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Characteristics and Agronomic Efficiency of Fertilizer Urea Granules- Acidic Coated Bamboo *Biochar*Acrylate on Plant Onion Red (*Allium ascaloniucm* L.)

I Kadek Ekadana[1], Dewa Ayu Ari Febriyanti[2*]

[1]Department Industrial Engineering, Mahendradata University, Denpasar, Indonesia
[2]Department Faculty of Agriculture and Business ,Dwijendra University, Denpasar, Indonesia
[1]Email: ikadekekadana@gmail.com
[2]Email: dewaayuarifebriyanti@gmail.com

ABSTRACT

The use of urea-biochar granular fertilizer is intended to overcome the problem of inefficiency in the excessive use of urea fertilizer. The efficiency of urea is relatively low because 40-70% of N is lost from the soil. The purpose of this study was to determine the agronomic efficiency of acrylic acid-coated bamboo urea-biochar fertilizer on shallot plants. The research was conducted in the greenhouse of UPT Plant Pest and Disease Control Center in Celuk Sukawati Gianyar Village, and in the Laboratory of Soil and Environmental Sciences, Faculty of Agriculture, Udayana University, arranged in a Completely Randomized Design with a single factor consisting of 9 treatments and repeated 3 times. The treatments were U_0B_0 (control), U_1B_0 (with urea without biochar), U_0B_1 (with biochar without urea), S_{35} (35% biochar- coated granules), S_{30} (30% biochar-coated granules), S_{25} (25% biochar-coated granules), M_{35} (35% biochar matrix granules), M_{30} (30% biochar matrix granules), M_{25} (25% biochar matrix granules). Parameters observed were plant growth yields (height, weight of tubers and fresh litter, weight of tubers and oven-dried litter, number of tillers), fertilizer agronomic efficiency. The results showed that the S_{30} treatment significantly increased the shallot plant height by 43.67 cm, the weight of the oven-dried bulbs by19.68 g and the RAE value by 362%, so that fertilization with the S_{30} treatment was the most efficient compared to other treatments and could be used by farmers in increasing the growth and yield of shallot plants.

Keywords*:* Acrylic acid, Biochar, Granule, Shallot plants, Urea

*Corresponding Author:
E-mail: dewaayuarifebriyanti@gmail.com (Dewa Ayu Ari Febriyanti)
Department Faculty of Agriculture and Business, Dwijendra University, Denpasar, Indonesia

1. INTRODUCTION

Shallots (*Allium ascalonicum* L.) is one of the spice commodities spices Which worth economy tall Because Lots used as spice food flavorings, food industry raw materials, and traditional medicinal ingredients (Dewi *et al*., 2016). Production onion red in Indonesia from year 2018 until 2021 experienced an increase of 439,376 ha,

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where in 2018 onion production red as much as 1,503,436 ha and in 2021 as many as 1,942,812 ha (Central Agency Statistics (BPS) Indonesia, 2022). The need for red onions is increasing increasing is a potential market opportunity and can be a motivation for farmer for increase production onion red. Wrong One effort Which can done is with application technology fertilization.

Fertilizer Nitrogen (N) hold role Which important in increase onion production, while the most widely used source of N fertilizer is urea. Characteristic urea Which hygroscopic and easy late in water cause use urea sprinkle become very wasteful and can pollute environment (Purnamasari *et al*., 2012). The efficiency of N fertilizer is relatively low (40-70%) because N Fertilizer can be lost from the soil through the processes of denitrification, volatilization, immobilization, washing and fixation of ammonium (Maulinda *et al*., 2017). One attempt What can be done to increase the effectiveness of fertilizer use is by modifying fertilizer to form slow-release fertilizer (Rekso, 2013). Zhang *et al.,* (2018) in his research disclose that with use urea free slow so need urea is reduced 50%, but results harvest increases 20-28%.

In study This, use material experience other as adhesive or the carrier then becomes a special consideration, including charcoal (*biochar)* bamboo as an absorbent and acrylic acid as an emulsifier and adhesive. Application *Biochar* can reduce the level of nitrogen loss in the soil, because *Biochar* is a fertilizer companion material that can hold water and nutrients soil to prevent fertilizer loss due to surface flow (*run off*) and leaching (Ratna, 2016), and can improve soil properties such as pH land and soil CEC (Widowati *et al.*, 2011). Airlangga *et al*., (2021) added that the addition of *biochar* to urea fertilizer causes the release of N become *slow release* so that intake need N on plant can sufficient until harvest.

According to Situmeang (2020) that *biochar* with the addition of inorganic fertilizer can cover lack hara from fertilizer organic, temporary *biochar* with the addition of organic matter is very helpful in improving degraded soil, because organic fertilizer can bind nutrients that are easily lost and help in providing soil nutrients so that fertilization efficiency is higher. Based on the problems above, it is necessary to assess the agronomic efficiency of fertilizers urea *biochar* bamboo webbed sour acrylate on onion plants red.

2. METHODS

2.1 Place And Time Study

Study this is implemented in House glass UPT Control Hall Pest and Plant Diseases in Celuk Sukawati Village, Gianyar, and in the Soil Science Laboratory and the Environment of the Faculty of Agriculture, Udayana University from August to with November 2023.

2.2 Tool And Material

Tool Which used in study is pan granulator, sprayer, sieve (size 20 mesh, 2 mmm and 5 mm), poly bag, plastic 3-kilogram, bucket as well as series tool glass in laboratory For analysis ammonium And nitrate,

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spectrophotometer, *Scanning Electron Microscope* (SEM) *Brand/Type Jeol JSM-IT200*, and kjeldahl macro tool. The material used in this research is bamboo *biochar*, urea fertilizer, tapioca flour, acrylic acid, distilled water, inceptisol soil taken from Plaga Village, And series material chemistry for analysis ammonium and nitrate.

2.3 Method Study

The research used a completely randomized design (RAL) with three replications. The treatment plan used is a simple single factor plan consists of 9 levels. The treatment is U_0B_0 (control/without urea and *biochar*), U_1B_0 (by urea without *biochar*), U_0B_1 (by *biochar* without urea), S_{35} (urea granules *biochar* coated 35%), S_{30} (urea granules coated with *biochar* 30%), S_{25} (urea granules coated *biochar* 25%), M_{35} (urea granules *biochar matrix* 35%), M_{30} (urea granules *biochar matrix* 30%), M_{25} (urea granules matric *biochar* 25%). By thus be found 27 unit's research. Inside testing agronomy fertilizer granules done measurement on several plant parameters and several soil characteristic parameters after harvest. The plant parameters observed included: plant height (cm), weight fresh plants (g), heavy dry oven total plants (g) And amount sapling (child per grove). Soil parameters after harvest include: soil ammonium and nitrate levels (%), N-total land (%) and soil pH. Evaluation efficiency/effectiveness in a way agronomist done with calculation mark Relativity Agronomy (*Relative Agronomic Effectiveness/* RAE).

2.4 Procedure study

In the application of adhesive urea granule fertilizer acrylic acid consists of several stages include preparing planting media, preparing seeds, planting, fertilizing, maintenance, observation and harvesting of shallot plants. Planting media used was inceptisol soil taken in Plaga Village which had already been carried out analysis beginning. The soil will be dried first and sifted 2 mm, after that weigh 8 kg of soil each and then put it in into a polybag measuring 30x35cm. The addition of basic chicken manure fertilizer is done 3 days before planting at a dose of 25g/polybag (10 tons/ha) while adding SP 36 fertilizer at a dose of 0.5g/polybag (200kg/ha), mixed evenly into each each land in poly bag Then incubated for 7 day before plant.

The tubers used as seeds are tubers that are stored for 2-4 months after harvest. The tip of the tuber is cut with a clean knife 1/4 of the length tubers, then soaked in a fungicide solution at a dose of 5 g/liter of water to make the tubers No attacked by mold. Planting done with method put 3 seeds onion red in middle polybag with distance between seeds is 10 cm.

Fertilization continuation done 2 Sunday after plant (SAP) each with addition fertilizer urea 0 .25 g/polybag (100 kg/ha) And fertilizer ZA 0.5 g/polybag (200 kg/ha), fertilization is done by making hole with depth 5 cm nearby tuber onion red. On moment onion plant red at the age of 4 SAP, follow-up fertilizer is given in the form of urea fertilizer with doses 0.25 g/polybag (100 kg/ha), ZA fertilizer 0.5 g/polybag (200 kg/ha), coated granule

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fertilizer 0.281 g/polybag and fertilizer granules matric 0.296 g/polybag.

Maintenance carried out includes watering, replanting, weeding, and pest and disease control. Watering is done as needed capacity field 70 ml/polybag. On moment plant age 2 SAP done stitching on plant Which dead. Weeding weed Which grows in in poly bag done with method unplug using hand. Control pest grasshopper controlled with method manually.

Harvest done on age 70 Day After Plant (HST) Which showed with the condition that some of the plants have fallen, if you hold them the base of the leaves are already limp and pale yellow in color, the tubers are fully formed and are dark red in color and compact seen at ground level so that tubers onion red ready for harvested. Observational data is analyzed using variance (Anova), if different real then data analyzed carry on with test Duncan level 5%.

3. RESULT AND DISCUSSION

Analysis results statistics show that applying fertilizer webbed granules acrylic acid has a very significant effect on plant height and number variables tillers, have a significant effect on the variables of fresh tuber weight and oven dried tuber weight, and had no significant effect on the fresh litter weight and litter weight variables dry oven.

Based on the results of the analysis, it shows that the provision of coated granule fertilizer Acrylic acid had a very significant effect on plant height, except for the S_{35} treatment, giving fertilizer urea granules *biochar* increase plant height onion red compared to the three controls tested (U_0B_0, U_1B_0 , and U_0B_1). However, high Shallot plants between urea *biochar granule fertilizer treatments* were not significantly different except compared to with treatment S_{35}. Treatment U_0B_1 different real with all treatments. Treatment M_{35}, M_{30}, $M_{25,}$ S_{30}, and S_{25} not noticeably different, however significantly different from U_0B_0, U_1B_0 and S_{35} while treatment U_0B_0, U_1B_0 and S_{35} No different real.

Treatment S_{30} show tall plant Which most tall compared to plant other that is 43.67 cm (Table 2). Matter This caused by element hara nitrogen (N) from urea Which contained in formulation fertilizer urea granules *biochar* bamboo adhesive acrylic acid. In the S_{30} treatment have N levels in fertilizer as big as 30% which causes the nutrients needed by shallot plants to be available in optimum and balanced amounts, and plants can absorb the elements The nutrients contained in the fertilizer are used to carry out metabolic processes with Good. Hasibuhan (2009) state that dose fertilizer in fertilization must be appropriate.

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TABLE I
Significance of the effect of acrylic acid coated granule fertilizer on growthonion red

No	Variable Observation	Significance
1	Tall Plant (cm)	**
2	Heavy Bulbs Fresh (g)	*
3	Heavy Litter Fresh (g)	ns
4	Amount Saplings (saplings)/clump)	**
5	Heavy Bulbs dry Oven (g)	*
6	Heavy Litter Oven dry (g)	ns

Information:
** : Influential very real
* : Influential real
NS : Influential No real

Providing N fertilizer contained in urea has a big influence of the increase in plant height, this is due to deep shallot plants Vegetative growth requires high N fertilizer. In line with the statement Riady (2015) that number of elements hara N Which can absorbed by plants can influence amount chlorophyll, tall plant, amount leaf plant And can influence production plants. Apart from content N on urea, matter This Also influenced by the function *of biochar* namely as a buffer Which capable keep element nourish and let go element N is appropriate need plant (Sudjana, 2014). (6 tillers per hill), U_0B_0 and U_1 B_0 (5.33 tillers per hill), S_{35} (5 pups per grove), M_{35} and M_{30} (4.33 tillers per hill), M_{25} (3.67 tillers per hill), and U_0B_1 (3 tillers per hill) which is the lowest number of tillers. Gutomo (2015) in their research stated that tuber formation was greatly influenced by the photosynthetic capacity of the plant. Some of the results of photosynthesis will be sent to the parts roots to initiate tuberization. The greater the results of photosynthesis, the more There is also a large amount of sucrose that can be transferred to the tubers. Increase in N distribution plant will cause increase formation cells new Which will influence process extension And widening leaf, add high And push process growth leaf And sapling plant (Sutedjo, 2008).

Use fertilizer granule urea-*biochar* generally increase in a way real weight of fresh and oven dried tubers compared to control (U_0B_0). However, the weight of the tuber the No different real with heavy tubers plant control Which get treatment fertilizer urea (U_1B_0) nor *biochar* (U_0B_1). Based on Table 5.2 shows that the heaviest weight of fresh onion bulbs at harvest is found in treatment S_{30} ie 30.37g, followed by treatment S_{25} (26.10g), M_{30} (23.41 g), U_0B_1 (22.56 g), U_1B_0 (21.86 g), M_{35} and M_{25} 15.24 g each, S_{35} (14.18 g) and U_0B_0 (12.78 g) which is the lowest fresh tuber weight. The weight of fresh litter at harvest is heaviest There is solid M_{30} treatment namely 4.26 g, followed by the U_0B_0 treatment (2.99 g), M_{25} (2.63 g), U 1 B 0 (2.28 g), S_{30} (2,11 g), M_{35} (1.82 g), S_{25} (1.72 g), U_0B_1 (1.28 g) And S_{35} (0.35 g) which is heavy litter fresh lowest.

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In the S_{30} treatment (fresh tuber weight) and M_{30} (fresh litter weight) has The N content in each fertilizer is 30% which is due to the presence of The addition of biochar to urea fertilizer causes the release of N to be *slow release* so that intake of N requirements on plants can sufficient until harvest (Airlangga *et al*., 2021). Providing adequate nitrogen can help hormones Cytokinins are more responsive to plants. Cytokinin hormones play an important role in new shoot growth , number of shoots up to number of leaves. This is in line with statement Lakitan (2008) that nitrogen in network plant is constituent components of many essential compounds for plants, for example acidsamino.

Use fertilizer granule urea-*biochar* generally increase in a way real fresh and oven-dried tuber weight compared to control (U_0B_0). However, the weight of the tuber the No different real with heavy tubers plant control Which get treatment fertilizer urea (U1 B0) nor *biochar* (U_0B_1). Based on Table 2. showed that the highest fresh tuber weight value was found in the S_{30} treatment with mark 30.37g, Which different No real with U_0B_0 , U_1B_0 , M_{30} And S_{25}, However significantly different from the U_0B_1 , U_0B_0 treatments and S_{35} . Treatment U_0B_0 real different with all treatments, while the lowest fresh tuber weight was found in treatment U_0B_1 which has weight tubers as big as 12 .78 g.

Fertilizer granule urea *biochar* bamboo webbed sour acrylate Which tested on Shallot plants, apart from containing N, also contain the nutrient potassium (K). as big as 0.37% based on results test SEM-EDS. Ispandi (2003) in his research stated that hara Very K required in the formation, enlargement and tuber elongation. Abdulrachman and Susanti (2004) added that giving sufficient K fertilizer in the soil causes onion growth more red optimal. The balance of nutrients, especially K, in the soil plays a very important role Synthesis of carbohydrates and protein so it really helps enlarge onion bulbsred (Sutrisna *et al* ., 2003).

TABLE II
Effect of giving granule fertilizer coated with acrylic acid on growth and results plants onion red

Treatment	Variable Observations						
	Height plants(cm)	Amount son (children per bunch)	Heavy tuber fresh (g)	Heavy tubers dryoven (g)	Heavy litterfresh (g)	Heavy litterdry oven (g)	Mark RAE (%)
U 0 B 0	34.00 c	5.33 a	12.78 c	6,28 c	2,99 a	0,59 a	0
U1B0	34,67 c	5,33 a	21,86 a	9,98 a	2,28 a	0,79 a	100
U0B1	35,67 b	3,00 d	22,56 a	11,58 a	1,28 a	0,43 a	143
M35	40,00 a	4,33 b	15,24 b	7,51 b	1,82 a	0,54 a	33

Journal of Sustainable Development Science
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M30	42,33 a	4,33 b	23,41 a	13,23 a	4,26 a	0,81 a	188
M25	40,67 a	3,67 c	15,24 b	7,81 b	2,63 a	0,63 a	41
S35	34,67 c	5,00 a	14,18 b	7,48 b	0,56 a	0,27 a	32
S30	43,67 a	6,00 a	30,37 a	19,68 a	2,11 a	0,74 a	362
S 25	42.00 a	7.00 a	26.10 a	16.80 a	1.72 a	0.51 a	284

4. CONCLUSIONS

Based on the research results and discussion that have been described, it can be concluded that there are differences in agronomic efficiency resulting from several formulations of bamboo biochar urea granule fertilizer coated with acrylic acid, so that the proportion of fertilizer recommended for commercialization is S30, because it significantly increases the height of shallot plants by 42 cm, fresh tuber weight is 26.10 g, oven dried tuber weight is 16.80 g and RAE value is 284%, so fertilization with S30 treatment is the most efficient treatment and can be utilized by farmers.

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