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" Emerging Innovation on Science and Technology for Sustainable Development "

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PREFACE

Bismillaahirrahmaanirrahiim
Assalaamu'alaikum warahmatullaahi wabarakaatuh.

Praise always we pray to God Almighty for giving us the abundance of grace, guidance and inayah, so that we all can met in the "1st International Conference on Science and Technology (ICST) 2016". ICST is a conference where researchers can share and publish their scientific papers about science and technology. The theme of this conference is "Emerging Innovation on Science and Technology for Sustainable Development".

This conference was done for two days, from 1st to 2nd December 2016, and took place in the Green Campus of the University of Mataram.

We received more than one hundred papers from various universities and research institutions in Indonesia and from overseas, but not all of the papers were published in this proceeding. The paper has been selected and grouped based on the similarity of the research field, which then are presented and discussed. Presentation of the papers will be held in eight parallel classes.

At this moment, the organizing committee would like to expressour gratitude to all of you who have participated this conference, especially to the all keynote speakers, presenters who have submitted posters or orally presented papers and also to the participants. Our special gratitude also goes to the Rector of the University of Mataram who has been highly supporting this conference. Last but not least, the organizing committee would like to thank to all of you who have supported this conference.

Wassalamu'alaikum warohmatullahi wabarakatuh.

Chairman of 1st ICST 2016

Dr. Satrijo Saloko

OPENING SPEECH - RECTOR THE UNIVERSITY OF MATARAM
The 1st International Conference on Science and Technology 2016

Respected Guests,
Keynote speakers,
Conference participants,
and all other participants.

On Behalf of all staffs of the University of Mataram, I welcome you all to Lombok, a beautiful island in West Nusa Tenggara Province, where the University of Mataram is located. Lombok is known for its natural and cultural diversity where you can enjoy traditional cuisines, beaches, waterfalls, mountain, traditional villages and handicraft of many ethnics including Sasak, Samawa, Mbojo, Balinese, Chinese, Arabic, and many others.

As the Rector of the University of Mataram, it is a great honour for me to address the opening of "The 1st International Conference on Science and Technology" here at the University of Mataram, which will be held from 1th to 2nd December 2016, with a theme "Emerging Innovation on Science and Technology for Sustainable Development". The main aim of this seminar is to gather scientist from all over the world to share their ideas, knowledge and experiences and to build network for possible future collaboration.

As we are aware that sharing knowledge and experiences from speakers are extremely valuable in a conference, therefore I would like to express my high appreciation, first, to the keynote speakers from overseas and from Indonesia for their willingness to come to Lombok to share their acknowledged works. Your effort and contribution to this conference are absolutely valuable. Second, my high appreciation also goes to the national speakers and all other participants, including the speakers from University of Mataram and local universities in West Nusa Tenggara Province, your participation in this conference not only will give incredible share of ideas, skills and knowledge that

you have, but also will improve the academic environment that we are developing in this university. I hope this conference will be a good forum, not only for communicating and sharing ideas, knowledge and experiences, but also for building networking for future collaboration.

I would also like to take this opportunity to express my appreciation to the sponsors which have given some contribution to this conference. Last but not least, I would like to thank the organizing committee as well as all other supporters and participants, without their effort, commitment and hard work, this conference will not run well.

Finally, I wish you most successful conference, enjoy Lombok Island and hope to see you again in other forum here at the University of Mataram.

Rector of the University of Mataram

Prof. Ir. Sunarpi, Ph.D

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Growth an Yield of Onion (*Allium Cepa Var. Ascalonicum*) as CA Result of Addition of Biocompost and Boactivity Fermented with *Trichoderma* spp.

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Abstract

The aim of this research was to look at the effect of biocompost and bioactivator fermented with trichoderma spp and their interaction on growth and yield of onion. A field experiment was conducted in Inceptisol at Seteluk Village, sub district of Batulayar and District of West Lombok. The treatments were split plot design which was consist of two main factors (1) with biocompost 20 t/ha and (2) without biocompost. The sub main plot was bioactivator consist of 5 levels mainly (a) without bioactivator, (b) 5 g/plant, (c) 10 g/plant, (d) 15 g/plant and (e) 20 g/plant. The result of this study showed that there was a significant higher on growth and yield of onion after addition of biocompost compared with without addition of biocompost. There was no interaction between biocompost and bioactivator. Furthermore, the effect of addition of biocompost at level of 10 g/plat resulted to the highest growth and yield of onion compared with other levels addition of biocompost.

Keywords: *biocompos, bioactivator, Trichoderma* spp., *onion, allium cepa* L.

1. Introduction

Onion*(Allium cepa var. ascalonicum.)* is becoming very populer horticultural crops in Indonesia due to its high econonomical value as well as its multi used of onion for food flavour and medical or pharmatical materials (Anonim, 2014). West Nusa Tenggara Province is one of the centra onion production in Indonesia after East Java, Central Java and West Java Province. However, the onion production in Indonesia is still low due to some constrains in the crop production systems.

Some factors that are responsible low production of onion in the West Nusa Tenggara Province are the use of low quality of seed and conventional farming practice by using high levels of inorganic fertilzer such as NPK Fertilizer (Sudhanta, 2015).

The use of bioactivator containing saprofit funggi of T. harzianumi and isolate of SAPRO-07 and funggi endofit of T. koningii isolate has been reported increased growth and yield of vanilia (Sudantha 2010a), increased growth and yield of corn (Sudantha and Suwardji,2013), increased growth and yield of soy bean (Sudantha and Suwardji, 2014), increase growth and yield of onion in the pot trial (Sudantha 2015).

In this paper we reported result of field trial the effect of biocompost and bioactivator fermented with Trichoderma spp on growth and yield of onion in the field trial.

2. Materials and Methods

Field trial was conducted at Seteluk Village, sub district of Batulayar and District of West Lombok from June to August 2016. Split plot experimental design was used to set up this field experiment which was consists of main treatment bioacompost (1) with biocompost 20 t/ha and (2) without biocompost. Sub treatments were application of bioactivator which consist of five levels mainly (a) without bioactivator (b) 5 g/plant of bioactivator (c) 10 g/plant of bioactivator (d) 15 g/plant of bioactivator and (e) 20 g/plant of bioactivator. The treatment was repeated three times, resulted in 2 x 5 x 3 = 30 experimental plots.

Biocompost of coconut shell was crushed and sieved with a 1.0 mm, then moistened with

T. koningii (Endo-04) and *T. harzianum* (isolates Sapro-07) suspense, where been grown on PDA. Solution was used water solvents which added 2.5 g granular sugar. The density of spore in suspension were 10^7 spores/ml. This solution is commonly known as Biotricon. Biocompost compounds had been added Biotricon were at 20-24% in moisture content. Biocompost was placed in container and sealed properly in anerobic condition and incubated in the room temperature. The incunbation period was used 28 days.

Fungi *Trichoderma* spp. was used in this study and had been cultured *T. koningii* isolates Endo-04 and *T. harzianum* isolates Sapro-07, were collected by Sudantha stored in Laboratory of Plant Protection, Agriculture Faculty, Universitas Mataram. Growing up used PDA (Potato Dextrosa Agar) with incubation period were 14 days.

The Bioactivator was made of leaves coffee had been dried at 60^0C for 14 days, after that it was crushed with a coffee mill and then sieved. The result of sieve powder was mixed with clay at 1:3 (v/v) in ratio then sterilized with *autocave*. The mixing matters were inoculated with fungi conidial biomass suspense *T. koningii* ENDO-2 and *T. harzianum* SAPRO

Plots size were 5x2 m^2 croping spaces were 25 cm x 20 cm, so there were 200 plant per plot. Onion seed seeds used was cultivar of Philip. Planting hole at depth of 2.5 cm. Combination of biocompost and bioactivator were applied on treatment basis as discussed above. During the growing season, water was applied based on furrow irrigation based on its onion requirement and weeding also applied at 20, 40, and 60 days after planting. Harvesting was done after 103 days after planting.

Data were analsysed using analysis of variance (2009), any significant different among means were then tested using Ducan's Multiple Test at probability level 95%.

3. Results and Discussion

3.1. Characteristis of Biocompost and Soil's Chemical Properties after Fermentation and Addition of Biocompost Fermented with *Trichoderma* spp.

Fermentation of biocompost using trichoderma spp affected the biocompost and soil properties. Chemical tests showed that there were decreased of biocompost pH and C/N ratio, but enhanced %-N. One of the most important of the benefit of fermentation was reducing C/N ratio. This has a significant implication on accelerating degradation of biocompost and become nutrient that may available for plant growth. Similarly fermentation biocompost also increased cation exchange capacity (CEC) (***Table 1.***).

Table 1. Chemical Change of Biocompost and Soi Properties after Fermentation and Application of Fermented Biocompost

Parameters	*BC Properties*			*Soil Properties*[a]					
	BC	FBC	Anova[b]	Basic	Soil (control)		Soil + BCT (20 tons/ha)		Anova[b]
				≤-1st Day	30th Days	60th days	30th Days	60th Days	
pH (H_2O)	7,8	7,2	*	6,5	6,4	6,5	6,4	6,2	ns
CEC ($cmol_c\ kg^{-1}$)	23,81	26,28	*	12,25 a	11,66 a	12,41 ab	14,53 c	14,24 bc	*
C (%)	62,00	60,00	*	2,80	2,65	3,10	3,15	3,00	ns
N (%)	0,37	0,82	**	0,18 a	0,23 ab	0,34 d	0,25 bc	0,31 cd	*
C/N Ratio	167	73	**						
Soil Respiration ($\mu mol\ CO_2\ kg^{-1}\ ha^{-1}$)	-	-		9,21 a	12,42 b	11,83 b	12,05 b	13,62 b	*

[a]*Means followed by the same letter at each row are not significantly different (P<0.05)*

Using this fermented biocompost (FBC) were 20 tons ha^{-1}, results of statistical

analysys on chemical tests showed that the fermentation of BC has no significance different effect on Biocompost pH and soil organic carbon (SOC), but significatly increased cation exchange capacity (CEC), %-N, C/N ratio and soil respiration.

Increasing CEC of soil were higher in soil applied FBC both on 30 and 60 days after application measured than without FBC application at the same period (30th and 60th days). By comparing before (1st day = 12.25 $cmol_c\ kg^{-1}$) and after fermentation and application both without FBC (30th $cmol_c$ days = 11.66 $cmol_c\ kg^{-1}$ and 60th days = 12.61 $cmol_c\ kg^{-1}$) and with FBC application (Soil+FBC in 30th days = 14.53 $cmol_c$ 1st kg^{-1} and 60th days = 14.24 $cmol_c\ kg^{-1}$) also showed improvement

3.2. Effect of Biocompost and Bioactivator on The Growth of Onion

Results of analysis of variance showed that application of both fermented biocompost and level of bioactivator were both significantly increased on plant heigh at 14,21,28 and 35 days after planting (DAP). Furthermore analysis using Least Square Different (LSD) at probability 95% can be seen at Tabel 1 and 2.

Tabel 1. The influence of biocompost on the hight of plant

Treatments	Mean the heigh of Onion Plant (cm)			
	14 DAP	21 DAP	28 DAP	35 DAP
With Biocompost	23,03 a [1)]	27,34 a[1)]	30,31 a[1)]	32,73 a [1)]
Without Biocompost	21,78 b	24,66 b	26,23 b	28,81 b
LSD P< 5%	1,10	2,98	3,86	3,12

1) Means followed with the same letter in the same colum are not significantly different.
2) DAP = Day after planting

Table 1 showed that the addition of biocompost fermented with Trichoderma spp significantly increased plant heigh at 14 DAP, 21 DAP, 28 DAP and 35 DAP compared with the height of plant without addition of biocompost. Sudantha and Suwardji (2016) advocated that addition of fermented biocompost with Trichoderma spp was able to accelerate the vegetative growth of onion. Similarly Salisbury dan Ross (1995) found that some fungi that life in the soil can produce etylence that are able to stimulate the growth of plant and also able to protect the plant from root rot desease. Moreover ethelence produced by the fungi is also able to speed up the flowering time. Sudantha (2010a) also found that fungi of endofit *Trichoderma* spp. was able to colonize in the plant tissues. As a result of ethylence produced in the plant tissues, the plant was cappable of accelerating the growth of plant tissue. Moreover, Trautman dan Olinceiw (1996) reported that Trichoderma harzianum was able to produce cellulose enzime that are capable of decomposing organic matter containing lignin and cellulose to the simple compounds which are disolve in soil solution and becoming available for plant growth and development.

Table 2. Influence of Bioactivator Level on Plant Heigh of Onion

Treatment of Bioactivator	Mean of Onion Plant Heigh(cm)			
	14 DAP	21 DAP	28 DAP	35 DAP
Without bioactivator	21,30 a[1)]	24,10 a[1)]	26,08 a[1)]	27,10 a[1)]
5 g/plant	22,51 b	25,75 b	27,25 b	31,22 b
10 g/plant	22,75 bc	26,74 bc	28,43 bc	32,67 bc
15 g/plant	23,74 c	27,28 c	28,67 c	32,74 c
20 g/plant	23,71 c	27,37 c	28,70 c	32,73 c
LSD at P < 5%	1,27	1,51	1,03	1,35

1) Values followed by the same symbon in the same colum are not sigficantly different at P<5%
2) DAP= Day after planting

Table 2 showed that the level of bioactivator significanly influenced plant heigh of

onion at 14 DAP, 21 DAP, 28 DAP and 35 DAP. All treatments were significantly increased plant heigh. Comparing the levels of treatments, doses of 10 g/plant of bioactivator considered to be the level that is significanly increase the plant heigh and economicly viable. This results suggested that bioactivator containing fungi of *T. koningii* isolat Endo-02 dan *T. harzianum* isolat Sapro-07 can stimulate plant height of onion.

Our data also suggested that bioactivator containing fungi of *T. koningii* isolat Endo-02 dan *T. Harzianum* isolat Sapro-07 were more prominent in increasing the heigh of pant of onio compared with biocompost suggesting that the use of bioactivatior may economically viable and practically more easy for farmers. Similar results has been reported by Sudantha et al (2016) suggested that 10g/plant of bioactivator can significantly increased the plant heigh of onion and economically viable conducted in other research for othe soil types. As previously reported that Sudantha (2010b) also found that fungi endofit *T. koningii* isolat ENDO-02 in the plant tissue produced etylence which able to stimulate vegetative growth of plant.

Further statistical test using LSD at P <5% for the influence of biocompost conducted independently on other plant parameters suggested that bioactivator significanly inreased number of tillering, fresh weigh of plant and number of plant bulb of onion (Table 3).

Table 3. Influence of biocompost on number of tillering, fresh weight of plant and fresh bulb weight of onion

Treatments	Number of tillering (bulb/rumpun)	Fresh weight of plant (g/rumpun)	Fresh bulb of onion (g/rumpun)
With biocompost	6,78 a[1])	39,11 a[1])	33,57 a[1])
Without biocompost	5,13 b	27,38 b	22,42 b
LSD 5%	1,63	1,02	1,77

1) Values followed by the same symbon in the same colum are not sigficantly different at P<5%

Table 3 suggested that addition of biocompost significantly increased number of tillering and fresh weight plant and fresh weight of bulb. This results similar to the results of Sudantha et al (2016) in the glass house experiment that addition of biocompost significantly increase number of tillering, plant fresh weight and fresh weight of bulb of onion. Furthermore Sudantha dan Suwardji (2013) also found application of biocompost fermented with fungi of endofit and saprofit *Trichoderma* spp increased plant heigh dan development of onion and yield of onion.

Table 4. Influence of bioactivator on number of tillering, fresh weight of plant and fresh bulb of onion

Treatments	Number of tillering (bulb)	Fresh weight of plant (g)	Fresh weight of bulb (g)
Without bioactivator	4,91 a [1])	29,42 a [1])	23,71 a [1])
5 g/plant	5,36 b	32,36 b	27,11 b
10 g/plant	5,62 bc	35,10 bc	28,06 bc
15 g/plant	5,87 c	35,56 c	30,86 c
20 g/plant	5,93 c	36,48 c	31,02 c
LSD P<0,5%	0,50	2,75	2,95

1) Values followed by the same symbon in the same colum are not sigficantly different at P<5%

Table 4 showed that aplication of bioactivator containing fungi of *T. Koningii* isolate Endo-02dan *T. harzianum* isolat Sapro-07 significantly increased number of tillering,fresh weight plant and fresh weight of bulb in comparation with witthout application of bioactivator. The data also suggested that application of bioactivator 10g/plant also significantly increased number of tillering and fresh weight plant and fresh weight of bulb.

The fact indicated that application of bioactivator capable of increasing yield of onion due to the dominant role of fungi of *T. harzianum* isolat Sapro-07. Similar reason that have been suggested in the above paragraph are apply for increasing of yield of onion as a result of application of bioactivator.

4. Conclusion

Result of this study suggested that the addition of biocompost to the soil resulted in higher growth and yield of onion compared with without addition of biocompost. In addition, the growth and yield of onion become much more higher with the additon of bioactivator at level up to 10 t/ha.

Further research should be directed to look at the method of application of biocompost and bioactivator to achieve potential yield of onion used in this study.

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