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The Effectiveness of Liquid Organic Fertilizer Banana Peel Kepok and Onion Peel to Plant Growth Ciplukan (*Physalis Angulata* L.)

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ABSTRACT: Ciplukan (*Physalis angulata* L.) is a medicinal plant that grows wild in tropical climates that has many properties to cure various degenerative diseases. This plant is relatively rare because it is often considered a weed. Banana peels and shallots can be used as liquid organic fertilizer (POC). Liquid organic fertilizer has the advantage that the nutrients contained are more quickly and easily absorbed by plant roots. The purpose of this study was to determine the growth of ciplukan (*Physalis angulata* L.) plants through the provision of various doses of liquid organic fertilizer kepok banana peel and shallot skin and determine the best dose of liquid organic fertilizer in affecting the growth of ciplukan (*Physalis angulata* L.) plants. The method used in this research is an experiment consisting of independent variables, namely liquid organic fertilizer of kepok banana peel and shallot skin and the dependent variable is the growth of ciplukan plants (*Physalis angulata* L.). The sample used in this study was the Ciplukan plant (*Physalis angulata* L.). Sampling using group randomized design (RAK) technique. This experimental method uses 5 treatments and each treatment is repeated as many as 5 repetitions, thus there are 25 experimental units of ciplukan (*Physalis angulata* L.) plant samples with concentrations of 0 ml, 15 ml, 25 ml, 35 ml, and 45 ml with the observation parameters measured are plant height, stem diameter, number of leaves, and leaf width. The results showed that liquid organic fertilizer of kepok banana peel and shallot skin had an effect on the growth of ciplukan (*Physalis angulata* L.) plants. The concentration of 35 ml/polybag gives a better effect on plant height, stem diameter, and leaf width in ciplukan (*Physalis angulata* L.) plants compared to the control treatment and other treatments.

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KEYWORDS: Ciplukan, Liquid organic fertilizer, Growth

INTRODUCTION

Indonesia is a fertile country and rich in plantations and agriculture. The existing potential can be used as a source of livelihood for the people of Indonesia. Medicinal plants are of great importance for human life and health. In general, this medicinal plant has properties to cure various diseases that exist in the human body in herbal and can be used as an antioxidant.

Ciplukan (*Physalis angulata* L.) is a wild plant that is still considered a weed by farmers, so its existence is increasingly rare, it is no wonder if the fruit is sold at a fantastic (Muhlisin, 2019). Ciplukan fruit has benefits, which can treat heart disease, asthma drugs, blood pressure drugs, stroke drugs, cancer drugs, diabetes drugs, and efficacious as a urine purifier, reduce fever, eliminate jaundice in infants, increase intelligence, relieve pain in the joints, lower cholesterol, increase blood as well as toxic substances in the body (Mahany, 2016).

Ciplukan fruit contains antioxidants that are quite high. The content of antioxidants in ciplukan fruit is phenolic which can prevent cancer. Ciplukan fruit is rich in vitamins, including vitamin A, vitamin C, vitamin D and vitamin K. Vitamin A can nourish the eyes, vitamin C can improve the body's metabolism, vitamin D besides being good for bones and teeth, can also prevent degenerative diseases, while vitamin K is efficacious in improving reproductive health (Rachmawati, 2019).

Ciplukan leaves are known to contain various compounds, including chlorogenic acid, elaidic acid, citric acid, malic acid, tannin, cryptoxanthin, physalin, saponin, terpenoids, flavonoids, polyphenols, alkaloids and steroids (Rohyani *et al.*, 2015). Such compounds have anti-inflammatory activity (Maifitrianti *et al.*, 2019), flavonoids are compounds that provide red, yellow, orange,

blue and purple color pigments in plants so it is suspected that mature ciplukan fruits that are yellow to Orange have many flavonoid compounds (Arifin & Ibrahim, 2018).

The problem of seed scarcity is a classic problem faced by farmers. Seed dependence on imports and the availability of seeds on the market are obstacles to increasing production. Ciplukan plants that have been classified as rare, because as weeds or nuisance plants that must be eradicated, making it difficult to find in rice fields as wild plants. In recent years since 2016, ciplukan fruit has been sold in malls at high prices (Deviana, 2019), then ciplukan plants began to be cultivated again, but novice farmers who try to cultivate ciplukan plants are constrained because of the absence of seeds.

From *survey* the preliminary survey results, it is known that 92.9% have seen ciplukan fruit and have consumed it about 67.9%, but only 35.7% know that ciplukan fruit contains chlorogenic compounds that are beneficial for the health of the body. This picture indicates that public knowledge about the benefits of ciplukan fruit as a food ingredient that supports the health of the human body is still relatively low, so it is natural that ciplukan fruit has not become a necessity for some people to consume it regularly as a daily food or beverage menu (Tajidan *et al*., 2020).

Banana kepok commonly consumed by the public only the flesh of the fruit is processed as fried, then the skin of the fruit is discarded as garbage, causing an unpleasant odor if not managed properly. If left unchecked kepok banana peel can cause accumulation of waste (Rambitan & Mirna, 2013).

The extensive use of shallots, especially as a seasoning for dishes, also produces a lot of waste from onion skins. Onion peel waste has been rarely used and simply thrown away. The outer part of this onion bulb contains food reserves containing flavonols of about 3.82 mg / kg from the flavonoid group which has antioxidant activity. Onion peel contains growth regulators (ZPT) that are needed by plants such as abscisic acid, indolacetic acid, gibberellin acid, and cytokinins as well as substances or compounds that can potentially kill caterpillar pests and accelerate root growth. Red onion peel (*Allium cepa* L.) contains compounds that are beneficial to plants such as auxin hormones that can stimulate the growth of shoots, flowers, and roots (Fadhil *et al*., 2018).

Based on this, a solution is needed to handle the peel of bananas and onions. One solution that can be done is kepok banana peel and shallots are used and processed into more useful materials, such as processed into liquid organic fertilizer (POC). Liquid organic fertilizer has the advantage that the nutrients contained more quickly and easily absorbed by plant roots (Novianto *et al.*, 2014), while inorganic fertilizers have a negative impact on the environment. The elements contained by the kepok banana peel include macro elements N, P, and K. It also contains microelements namely Ca, Mg, and Zn which function as immunity and fertilization in plants (Rambitan & Mirna, 2013). The aim of this study is to determine the effectiveness of liquid organic fertilizer kepok banana peel and onion peel on plant growth ciplukan (*Physalis angulata* L.).

MATERIALS AND METHODS

This research was conducted in the courtyard of a private house in Perum Vila Asri Block F No. 25, Mustika Jaya District, Mustika Jaya village, Bekasi city. The implementation of this research took place in March-August 2023.

Tools that will be needed in the study are a small shovel, *polybag* size 15 x 15 cm, roll meter, used bottles, *handsprayer* 500 ml, bucket, camera, stationery, and solatip paper. As for the materials to be used in the study are ciplukan plant seeds, NPK fertilizer, furadan, burnt husk, water, kapok banana skin, onion skin, fermented raw husk, and manure.

This study was conducted using a randomized design method group (RAK) with one factor that is in this study there is a control group that was not given liquid organic fertilizer (P_0) from waste kepok banana skin and onion skin, and the treatment group that was given liquid organic fertilizer kepok banana skin waste and onion skin with a dose of 15 ml ($P1_1$), 25 ml ($P2_2$), 35 ml ($_3P3$), and 45 ml ($P4_4$). With 25 experimental units with 5 treatments that are repeated 5 times, and each treatment consists of 1 unit. Each experimental unit consisted of one ciplukan seed planted in *a polybag*, so there were 25 seeds of Ciplukan (*Physalis angulata* L.) are planted in *polybags*.

How to make POC kepok banana skin and onion skin that is the first step is to first clean the used bottles that will be used, then prepare kepok banana skin as much as 10 pcs and onion skin as much as 20 cloves, then kepok banana skin sliced small so that it can be inserted into the bottle while the onion skin can into the bottle, after the banana peel and onion kepok mixed in the bottle then add water as much as 2.5 liters into the bottle to the limit of the bottle neck, after that the bottle can be closed tightly and allowed to stand for 3-4 days, the bottle cap is opened every day so that the gas contained in the bottle before using the fertilizer can be filtered first to make it easy to apply.

After making the POC, seed planting preparation is done with (1). Menyiapkan *polybag* berukuran 15 x 15 cm. Then enter the planting media in the form of a mixture of fermented raw husk, NPK fertilizer, furadan, drum fertilizer, and burnt husk into *polybags* up to ½ part of *the polybag*. (2). After the planting media is ready, then hole the media 3-5 mm deep and then each hole in *the polybag* is filled with 1 ciplukan seed and closed again with planting media using a small shovel. And give liquid organic fertilizer kepok banana skin and onion skin (experimental) applied by dissolving it in 2.5 liters of water, then sprayed on the leaves using *a handsprayer* with a spray volume of cc/liter sprayed in the morning. (3). Watering the plants is done once or twice a day adjusted to the conditions of the growing medium to keep it moist. (4). Then, each *polybag* is affixed with a label using a paper solatip in

accordance with the plant trial design table that has been made previously. (5). Make observations or control on the plant every day, if there are weeds around the plant immediately cleaned so as not to inhibit the growth process in the plant.

Plant size parameters were performed at the age of 14, 21, 28, and 35 days after planting (HST). The observed are as follows:

1. **Plant height (cm)**
   The part that is measured starting from the base of the stem to the highest part of the plant using a meter roll or ruler.
2. **Rod Diameter (mm)**
   The diameter of the STEM is measured at the base of the stem the same as in the measurement of plant height by using a roll meter.
3. **Number of leaves (strands)**
   The number of leaves per stalk is calculated based on the number of leaf sheets that have been fully opened.
4. **Leaf width (cm)**
   The measured Leaf is a leaf whose size has been perfectly open by using a meter roll or ruler.

RESULT AND DISCUSSION

Plant Height

Based on the results of data analysis of liquid organic fertilizer treatment kepok banana peel and onion peel with different concentrations of 0 ml as the control group (P_0), 15 ml (P_1), 25 ml (P_2), 35 ml (P_3), and 45 ml (P_4) as the experimental group showed that the application of liquid organic fertilizer kepok banana peel and onion peel significantly affect the plant height ciplukan (*Physalis angulata* L.). Giving liquid organic fertilizer kepok banana skin and onion skin with a dose of 0 ml (P_0) is the highest average treatment dose of 6.80 cm. The results of the analysis can be seen in detail in Table 1.

Giving liquid organic fertilizer has no effect on plant height ciplukan (*Physalis angulata* L.) at the age of 14 HST and 21 HST because the roots of plants have not been fully formed therefore the absorption response of the elements of the haranya was also still in small quantities. So that the plant ciplukan (*Physalis angulata* L.) at the age of 21 HST there was one plant that died after being given the treatment.

In plants ciplukan (*Physalis angulata* L.) which is already 28 HST, this liquid organic fertilizer gives a real effect between the treatments given to the increase in plant height because the roots of the plant have been fully formed so that it is able to absorb nutrients in large quantities. This is also suspected because liquid organic fertilizer contains Nitrogen which can spur the growth of apical meristem so that the plant grows longer. Apical Meristem is found at the end of the STEM and branches and root tips and always produces cells to grow lengthwise (Mahardika, 2009). According to (Setyamijaya, (1986) in Rahmah *et al.*, (2014) nitrogen elements present in liquid organic fertilizers are able to influence the growth of apical meristems to be able to develop. Plant height is influenced by the provision of Nitrogen that can increase plant height up to 35 cm higher than plants that are not given Nitrogen (Zubachtirodin and Subandi (2008) in Rahmah *et al.*, (2014). Plant height is a growth parameter that is often observed because it can indicate the influence of the environment or the treatment given. From the data that has been analyzed by one-way ANOVA test that the treatment of liquid organic fertilizer kepok banana skin and onion skin significantly affect the plant height ciplukan (*Physalis angulata* L.) at the time of observation 28 HST, so that further tests must be carried out using *the T test*. The results of *the t-test* showed that the treatment of P_3 with a dose of 35 ml is better than the treatment of P_0, P_1, P_2, and P_4.

Liquid organic fertilizer to plants ciplukan (*Physalis angulata* L.) at the age of 35 HST does not affect the height of the plant because the plant has entered the end of the vegetative period therefore the increase in plant height has begun to stop. In plants ciplukan (*Physalis angulata* L.) this is 35 HST there are two plants that died due to the rather hot ambient temperature conditions in the research site so that the process of plant growth is inhibited. So that at the time of the study from 21 HST to 35 HST only 22 plants ciplukan (*Physalis angulata* L.) who survive. The results of the analysis showed that the treatment of POC concentration of banana peel and onion peel significantly affect the diameter of the stem of the plant ciplukan (Physalis angulata L.) when the plant is 28 HST. The results of the analysis can be seen in detail in Table 2.

Table 1. Effect of POC Concentration of Kepok Banana Peel and Onion Peel on Plant Height

Treatment	Height of plant (cm)			
	14 HST	21 HST	28 HST	35 HST
P_0	4,40	5,00	6,80	4,18
P_1	3,86	4,84	6,06	6,40
P_2	3,92	5,20	6,60	6,64
P_3	3,78	3,94	4,58	5,14
P_4	3,84	3,50	3,50	3,96

Note: the number followed by the same letter in the same column is significantly different at 5% based on the DMRT test

Application of liquid organic fertilizer kepok banana skin and onion skin with a dose of 0 ml (P_0) is the highest average treatment dose of 0.82 cm. From the data that have been analyzed by one-way ANOVA test that the treatment of liquid organic fertilizer kepok banana skin and onion skin significantly affect the diameter of the stem of the plant ciplukan (*Physalis angulata* L.) at the time of observation 28 HST, so that further tests must be carried out using *the T test*.

Rod Diameter

The results of *the t-test* showed that the treatment of P_3 with a dose of 35 ml (P_3) is better than the treatment of P_0, P_1, P_2, and P_4. According to Djamaluddin (1983) in Indah *et al*., (2014) stated that the increase in stem diameter is caused by good plant growth because the nutrients needed are quite available. The growth of stem diameter is influenced by the application of fertilizers and physiological processes that occur in the body of the plant, namely the process of photosynthesis, respiration, and translocation. Soil as a medium to grow plants can not always meet the needs of nutrients to support the availability of nutrients and therefore required the addition of nutrients in the form of fertilizer (Satria *et al*., 2015).

Table 2. Effect of POC Concentration of Kepok Banana Peel and Onion Peel on Stem Diameter

Treatment	Diameter of Stem (mm)			
	14 HST	21 HST	28 HST	35 HST
P_0	0,64	0,58	0,82	0,50
P_1	0,50	0,50	0,78	0,78
P_2	0,56	0,50	0,72	0,74
P_3	0,54	0,52	0,64	0,70
P_4	0,60	0,40	0,50	0,50

Note: the number followed by the same letter in the same column is significantly different at 5% based on the DMRT test

Number of Leaves

Table 3. Effect of POC Concentration of Kepok Banana Peel and Onion Peel on The Number of Leaves

Treatment	Number of Leaves (pieces)			
	14 HST	21 HST	28 HST	35 HST
P_0	4,80	4,40	3,80	3,00
P_1	4,00	4,00	3,20	5,00
P_2	4,00	3,80	3,20	4,20
P_3	4,40	4,00	4,20	4,80
P_4	5,20	3,40	3,20	4,00

Note: the number followed by the same letter in the same column is significantly different at 5% based on the DMRT test

Based on the results of data analysis in Table 3. showed that the treatment of liquid organic fertilizer kepok banana peel and onion peel does not significantly affect the variable number of leaves in all elements of observation. The average number of leaves in each treatment showed almost the same number of leaves at each age of observation, namely 14 HST, 21 HST, 28 HST, and 35 HST.

This is allegedly due to the low concentration of liquid organic fertilizers. In each treatment, dilution of liquid organic fertilizer dissolved in 2.5 liters of water is still not able to increase the number of leaves during the vegetative growth of plants. Nutrients contained in liquid organic fertilizers and in the soil is not enough and balanced to increase the number of leaves of plants ciplukan (*Physalis angulata* L.). In other words, the dose of liquid organic fertilizer given is not able to spur plant growth. The ability of plants ciplukan (*Physalis angulata* L.) grow allegedly derived from the supply of nutrients from the soil.

The dose of administration in all treatments is low so that it is not able to increase the growth rate of plants, as stated by Sarief (2010) that the provision of fertilizer tailored to the needs of plants. When given in excessive amounts will cause poisoning or even inhibit plant growth. While the administration of less dosage can not provide a significant effect. In this variable number of leaves giving liquid organic fertilizer at 14 HST, 21 HST, 28 HST, and 35 HST has no effect on the number of leaves in plants ciplukan (*Physalis angulata* L.), this is because at the beginning of the plant growth period has not been able to absorb nutrients to the fullest, indicating that the application of this type of liquid organic fertilizer gives the same effect on each treatment at the age of plants 14 HST to 35 HST.

Leaf Width

Based on the results of data analysis showed that the treatment of liquid organic fertilizer kepok banana peel and onion peel significantly affect the width of the leaves of plants ciplukan (*Physalis angulata* L.). Application of liquid organic fertilizer kepok

banana peel and onion skin with a dose of 15 ml (P_1) is the highest average treatment dose of 2.84 cm. The results of the analysis can be seen in detail in Table 4.

Table 4. Effect of POC Concentration of Kepok Banana Peel and Onion Peel on Leaf Width

Treatment	Width of leaves (cm)			
	14 HST	21 HST	28 HST	35 HST
P_0	2,42	2,52	2,76	1,82
P_1	2,28	2,36	2,68	2,84
P_2	2,40	2,46	2,46	2,62
P_3	2,34	2,46	2,20	2,44
P_4	2,20	2,14	1,68	1,82

Note: the number followed by the same letter in the same column is significantly different at 5% based on the DMRT test

Based on the data that has been analyzed by one-way ANOVA test that the treatment of liquid organic fertilizer kepok banana skin and onion skin significantly affect the width of the leaves of plants ciplukan (*Physalis angulata* L.) at the time of observation 28 HST, so that further tests must be carried out using *the T test*. The results of *the t-test* showed that the treatment of P_1 with a dose of 15 ml is better than the treatment of P_0, P_2, P_3, and P_4. The average width of the leaves of the plant ciplukan (*Physalis angulata* L.) the largest is found in the treatment of P_1 and the lowest in the treatment of P_0. Wide leaf plant ciplukan (*Physalis angulata* L.) the largest at the age of 35 HST is 2.84 cm while the width of the leaves are small plants at the age of 14 HST is 2.42 cm. Menurut Sarif *et al.*, (2015) the element Nitrogen plays an important role in the vegetative growth of plants, in addition, when the element Nitrogen is sufficient, plant leaves will grow larger and expand the leaf surface available for photosynthesis. A high supply of Nitrogen will accelerate the conversion of carbohydrates into protein and is used to build cell walls. Nitrogen fertilization has a noticeable influence on leaf extension, especially on leaf width and area.

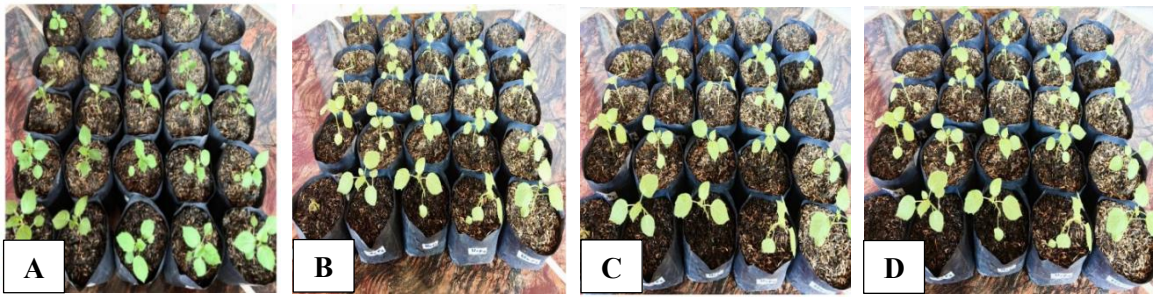

FIG.1: OBSERVATION OF THE GROWTH OF CIPLUKAN PLANTS IN DIFFERENT TIME PERIODS: (a) 14 DAP, (b) 21 DAP, (c) 28 DAP, and (d) 35 DAP

Based on the results of research and discussion that has been reviewed, it can be concluded that liquid organic fertilizer banana peel and onion peel kepok influence on plant growth ciplukan (*Physalis angulata* L.) only when the plant is 28 HST. This study was conducted at Perum Vila Asri, Bekasi. By providing various doses of liquid organic fertilizer banana skin and onion skin kepok this effect on the parameters of observations which include plant height, stem diameter, and leaf width, while for the parameters of the number of leaves of liquid organic fertilizer banana skin and onion skin kepok no effect because the nutrients contained in the soil is not enough and not balanced, so that the number of leaves of the plant ciplukan (*Physalis angulata* L.) in each observation ranging from 14 HST to 35 HST have almost the same number. The parameters of plant height, stem diameter, and leaf width are influenced by the plant ciplukan (*Physalis angulata* L.) aged 28 HST while the Leaf width parameter has no influence in each observation. The concentration of 35 ml /*polybag* gives a better effect on plant height, stem diameter, and leaf width in plants ciplukan (*Physalis angulata* L.) compared with control and other treatments.

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