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Growth and Yield of Pak Choy (*Brassica rapa* L.) under Organic and Inorganic Fertilizer Applications in Latosol Soil

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ABSTRACT

Pakchoy is a vegetables crop with high economic and nutritional value. It also exhibits rapid growth and can thrive in both warm and cool climates, making it is suitable for cultivation in both highland and lowland areas. This study aimed to determine the optimal combination and dosage of organic and inorganic fertilizers. The research was conducted from March to April 2025 in the Greenhouse of the Experimental Garden, Faculty of Agriculture, Udayana University. A factorial randomized complete block design (RCBD) was used, with the first factor being organic fertilizer (compost) at four levels: 0, 20, 40, and 60 g/plant, and the second factor being inorganic fertilizer (urea) at four levels: 0, 1, 2, and 3 g/plant. Each treatment was replicated three times. The results showed that the application of inorganic fertilizer (urea) alone had a significant effect effect on plant height, root length, fresh and dry root weight, and fresh plant weight. Inorganic fertilizer (urea) at the 2 g/plant dosage showed the highest and significantly different value for the fresh weight variable (107.67 g). On the other hand, organic fertilizer (compost) alone does not have a significant effect on any of the observed variables. Moreover, no significant interaction was found between the two factors.

Keywords: Latosol, Urea, Pakchoy

INTRODUCTION

Pakcoy mustard greens (*Brassica rapa)* L.) is one of the plant vegetables that have mark economical and highly nutritious, besides that its growth Enough fast and can grow with good in a temperate environment hot and climate cold so that can cultivated in the area plains tall and plains low (Jaya and Joseph, 2024). Pakcoy mustard greens contain diverse substance nutrition food Which essential for health body namely protein, fat, carbohydrates, Ca, P, Fe, provitamin A, vitamin B, vitamin C, minerals and fiber. increase growth and yield pakcoy, among others can done with fertilization. Fertilization can done through root and leaf.

Fertilization through root can in the form of fertilizer organic and inorganic with objective for add nutrient to in media plant. Use fertilizer inorganic is method fastest for maintain productivity plants, because nutrients that given is at in easy ion form available for plant. According to Sunarjono (2013), needs urea plant fertilizer mustard greens per hectare is 300kg (equivalent to

1.9g/ plant). Meanwhile material organic contained in in fertilizer organic capable repair characteristic physical, chemical and biological soil. Fertilizer organic rich in nature macro nutrient content However nutrient content its relative micro low, so that in the application required in amount many (Kirana *et al.* 2023). Research Busyairi *et al*. (2024) on plants pakcoy, a dose of 100g/polybag provides results best. In order to overcome constraint in use fertilizer inorganic and fertilizer organic above, then required something efforts that can be made pressing use material chemistry in field agriculture, maintaining fertility land, increase quality production and increase income farmer. The purpose of study This is for know dose fertilizer the best organic (compost) and inorganic (urea), as well as its interaction on growth and yield plant bok choy.

MATERIALS AND METHODS

Materials used in study This that is seed pakcoy, seedling tray, fertilizer compost, fertilizer urea, latosol soil and polybags.

Study implemented from March 2025 to April 2025 in the Garden Test Faculty Agriculture (KPFP) Udayana University, with use design random factorial group (RAK) with factor First that is dose fertilizer organic (compost) with 4 level treatment that is: 0, 20, 40, 60 g/plant , whereas factor second that is dose fertilizer inorganic (urea) with 4 level treatment that is : 0, 1, 2, 3 g/plant. Observed variables is tall plants, number leaves, long roots, fresh weight and weight dry roots, fresh weight and weight dry plant.

Study This started with seeding seed bok choy in a tray containing soil and fertilizer media (1:1), where the seeds soaked in warm water and only seed planted sink one by one hole, then the tray is closed plastic black during two day and watered twice a day. After 14 days, the seeds Healthy moved into a polybag measuring 20x20 cm (diameter 12 cm) which has been filled with soil and fertilizer media organic in accordance treatment (0g, 20g, 40g, 60g), and arranged with distance 10x10 cm in House glass. Maintenance covering embroidery (3 HSPT), fertilization inorganic (14 HST, dose 1, 2, 3 g/plant), watering twice a day, weekly manual weeding, as well as hilling in accordance needs. Harvesting is carried out at 35 days of age after planting with pull out plants and cleaning root from the media.

RESULTS AND DISCUSSION

Results analysis variety (ANOVA), administration fertilizer urea show mark influential very real to variables growth and results plant pakcoy, namely plant height, and influential real on variables long roots, fresh and dry weight roots, and heavy fresh plants. Treatment fertilizer compost no show influence real to variables Which observed, and no there is influence interaction between second factor Which tested (Table 1).

Giving compost with four level treatment (K0 - K3) shows influence No real to all over growth and biomass plants. Height plant range between 22.84 cm to 23.78 cm, the number leaf relatively stable between 15–15.42 strands, And long root range between 28 cm to 29.49 cm (Table 2). This show that compost on level which given not yet capable give improvement growth vegetative meaning. Likewise, the fresh and dry weight parameters roots, and fresh and dry weight plants, no there is trend growth that real. Fresh weight of plants A little more high in the K0 treatment (89.08 g), however difference This No too big compared to treatment others. It is suspected that the compost given need time longer to decompose and release nutrients in general effective. With Thus, the optimal benefits of compost possibility new can felt in term more time long. This result in line with research by Azeem *et al.* (2014) which states that decomposition compost need time for

release nutrients in available forms for plants, especially nitrogen and phosphorus. Research by Duddigan *et al.* (2021) also shows that response plant to application compost new significant after season planting second or third, when compost has decompose more advanced and integrated to in land. Different with compost, giving urea provides real impact to several observation parameters.

At high parameters plants (Table 2), treatments U1 (24.38 cm) and U2 (24.21 cm) were different real compared with U0 (21.77 cm), indicating that administration of urea increases growth title plant in a way significant. This shows that element nitrogen from urea fast available and absorbed plant, so that stimulate formation network vegetative. This result in line with study Susanti *et al.* (2018) which explains that application of urea significant increase growth plant kailan (*Brassica oleracea* var. alboglabra) in the ground Ultisol, in particular in increase amount leaves and weight plants. Findings This show that nitrogen from urea play a role important in stimulate development vegetative plant vegetables. Besides That, Kogoya *et al.* (2017) found that optimal urea dose can increase tall plant spinach pull out white (*Amaranthus tricolor* L.) real on soil media, which shows effect positive urea fertilizer on plants vegetables that grow in the ground with fertility low such as Latosol. Research Vidasari *et al.* (2021) also supports matter Where is this giving urea fertilizer increases tall plant spinach land (*Ipomoea reptans)* Poir) in significant in Latosol soil. In addition, research by Agustin and Suntari (2018) also reported that urea application together compost capable repair characteristic chemistry land and improve growth plant corn, especially on the ground with fertility low like latosol soil.

In addition to plant height, the increase growth is also seen in the number of strands leaves that go hand in hand increasing urea dose, there was also an increase strands leaf However results the different No real between factor Which tested. Matter This in line with study Susanti *et al.* (2018) who reported that application fertilizer organic and inorganic in plants vegetables in Latosol soil show variation amount leaves that are not significant, although there is trend improvement amount leaves in doses fertilizer certain.

Table 1. Significance Influence Fertilizer Compost, Urea Fertilizer, and Interactions with Plant Growth and Yield Pakcoy

No	Variables Observation	Compost (K)	Urea (U)	Interaction (KxU)
1	Tall Plant	ns	**	ns
2	Amount Leaf	ns	ns	ns
3	Long Root	ns	*	ns
4	Heavy Fresh Root	ns	*	ns
5	Heavy Dry Root	ns	*	ns
6	Heavy Fresh Plant	ns	*	ns
7	Heavy Dry Plant	ns	ns	ns

Information :

ns : influential No real ($P \geq 0.05$)

* : influential real ($P<0.05$)

** : influential very real ($P<0.01$)

The length parameter roots (Table 2), U0 treatment (without urea) actually produce root longest (30.88 cm), which is different real from other urea treatments namely U1(28.13 cm), U2 (27.71 cm), and U3 (27.84 cm).

This matter indicates that administration of urea in amount tall tend pressing growth root, possibility consequence domination growth vegetative part on like stem And the leaves caused by nitrogen, as well decrease exploration root Because high nutrient availability in the root zone. This result supported by research Nurhalimah *et al.* (2019) shows that application excess nitrogen in plants spinach in latosol soil causes decline long root Because growth plant more focused on the part on than system roots.

Table 2. The Effect of Compost and Urea Fertilizer on parameter Tall Plants, Number of Leaves, and Root Length

High Treatment	Plant (cm)	Amount Leaf (helai)	Long Root (cm)
Compost			
K0	23.78	15.08	28.49
K1	22.84	15	28
K2	23.34	15	29.49
K3	23.02	15.42	28.58
Urea			
U0	21.77 b	14.92	30.88 a
U1	24.38 a	14.5	28.13 a
U2	24.21 a	16	27.71 ab
U3	22.63 ab	15.08	27.84 ab

Description : The numbers that followed with letter Which same in column and in the group compost and urea different No real based on the DMRT test (α = 5%).

Table 3. Influence Fertilizer Compost and Urea Fertilizer on Fresh Weight of Roots, Root Weight Root Dryness, Plant Fresh Weight, and Dry Weight Plant

Severe Treatment	Fresh Root (g)	Heavy Dry Root (g)	Heavy Fresh Plant (g)	Heavy Dry Plant (g)
Compost				
K0	6.25	1.17	89.08	5.76
K1	6.08	1.1	85.25	6.1
K2	6	1.05	84.67	5.93
K3	6.5	1.22	88.25	5.8
Urea				
U0	7.50 a	1.33 a	68.83 b	5.61
U1	5.67 ab	1.13 ab	85.50 ab	5.91
U2	6.67 ab	1.19 ab	107.67 a	6.51
U3	5.00 b	0.88 b	85.25 ab	5.55

Description : The numbers that followed the letter that same in column and in groups compost and urea are different No real based on the DMRT test (α = 5%).

Improvement long roots in treatment without urea (U0) also occurs in the variable fresh weight of roots, with fresh weight of roots. The highest (Table 3) was recorded at U0 (7.50 g) and differed real compared to U3 (5.00 g). This is show that in condition without addition of urea, plants allocate more Lots biomass in the roots, possibly as mechanism adaptive for increase absorption nutrients. The results supported by the results study Sartika and Suprapta (2019), Which show that accumulation biomass roots of plants mustard in Latosol soil tend increase without excess nitrogen due to system root more develop for look for nutrients in general active. In addition, Rahman *et al.* (2020) also noted that balance between organic and inorganic nutrients important in support growth optimal roots in the soil Latosol type which has ability adsorption tall to nitrogen.

Dry weight roots also show pattern similar (Table 3). U0 gives results highest (1.33 g), different real compared to U3 which only of 0.88 g. This confirms that high urea dose (U3) actually lower growth system roots, which may caused by nitrogen saturation in the root zone or imbalance other nutrients. Matter This strengthened by study Nurcahyani *et al.* (2021) who reported that improvement nitrogen dosage tends to lower ratio roots - crowns of plants mustard Because domination growth leaf.

Different with growth interconnected roots fresh and dry weight show similar value, fresh weight of the plant precisely highest in the U2 treatment (107.67 g), which is statistics different real from U0 (68.83 cm) and different No real with U1 (85.50 g) and U3 (85.25 g). This is show that administration of urea at a dose is (U2) pushing growth part on plant. Dry weight the highest plant was at U2 (6.51 g), however mark the different No significantly in other treatments tested (Table 3). These results support conclusion that combination proper nitrogen requirements very important For increase total crop productivity. Rolanda *et al.* (2021) stated that availability of nitrogen in amount enough (not excessive and less) support formation network plant in a way active, especially in plants responsive vegetables to macronutrients like nitrogen.

Application fertilizer nitrogen Which appropriate can increase biomass plant mustard in a way significant, but use fertilizer organic still required for guard quality land term long, especially on Latosol soil which tends to sour and nutrient poor. Arifin *et al.* (2022), stated that administering nitrogen at the optimum dose is capable of increase heavy dry plant mustard green in a way significant. Increase heavy dry the related close with sufficient nitrogen availability for support formation compound organic main in body plant like amino acids, proteins, and chlorophyll.

Analysis results fingerprints variety show that no there is real interaction between factors tested, so each factor influential in a way independent to observed variables.

CONCLUSION

Use fertilizer organic (compost) based statistical test results show mark influential No real to all observed variables. Fertilizer inorganic (urea) with dose 2 g/plant show mark highest and different real with dose 0 g/plant on variable plant fresh weight (107.67 g) and (68.83 g) or increase by 56.42%. The results show urea fertilizer dose 2 g/plant give results best. Second factor Which tested that is dose fertilizer organic and inorganic no show its interaction on variables observed growth and results.

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