plant can accelerate the age of plants starting to flower in peanuts.

The best fruit weight per plant is shown in the interaction of rice washing water and MSG water with the highest dose. This shows that the higher the concentration of rice washing water and MSG water, the higher the yield of tomato plants. Istiqomah (2012) states that the concentration of rice washing water influences the length of pods, number of pods and the dry weight of seeds in mung bean plants where the concentration of brown rice washing water 100% gives the largest and significantly different concentrations with concentrations of 0%, 25% and 75%. Likewise with Bukhari's research (2013), it shows that the concentration of rice washing water shows a very significant effect on the weight of eggplant fruit. Giving MSG at a dose of 3 grams and 6 grams per plant can reduce the dry weight of pods, increase the number of pithy pods, reduce the number of empty pods and increase the weight of 100 seeds, thereby increasing the quality of peanuts (Gresinta, 2015).

Effect of rice washing water on yields and components of tomato plants due to the content of phosphorus (P) and potassium (K) contained in rice washing water. Nutrient content in rice washing water according to Wulandari, et al (2011) ranges from 16.3% P and 0.02% K. Sarief (1985) adds that the increase in yield and yield components of plants is more influenced by the availability of nutrients P and K.

Posfor as ortho-phosphate has an important role in the reaction of enzymes that depend on phosphorylase. This is because all plant cell nuclei contain phosphorus, which is very important in cell division, and also for the development of meristem tissue (Sarief, 1985). Novizan (2005) added that the P element functions more for root growth, specifically accelerating flowering and ripening of fruit and increasing fruit production.

The element K functions to form proteins and fats, the formation of buffohydrate, and also strengthens the fruit which is not easy to fall (Novizan, 2005). Element K also functions as an enzyme activator in the process of photosynthesis and respiration (Hanafiah, 2007). In addition, Sutedjo (2010) also stated that potassium plays a role in protein synthesis, carbohydrate metabolism that plays a role in starch formation, breakdown and translocation of starches and improve seed quality. Fageria, et al (2009) added that the element K plays an

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important role in plant metabolism, among others directly involved in several physiological processes.

The involvement of K elements in physiological processes is grouped into two aspects including biophysical aspects and biochemical aspects. Seen from the biophysical aspects of potassium in the enzymatic activity of enzymes in carbohydrate and protein synthesis as well as increasing photosynthate translocation of leaves.

Conclusion

1. The best yield component and yield of tomato plants in a single factor of rice washing water is in the administration of a dose of 1000 ml.liter-1.
2. The best yield and yield components of tomato on a single factor of MSG water are found in the administration of a dose of 6 g.liter-1.
3. The best component of yield and yield of tomatoes on a single factor of AC waste water is found in the administration of a dose of 200 ml.liter-1.
4. The best yield and yield component in the interaction of rice washing water and MSG water is best in the administration of 1000 ml.liter-1 rice washing water with 6 g.liter-1 MSG water.

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