APPLICATION OF ORGANIC FERTILIZER FROM LIVESTOCK WASTE TO INCREASE INORGANIC FERTILIZER USE EFFICIENCY IN TOMATO CROP CULTIVATION

by Syafrullah, Neni Marlina, Gribaldi, Iin Siti Amina Gusmiatun, Khodijah, Dali And Yani Purwanti

Submission date: 07-Jul-2020 11:36AM (UTC+0700)
Submission ID: 1354437278
File name: 10.1.1.740.2132_1.pdf (387.74K)
Word count: 4765
Character count: 25129

International Journal of Engineering Research and Science & Technology

ISSN : 2319-5991
Vol. 4, No. 4
November 2015

www.ijerst.com

Email: editorijerst@gmail.com or editor@ijerst.com

Int. J. Engg. Res. & Sci. & Tech. 2015

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com
Vol. 4, No. 4, November 2015

Research Paper

APPLICATION OF ORGANIC FERTILIZER FROM LIVESTOCK WASTE TO INCREASE INORGANIC FERTILIZER USE EFFICIENCY IN TOMATO CROP CULTIVATION

Syafrullah[1], Neni Marlina[2]*, Gribaldi[3], Iin Siti Aminah[1], Gusmiatun[1], Khodijah[2], Dali[2] and Yani Purwanti[2]

*Corresponding Author: **Neni Marlina** ✉ marlina002@yahoo.com*

The research objective was to determine application impact of organic fertilizer from livestock dunks on vegetative growth and yield quality of tomato. It was conducted in Indralaya from October 2013 to February 2014. Method used in this study was Completely Randomized Design with three replications. The treatments were as follows : Po = control; P1 = recommended dose of inorganic fertilizer (135 kg N. ha^{-1}, 75 kg PZOS.ha^{-1}, and 110 kg K20 ha^{-1} (RR)); P2 = organic fertilizer from cow dunk at dose of 10 ton.ha^{-1} + RR; P3 = organic fertilizer from cow dunk at dose of 10 ton.ha^{-1} + 50% RR; P4 = organic fertilizer from buffalo dunk at dose of 10 ton.ha-1 + RR; P5 = organic fertilizer from buffalo dunk at dose of 10 ton.ha^{-1} + 50% RR; P6 = organic fertilizer from chicken dunk at dose of 10 ton.ha^{-1} + RR; P7 = organic fertilizer from chicken dunk at dose of 10 ton.ha^{-1} + 50% RR; P8 = organic fertilizer from goat dunk at dose of 10 ton.ha^{-1} + RR and P9 = organic fertilizer from goat dunk at dose of 10 ton.ha^{-1} + 50% RR. The result showed that soil fertility can be improved by application of livestock dunk-based organic fertilizer. The best organic fertilizer was organic fertilizer from chicken dunk. Application of recommended inorganic fertilizer at half dose combined with several organic fertilizers from livestock dunk showed higher yield than that of inorganic fertilizer at recommended dose. This in turn had increase the use efficiency of inorganic fertilizer as well as had produced higher yield of tomato.

Keywords: Tomato, Livestock dunk-based organic fertilizer, Inorganic fertilizer

INTRODUCTION

The effort to increase tomato production can be done through fertilizing. In order to achieve high yield and high quality of tomato, the addition of organic fertilizer is required besides inorganic fertilizer. Inorganic fertilizer application in fact can increase vegetable yield, but it makes farmers solely depended on inorganic fertilizer in the long

[1] Agricultural Faculty of Muhammadiyah University, Palembang.
[2] Agricultural Faculty of Palembang University.
[3] Baturaja University.

term. The price of inorganic fertilizer was expensive and its application can create environmental pollution. The practice of organic farming nowadays mostly utilized local resources as material for organic fertilizer and organic pesticide.

Utilization of agricultural wastes, especially livestock dunk or manure is one of technique in application of organic agriculture cultivation. Hartatik and Widowati (2006) define manure as all waste products from livestock animals that can be utilized to increase nutrients and to improve physical and biological characteristics of soil. The objective of organic matter addition is to improve soil structure, to increase water holding capacity of soil (Riley *et al.,* 2008) and to increase biological activities in soil (Riley *et al.,* 2008; Dinesh *et al.,* 2010). In addition, Acquaah (2005) stated that organic matter has important role in increasing soil fertility through improvement of physical, chemical and biological characteristics of soil. Moreover, Hsu *et.al.* (2009) described that organic matter can increase soil biological activity as well as water availability in soil. Availability of more soil water creates better absorbtion and transportation of nutrients so that photosynthetic rate for increasing food supply for plant growth can be more guaranteed (Muhakka *et. al.,* 2006).

Study results from Darwin *et. al.* (2012) showed that application of bokashi or organic fertilizer from chicken dunk combined with recommended half dose of inorganic fertilizer can increase crop production and save inorganic fertilizer usage. Furthermore, study results from Pangaribuan *et. al.* (2011) also showed that organic fertilizer (bokashi) from crop residues can reduce the usage of inorganic fertilizer. Study results from Marlina *et al.* (2014) showed that biofertilizer (rice straw compost enriched with microbe) can reduce the usage of inorganic fertilizer by 25% of recommended dose for rice crop at lowland soil. Moreover, Sudiarso (2004) stated that application of organic fertilizer combined with inorganic fertilizer at recommended half dose can increase the growth and yield of rice crop. The research objective was to study the impact of organic fertilizer from livestock wastes of chicken, goat, cow and buffalo on vegetative growth, yield and quality of tomato.

MATERIALS AND METHODS

This research has been conducted at experimental plot from October 2013 to February 2014. Analysis of soil and organic fertilizer was conducted in Soil Science Laboratory, Faculty of Agriculture, Sriwijaya University.

Materials used in this research were tomato seed of Permata variety, cow dunk, buffalo dunk, chicken dunk, goat dunk, bioactivator, rice husk, rice bran, Urea fertilizer, SP--36 fertilizer, KCl fertilizer and organic pesticide.

The method used in this research was Completely Randomized Design with three replications. The treatments were as follows:

P_0 = control (without organic and inorganic fertilizer)

P_1 = recommended dose of inorganic fertilizer (135 kg N. ha^{-1}, 75 kg P_ZO_S.ha^{-}', and 110 kg K_20 ha^{-1}) (Surawinata, 2003)

P_2 = organic fertilizer from cow dunk at dose of 10 ton.ha^{-1} + recommended dose of inorganic fertilizer.

P_3 = organic fertilizer from cow dunk at dose of 10 ton.ha^{-1} + half dose of recommended inorganic fertilizer.

P_4 = organic fertilizer from buffalo dunk at dose

of 10 ton.ha^{-1} + recommended dose of inorganic fertilizer.

P_5 = organic fertilizer from buffalo dunk at dose of 10 ton.ha^{-1} + half dose of recommended inorganic fertilizer.

P_6 = organic fertilizer from chicken dunk at dose of 10 ton.ha^{-1} + recommended dose of inorganic fertilizer.

P_7 = organic fertilizer from chicken dunk at dose of 10 ton.ha^{-1} + half dose of recommended inorganic fertilizer.

P_8 = organic fertilizer from goat dunk at dose of 10 ton.ha^{-1} + recommended dose of inorganic fertilizer.

P_9 = organic fertilizer from goat dunk at dose of 10 ton.ha^{-1} + half dose of recommended inorganic fertilizer.

The treatment effect was determined by using F test at 5% level. If there was significant different on the observed parameters, then each treatment was compared by using Honestly Significant Difference (HSD) test at level of α = 5%.

Several livestock dunks from chicken, cow, goat and buffalo were loosened manually. Bioreactor of EM-4 was diluted at concentration of 1 mL.L^{-1} and mollase was added at concentration of 1 g.L^{-1}. The mixture of livestock dunks (according to treatments) + rice bran + rice husk (at rastio of 8:1:1) was poured with bioactivator solution. This compost materials hipe was maintained at temperature of 40--50 °C by covering its with thick canvas and was homogenously stirred for every two days period. This fermentation process was procceded for 3-4 weeks period until the ready to use organic fertilizer was produced and ready to be applied in field.

Tomato seeds were germinated by spreading them in nursery seed plot and media of seed weaning in form of soil and livestock dunk organic fertilizer at ratio of 2:1 that was previously sieved by using sand siever was prepared. Tomato seeds were germinated up to 4 weeks old in which they have 3 to 5 true leves, have vigorous growth, have no pest and disease symptom and subsequently ready to be planted in the field.

Soil tillage was done completely with two times plowing and even surface by using cangkul. Plot size for each treatment was 7 m x 5 m with distance amongst replications of 1 m. Tomato was planted with planting distance of 50 cm x 60 cm. Lime in form of CaCO with dose of 4 ton per ha was applied two weeks before planting to neutralize soil acidity.

Weeds control was done manually by using small hoe or mattock, whereas pest and disease control was done by using local organic pesticide which consisted of nymp leaf extract, galangal and lemongrass with dose of 1 liter solution diluted in 10 L of water and was applied once a week (Wahyono and Rachmat, 2007). Fruit fly control was conducted by using fly trap in form of methyl eugenol according to the recommendation. Harvesting was done when tomato fruit had achieved breaker stage. The observed parameters were plant height (cm) at period of 55 days after planting, dry matter weight (g), dry weight of stems, roots and leaves at period of 56 days after planting, fruit diameter (cm); fruit number per plot, total fruit weight per plot (kg. plot^{-1}); saleable fruit weight (kg.plot^{-1}); fruit percentage experienced BER *(blossom-end rot)* per plant; total dissolved solid (°Brix) measured by using *refractometer;* and acid content (%) by using titration method.

RESULTS AND DISCUSSION

RESULTS

Tabel 1 showed results of soil analysis after liming and before experiment. Soil fertility at study location showed relatively low C/N ratio with magnitude of 10 and soil pH level of 5.06.

Analysis results of organic fertilizer from livestock wastes before application in the field was given in Table 2. Organic matter from organic fertilizer showed different C/N ratio values. The C/N ratio values of organic fertilizer from chicken dunk and goat dunk were in the range of 6 to 8 which means these organic fertilizers had perfectly decomposed. The C/N ratio values of organic fertilizer from cow dunk and buffalo dunk were in the range of 11 to 12 which means that decomposition process of big livestock dunks were slower. Macro elements content such as N, P and K on all organic fertilizers showed different values. The highest value in term of N, P and K nutrients was found in organic fertilizer from chicken dunk followed by organic fertilizer from goat dunk which had high value of N and K nutrients, whereas organic fertilizers from cow dunk and buffalo dunk had low values of P nutrient.

Table 3 showed that application of organic fertilizers from livestock wastes had produced higher values in term of plant height, plant dry matter weight, fruit diameter and fruit numbers per plant than that of without organic fertilizer from livestock waste and inorganic fertilizer (P_0 = control), even than that of inorganic fertilizer treatment (P_1). Tomato plants treated with several organic fertilizers from livestock wastes had higher height, bigger fruit size and higher fruit numbers per plot. Tomato fruit diameters and fruit numbers per plant between treatments of organic fertilizer from livestock waste added with full dose of inorganic fertilizer and treatments of organic fertilizer from livestock waste added with half dose of inorganic fertilizer were not significantly different.

Table 1: Results of Initial Soil Analysis Before Research

Elements	Results	Criteria*
pH H_20 (1:2,5)	5.06	Acid
pH KC1(L2.5)	4.48	Acid
N (%) Kjeldahl	0.14	Low
P Bray-1 (ppm)	4.80	Low
K NH_40Ac (me 100 g^{-1})	0.22	Low
C-organic (%)	1.60	Low
KTK (me.100.g)	9.65	Low
C/N Ratio	10.66	Low
Texture (%)Sand	24.20	Clay
Loam	26.10	
Clay	47.25	

*Remarks: * According to Soil Research Center (2005)*

Table 2: Analysis Results of Waste Organic Fertilizer After the Composting Process

Treatment	N-total (%) Kejdahl	P Bray (%)	K (%) $NH_4$0Ac	pH (1:2.5)		C-organic (%)	C/N Ratio
				H_2O	KCl		
Inorganic fertilizer of chicken dunk	1.35	1.20	1.38	8.64	7.98	7.85	6.04
Inorganic fertilizer of goat dunk	1.14	0.30	1.05	8.83	8.06	9.05	8.08
Inorganic fertilizer of cow dunk	0.96	0.17	0.56	7.54	6.80	11.94	12.55
Inorganic fertilizer of buffalo dunk	0.75	0.55	0.40	6.84	6.33	10.05	11.09

Table 3: Crop Height, Crop Dry Matter Weight, Fruit Diameter and Fruit Numbers Per Plot at Several Treatments of Livestock Waste Organic Fertilizer

Treatment	Height (cm)	Crop Dry Matter Weight (kg)	Fruit Diameter (cm)	Fruit Numbers per Plot (Fruits)
PO = control	47.12d	2.42d	3.48c	190.32c
P1= recommended dose of inorganic fertilizer	70.39c	3.72c	4.08b	535.66b
P2 = Cow dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose doseekomendasi	82.92b	4.89b	4.19b	761.32a
P3 = Cow dunk organic fertilizer of 10 ton.ha^{-1} + $^1/_2$ recommended dose	82.65b	4.84b	4.24b	761.32a
P4 = Buffalo dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose Ppk org kotoran kerbau 10 ton ha^{-1} + dosis rekomendasi	84.79b	5.26b	4.25b	762.66a
P5= Buffalo dunk organic fertilizer of 10 ton.ha^{-1} + $^1/_2$ recommended dose Ppk org kotoran kerbau 10 ton ha^{-1} +$^1/_2$ dosis rekomendasi	82.45b	5.24b	4.22b	761.00 a
P6 = Chicken dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose Ppk org kotoran ayam 10 ton ha^{-1} + dosis rekomendasi	94.65a	6.53a	4.85a	795.32a
P7= Chicken dunk organic fertilizer of 10 ton.ha^{-1} + ½ recommended dose	93.29a	6.44a	4.86a	786.00 a
P8= Goat dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose	92.75a	6.24a	4.58a	765.32a
P9= Goat dunk organic fertilizer of 10 ton.ha^{-1} + ½ recommended dose	90.92a	6.15a	4.57a	767.00 a
HSD	5.09	0.37	0.33	112.83

Remarks: Numbers followed by the same letter at the same column showed not significantly different based on Honestly Significant Difference (HSD) test at level of α = 5%

The study results showed that application of organic fertilizer from livestock waste had increased average number of tomato fruits per plot (Table 4) than that of without organic fertilizer and without inorganic fertilizer (P_0 = control), even than that of inorganic fertilizer treatment (P_1). Total tomato fruits were increased by more than 60% compared to control treatment or recommended inorganic fertilizer dose. Treatments of organic fertilizer from livestock waste added with full dose of inorganic fertilizer (P_7) and organic fertilizer from livestock waste added with half dose of inorganic fertilizer were not significantly different.

Table 5 showed that application of organic fertilizer from livestock waste had significantly decreased the tomato fruit percentage attacked by BER compared to control treatment or inorganic fertilizer treatment. Total dissolved solid (°Brix) on tomato fruit was significantly increased although acid content was not affected by treatment of organic fertilizer from livestock waste. Tomato fruit percentage attacked by BER and total dissolved solid (°Brix) between treatment of organic fertilizer added with full doze of inorganic fertilizer and treatment of organic fertilizer added with half doze of inorganic fertilizer were not significantly different.

DISCUSSION

Results of initial soil analysis generally showed that soil fertility status at the study location was low with neutral soil reaction and low content of macro elements such as N, P and K (Table 1). Analysis of organic fertilizer in relation to C/N ratio in this study showed that organic fertilizers from chicken dunk and goat dunk had C/N in the range of 6 to 8, whereas organic fertilizers from cow dunk and buffalo dunk had C/N in the range of 11 to 12. Organic matter with low value of C/N ratio is easier to be decomposed and faster in providing of nutrients (Moral *et al.*, 2005; Hartatik and Widowati, 2006). In general, tomato plant growth was good and in healthy condition during the study period.

Results of study showed that application of organic fertilizer from livestock dunks added with

Table 4: Fruit Yield from Several Organic Fertilizer Treatments of Livestock Waste

Treatments	Yield (kg.plot^{-1})
P_0 = Control	4.58d
P_1 = Recommended dose of inorganic fertilizer	17.55c
P_2= Cow dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose	29.13b
P_3= Cow dunk organic fertilizer of 10 ton.ha^{-1} + ½ recommended dose	29.29b
P_4 = Buffalo orHHdunk organic fertilizer of 10 ton ha^{-1} + recommended dose	29.33b
P_5= Buffalo dunk organic fertilizer of 10 ton ha^{-1} + ½ recommended dose	29.39b
P_6 = Chicken dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose	34.80a
P_7= Chicken dunk organic fertilizer of 10 ton.ha^{-1} + 11/2 recommended dose	33.91a
P_8= Goat dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose	29.14b
P_9= Goat dunk organic fertilizer of 10 ton.ha^{-1} + ½ recommended dose	28.55b
HSD	4.30

Remarks: Numbers followed by the same letter at the same column showed not significantly different based on Honestly Significant Difference (HSD) test at level of α = 5%

Table 5: Tomato Fruit Percentage Attacked by Ber, Total Dissolved Solid and Acid Content at Several Treatments of Organic Fertilizer from Livestock Waste

Treatment	BER (%)	TDS (°Brix)	Acid (%)
P_0 = Control	12.54b	5.00a	0.42
P_1 = Recommended dose of inorganic fertilizer	11.62b	5.58b	0.57
P_2= Cow dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose	6.88a	5.44b	0.53
P_3= Cow dunk organic fertilizer of 10 ton.ha^{-1} + ½ recommended dose	5.56a	5.41b	0.59
P_4 = Buffalo orHHdunk organic fertilizer of 10 ton ha^{-1} + recommended dose	6.80a	5.36b	0.63
P_5= Buffalo dunk organic fertilizer of 10 ton ha^{-1} + ½ recommended dose	6.75a	5.36b	0.43
P_6 = Chicken dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose	6.93a	5.59b	*0.5* 0
P_7= Chicken dunk organic fertilizer of 10 ton.ha^{-1} + ½ recommended dose	6.70a	5.5 0 b	0.47
P_8= Goat dunk organic fertilizer of 10 ton.ha^{-1} + recommended dose	7.34a	5.52b	0.61
P_9= Goat dunk organic fertilizer of 10 ton.ha^{-1} + ½ recommended dose	4.76a	5.57b	*0.5* 0
HSD	3.50	0.34	0.30 ns

Remarks: Numbers followed by the same letter at the same column showed not significantly different based on Honestly Significant Difference (HSD) test at level of α = 5% ; BER = blossom end rot; TDS = total dissolved solid

inorganic fertilizers either at recommended full dose or half dose levels had significantly increased total tomato production and saleable tomato fruits production. The best treatments that produced higher total tomato production and saleable tomato fruits production were application of organic fertilizer from chicken dunk + full dose of inorganic fertilizer (P_6) or application of organic fertilizer from chicken dunk + half dose of inorganic fertilizer (P_7). The positive effect of organic matter from organic fertilizer of chicken dunk had been reported for tomato plant production (Odoemena, 2005; Olaniyi and Ajibola, 2008), soybean production harvested at immature stage (Melati *et al.*, 2008), sweet corn (Mayadewi, 2007) and sorghum (Irwan *et al.*, 2005). Therefore, application of inorganic fertilizer at recommended half dose added with organic fertilizer from chicken dunk at dose 10 ton.ha^{-1} relatively gave positive effect on the growth and production of tomato and economically saving the inorganic fertilizer use. Hasibuan and Lumbanraja (2010) also found that 50% reduction in NPK fertilizer usage on soybean crop can be compensated with organic fertilizer and chicken manure. Pangaribuan *et al.* (2011) also showed that organic fertilizer from crops residue was capable to reduce inorganic fertilizer usage.

One of disadvantage from organic manure is that its nutrients are very slowly available so that it should be combined with inorganic fertilizer because nutrients from the latter are quickly available. Therefore, this combination would produce synergical relationship between bokashi manure and inorganic fertilizer at recommended half dose. This positive synergic related to bokashi manure that is capable to improve soil physical proerties, whereas inorganic fertilizer is capable to provide nutrients in quick manner. Application of organic fertilizer was assumed capable to increase numbers and diversity of microbes and

soil worms (Murwani and Karvanto, 2010) so that application of inorganic fertilizer at recommended half dose was sufficient to increase tomato yield.

Increase of tomato production due to bokashi application had impacts in term of improving soil physical and chemical properties as well as soil biology. Improvement of soil physical properties was due to organic matter as bonding agent for loose soil grains or as aggregates stabilizer (Gonzales and Cooperband, 2002; Riley *et al.,* 2008). Improvement of soil chemical properties was due to organic matter that helps roots of plant to penetrate deeper so that capable to absorb nutrients and water in huge quantity, to improve rhizosphere condition that maintain nutrients cycle, to improve exudation by roots of plant which in turn capable to increase degradation of soil organic matter and N mineralization (Morgan *et al.,* 2005). Improvement of soil biological properties was due to organic matter as energy source for most of soil organisms (Saviozzi *et al.,* 2006).

Result of study showed that tomato yield obtained from application of bokashi chicken manure was significantly higher than that of application of bokashi cow manure, bokashi buffalo manure or bokashi goat manure. This result was in accord to the research by Melati and Andriyani (2005) which showed that application of chicken manure at dose 10 ton.ha$^{-}_{1}$ was capable to increase vegetative growth and production of organic soybean. Chicken manure had higher nutrients content of N, P and K than that of other livestock manures (Table 2) because solid dunk in poultry livestock is mixed with its liquid dunk. Nutrients content found in urine are always higher than that found in solid dunk (Hartatik and Widowati, 2006). According to Hartatik and Widowati (2006), nutrients quality of manure is affected by feeds consumed by livestocks, livestock health, livestock age as well as quantity and type of materials used as stall litter.

The higher tomato yield obtained from treatments of organic fertilizer from livestock wastes (P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9) compared to control treatment (P_O) or inorganic fertilizer treatment (P_I) was supported by vegetative growth data in which plant height and plant dry matter weight were significantly higher than that of control treatment or recommended inorganic fertilizer (Table 3). Hsu *et al.* (2009) stated that plant treated with organic fertilizer would have higher quantity of biomass accumulation in upper part compared to plant treated with inorganic fertilizer. Therefore, it can be explained that there is relationship between the increase in plant height and plant dry matter weight with tomato fruit production. Organic matter will increase soil biological activities and soil water availability. Availability of more water in soil will produce better absorbtion and transport of nutrients which in turn increase photosynthesis rate that provide better guarantee of food supply for plant growth (Muhakka *et al.,* 2006) and subsequently tomato fruit production will also increase.

Result of this study also showed that fruit diameter and fruit numbers per plot was increased due treatment of bokashi application. This was supported by the fact that plant dry matter weight as the representation of assimilate numbers was significantly higher on treatment of bokashi manure added with recommended inorganic fertilizers at full dose or half dose (P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9) than that of control treatment (P_O) or recommended inorganic fertilizer treatment (P_1) (see Table 3). The increase in dry matter weight results in increase of fruit diameter and fruit numbers. Table 5 showed that application of

organic fertilizer from livestock waste added with inorganic fertilizers at full dose and half dose had significantly decrease fruit percentage that experienced physiological disorder in form of *blossom-end-rot.* This showed that application of organic fertilizer from livestock waste added with inorganic fertilizers was capable to improve plant endurance toward physiological disorder of *blossom-end-rot.* Morgan *et al.* (2005) described that organic matter addition would improve rhizosphere condition which in turn increase plant resistency toward diseases and plant tolerance toward toxic substances. Taste of tomato is one of important quality component for consumers. Application of organic fertilizer from livestock waste added with inorganic fertilizers at full dose and half dose had significantly increased total dissolved solid (°Brix) of tomato fruits than that of control treatment. Similar result was also demonstrated by Joshi and Vig (2010). This was estimated due to improvement of soil structure as a result of organic matter addition into soil which increases the absorption of N and K nutrients by tomato plant. Wright and Harris (1985) stated that increase in N and K nutrients would increase total dissolved solid content within tomato fruit. Application of organic fertilizer from livestock waste in combination with inorganic fertilizer in this study was not increased acid content of tomato fruit. Similar result was also demonstrated by Joshi and Vig (2010).

CONCLUSION

Organic fertilizer from chicken dunk combined with recommended inorganic fertilizer at half dose level had increased tomato yield than that of organic fertilizers from goat dunk, cow dunk and buffalo dunk. Organic fertilizer based on livestock waste such as chicken dunk, goat dunk, cow dunk and buffalo dunk combined with recommended inorganic fertilizer at half dose level can be applied in order to increase the use efficiency of inorganic fertilizer for tomato cultivation.

ACKNOWLEDGMENT

The writers had delivered gratitude to Rector of Muhammadiyah University, Palembang that had provided funding aid for internal research in year of 2013.

REFERENCES

1. Dinesh R, Srinivasan V, Hamza S and Manjusha A (2010), "Short-term incorporation of organic manures and biofertilizers influences biochemical and microbial characteristics of soils under an annual crop turmeric *(Curcuma longa L.)", Bioresource Technol.,* pp. 4697-4702.
2. Joshi R and Vig A P (2010), "Effect of vermibokashi on growth, yield, and quality of tomatoes *(Lycopersicon esculentum L.)", Afr. J. Basic AppL Sci.*, Vol. 2, pp. 117-123.
3. Marlina N, Gofar N, Halim A, dan A M Rohim (2014), "Improvement of Rice Growth and Productivity Through Balance Application of Inorganic and Biofertilizers in Inceptisol Soil of Lowland Swamp Area", *Journal of Agricultural Science Agrivita,* Vol. 36, No. 1, pp. 48-56
4. Moral R, Moreno-Caselles J, Perez-Murcia M D, Perez-Espinosa B Rufete and Paredes C (2005), „Characterisation of the organic matter pool i ~$_n$ manures", *Bioresource Technol.*, Vol. 96, pp. 153-158.
5. Melati M and Andriyani W (2005), "The Effect of Chicken Manure and Green Fertilizer from

Calopogonium mucunoides on the Growth and Production of Immature Harvested Soybean Using Organic Cultivation", *J. Agron. Indonesia,* Vol. 33, pp. 8-15.

6. Melati M, Asiah A and Rianawati D (2008), "Application of Organic Fertilizer and Its Residue for Production of Immature Harvested Soybean", *J. Agron. Indonesia,* Vol. 36, pp. 204-213.
7. Morgan J A W, Bending G D and White P J (2005), "Biological costs and benefits to plant-microbe interactions in the rhizosphere", *J. Exp. Bot.*, Vol. 56, pp. 1729-1739.
8. Muhakka, Budianta D, Munandar and Abubakar (2006), "Optimalization of Organic Fertilizer and Sulfur Addition on Production of Elephant Grass *(Pennisetum purpuphoides)", J. Tanaman Tropika*, Vol. 9, pp. 30-41.
9. Murwani S and A Karyanto (2010), "The Effect of Manure and Vegetable Cropping Pattern at Inter Rows of Young Coffee Crop on Population and Biomass of Earthworm. pp. 126-136", *In* Hasibuan, R. (Ed.). *Proceeding of National Seminar of Soil Biodiversity I.* Bandar Lampung 29-30 June.
10. Pangaribuan D A, Pratiwi O L and Lismawanti (2011), "The Decrease of Inorganic Fertilizer Usage and Addition of Bokashi from Crop Residue in Tomato Crop Cultivation", *J. Agron. Indonesia,* Vol. 39, pp. 173-179.
11. Riley H, Pommeresche R, R Eltun, S Hansen and A Korsaeth (2008), "Soil Structure, Organic Matter and Earthworm Activity in a Comparison of Cropping Systems with Contrasting Tillage, Rotations, Fertilizer Levels and Manure Use", *Agric. Ecosyst. Environ.,* Vol. 124, pp. 275-284.
12. Saviozzi A, Cardelli R, P N'kou, R Levi-Minzi and R Riffaldi (2000), "Soil Biological Activity Influenced by Green Waste Bokashi and Cattle Manure", *Compost Sci. Util.*, Vol. 14, pp. 54-58.
13. Surawinata E T (2003), "The Effect of Several Combinations of Organic Fertilizer from Bantargebang and Inorganic Fertilizer on the Growth and Yield of Tomato Crop of Arthaloka Variety", *J. Agrikultura,* Vol. 14, pp. 139-144.

International Journal of Engineering Research and Science & Technology
Hyderabad, INDIA. Ph: +91-09441351700, 09059645577
E-mail: editorijlerst@gmail.com or editor@ijerst.com
Website: www.ijerst.com

APPLICATION OF ORGANIC FERTILIZER FROM LIVESTOCK WASTE TO INCREASE INORGANIC FERTILIZER USE EFFICIENCY IN TOMATO CROP CULTIVATION

ORIGINALITY REPORT

23%	20%	11%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

MATCH ALL SOURCES (ONLY SELECTED SOURCE PRINTED)

6%

★ ijerst.com

Internet Source

Exclude quotes	On	Exclude matches	< 1%
Exclude bibliography	Off		