

Effectiveness of Using Chicken Manure and Organic Liquid Fertilizer in *Ciplukan* Plant Cultivation (*Physalis angulata L.*)

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Abstract The ciplukan plant is a herbal medicinal plant for improving digestion, anti-inflammatory, disinfectant, asthma, whooping cough, bronchitis, orchitis, ulcers, cancer, tumours, leukaemia, and diabetes. Optimal cultivation of ciplukan plants is needed to see the benefits obtained for health. This study aims to determine the effectiveness of using chicken manure and Organic Liquid Fertilizer (OLF) to cultivate ciplukan (*Physalis angulata L.*) plants. This study is a completely randomized factorial experimental study (CRD) with two factors and three replications. The treatment factor consisted of two factors: the use of chicken manure and OLF with three replications. Parameters in the study included plant height, number of leaves, wet bottom stover, the weight of dry bottom stover, number of fruits, and fruit weight. ANOVA analysis was carried out to determine the effect of chicken manure and OLF and continued with the 5% DMRT test on significantly different results. The results showed that chicken manure and OLF had a very significant effect on all observation parameters. The best growth in the A₂C₂ treatment was plant height 74.67 cm. The best crop yields were in the A₂C₂ treatment with an average number of 37 fruits and average fruit weight of 780 grams per plant.

Keywords Organic Fertilizer, Chicken Manure, Organic Liquid Fertilizer, Ciplukan, Health

1. Introduction

Ciplukan (*Physalis angulata L.*) is a plant that is widely found in tropical and subtropical areas. Ciplukan is one of the Indonesian plants proven to have anti-cancer activity [1]. In Indonesia, this plant is still few who use it and cultivate it. This plant, in Java, usually grows wild in gardens, dry fields, roadsides, and forests. Usually, these plants are traded as ingredients for traditional medicine in the form of a single herb or *simplicia*. Ciplukan has uses in traditional medicine and the potential for the growth of small fruits [2]. All parts of the ciplukan plant, such as leaves, fruit, stems, and roots, are used for herbal drinks [3], [4]. Natural plant products are becoming important in helping promote health around the world [5]. Education about organic food is essential for the community to maintain health [6]. Knowledge of food safety has an essential role in guiding health practice [7]. Ciplukan plants are still mostly taken from plants that grow wild and are not cultivated intensively. The introduction of herbal plants is needed to increase public understanding to create general health [8]. Plants are a source of obtaining materials to overcome various human health problems [9]. Herbal plants need to be developed for commercial and economic purposes [10]. Business sustainability will affect several factors of facilities, capabilities, and production obtained so that it affects the economy of farmers [11].

Ciplukan plants have properties that are used to treat various diseases and have been proven empirically and

medically. Even in countries such as Brazil, India, Japan, America, Colombia, Peru, Taiwan, Trinidad, Suriname, El Salvador, conducting medical research for the efficacy of this plant and proven *ciplukan* plant can treat various diseases. *Ciplukan* is eaten because of its high nutritional content, and various parts of the plant are also used for medicinal purposes [12]. Despite its many benefits, many people still lack information about this plant and its use for health. Healthy food can affect the health of the family at home [13]. *Ciplukan* is one type of plants that local Indonesian people have long used as medicine [14], [15]. Many people do not know the benefits of the *ciplukan* plant, so it is often removed because it is considered a nuisance plant when it grows in the yard, rice field, or garden. This plant is often removed and eradicated using chemicals so that it is currently rarely found growing in gardens, rice fields, or yards. Parts of *ciplukan* such as leaves, have various pharmacological activities, and the fruit can be used as human food [16]. However, the efficacy of this plant is very much good from the roots, leaves, and fruit itself. The root of the *ciplukan* plant is generally used as an anthelmintic and fever reducer. The leaves heal broken bones, water swelling, boils, ulcers, heart-strengthening, sprains, abdominal pain, and gonorrhea. *Ciplukan* leaves are widely used for wound treatment [17]. *Ciplukan* fruit is often eaten to treat epilepsy, inability to urinate, diabetes, and jaundice [18].

Plant growth is influenced by two factors, namely internal factors, and external factors. Internal factors come from the plant itself, while external factors come from outside the plant, fertilization. Fertilization serves to improve soil quality so that plant productivity can increase. Therefore, the addition of nutrients to *ciplukan* will support greater production [19].

Manure is an organic fertilizer from the fermentation of solid or liquid manure (urine), generally from mammals or poultry. Organic fertilizers, such as chicken manure, have advantages in improving soil physical properties such as soil permeability, soil porosity, soil structure, and soil cations. In addition, manure also plays a role in increasing the absorption and holding capacity of the soil to water so that the availability of water needed by plants is fulfilled [20]. The nutrient content in chicken manure is 1.7% N, 1.90% P₂O₅, and 1.50% K₂O.

Another factor that affects plant growth is Organic Liquid Fertilizer (OLF). The plants themselves easily absorb OLF in their application to plants. Organic Liquid Fertilizer is usually made from waste materials, such as

vegetables, tofu, fish, etc. Nutrient content of OLF from banana peels and eggshells: Nitrogen (N) 0.89%; Phosphorus (P) 0.04% and Potassium (K) 1.82%. The content of OLF from molasses is 60 ml and fermented for seven days. Nitrogen (N) is 0.339%, Phosphorus (P) is 0.067% and Potassium (K) is 0.127%.

Rural communities rely heavily on herbal resources to cure diseases [21]. The community needs to preserve local medicinal plants for future generations to support health [22]. The importance of *ciplukan* plants for herbal medicinal needs must be cultivated organically. So this study aims to determine the effect of using manure and OLF to grow *ciplukan* plants. The use of organic fertilizers is expected to influence production and health benefits.

2. Research methods

This research is an entirely randomized factorial experimental study (CRD) with two factors and three replications. The study was carried out in Dukuh Kantil, Teras Village, Teras Subdistrict, Boyolali Regency with an altitude of 220 m above sea level. Research materials include *ciplukan* plant seeds, chicken manure, and OLF. The tools used include Seedling tub, 20 cm x 40 cm polybag, measuring cup, digital scale, bucket and stirrer, cheers, stationery (book, ballpoint pen, ruler) nameplate/label.

The treatment factor consisted of two factors and three replications. Description of the treatment of the two factors and three replications in the study as follows:

- A₀C₀: chicken manure 0 ton/ha and OLF 0 cc.
- A₀C₁: chicken manure 0 ton/ha and OLF 10 cc.
- A₀C₂: chicken manure 0 ton/ha and OLF 15 cc.
- A₁C₀: chicken manure 10 ton/ha and OLF 0 cc.
- A₁C₁: chicken manure 10 ton/ha and OLF 10 cc.
- A₁C₂: chicken manure 10 ton/ha and OLF 15 cc.
- A₂C₀: chicken manure 20 ton/ha and OLF 0 cc.
- A₂C₁: chicken manure 20 ton/ha and OLF 10 cc.
- A₂C₂: chicken manure 20 ton/ha and OLF 15 cc.

Parameters observed in the study were plant height, number of leaves, wet stover, the weight of dry stover, number of fruit, and fruit weight. This study used an experimental method, with the basic pattern of Completely Randomized Design (CRD) followed by a 5% DMRT test with significantly different results.

3. Result and Discussion

3.1. The Effectiveness of Using Chicken Manure and OLF on Plant Height

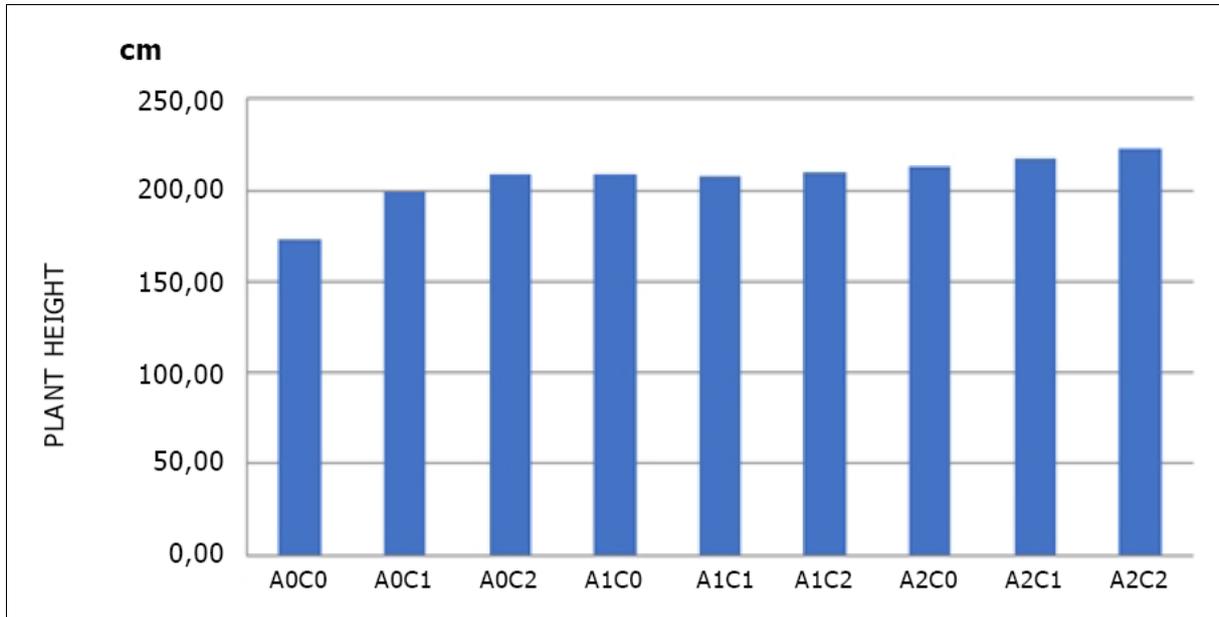


Figure 1. Histogram of Plant height

In Figure 2, the highest ciplukan plant height was (74.67 cm), obtained from the combination of A_2C_2 treatments (manure dose 20 tons/ha and POC 15 cc). Conversely, the lowest ciplukan plant height was (55.33 cm), obtained in the combination treatment A_0C_0 .

3.2. The Effectiveness of Using Chicken Manure and OLF on the Number of Leaves

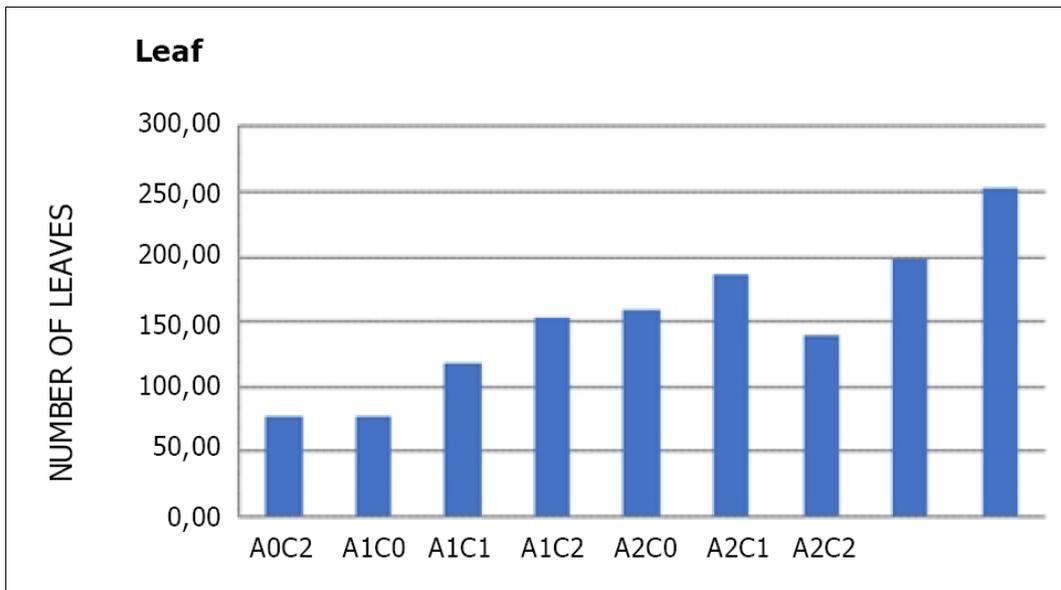


Figure 2. Histogram of Leave Number

In Figure 2, the highest number of leaves of ciplukan plants, namely (85.67 strands), was obtained in the combination of A_2C_2 treatments (dose of manure 20 tons/ha and POC 15 cc). On the other hand, the smallest number of leaves of the ciplukan plant (21.67 pieces) was obtained in the A_0C_0 treatment combination.

3.3. The Effectiveness of Using Chicken Manure and OLF on Plant Wet Weight

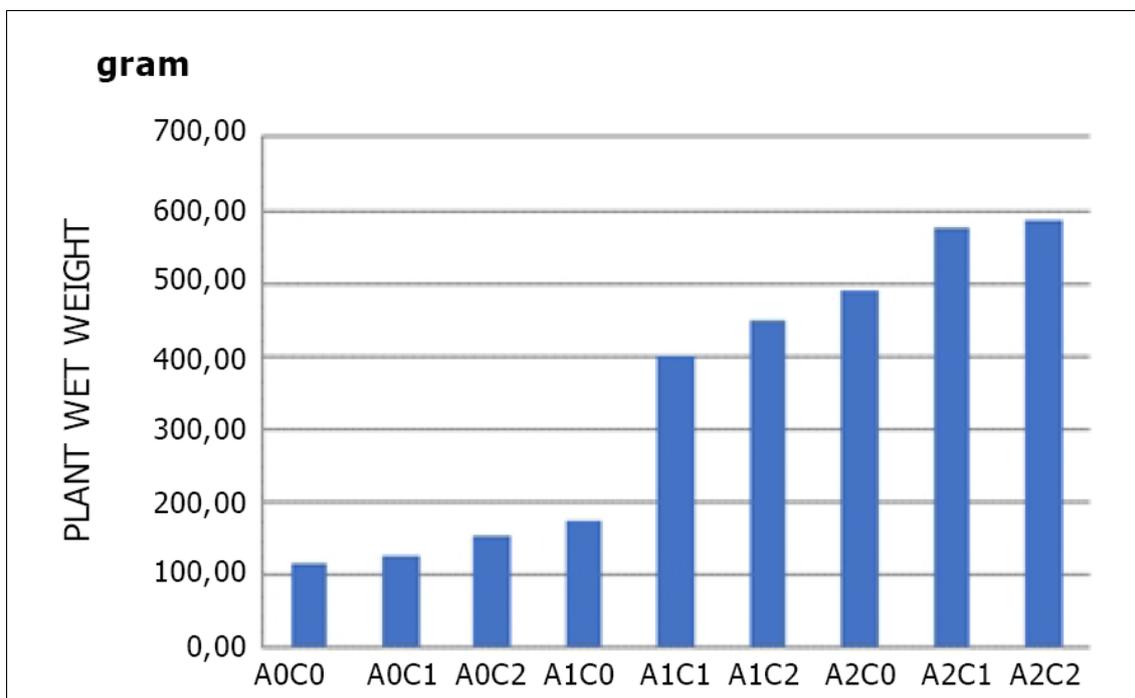


Figure 3. Histogram of Plant Wet Weight

In Figure 3, the highest *ciplukan* wet plant weight, namely (198.33 grams), was obtained in the A_2C_2 treatment combination. On the other hand, the lowest wet weight of the *ciplukan* plant was (36.00 grams), obtained in the combination of A_0C_0 treatment.

3.4. The Effectiveness of Using Chicken Manure and OLF on Plant Dry Weight

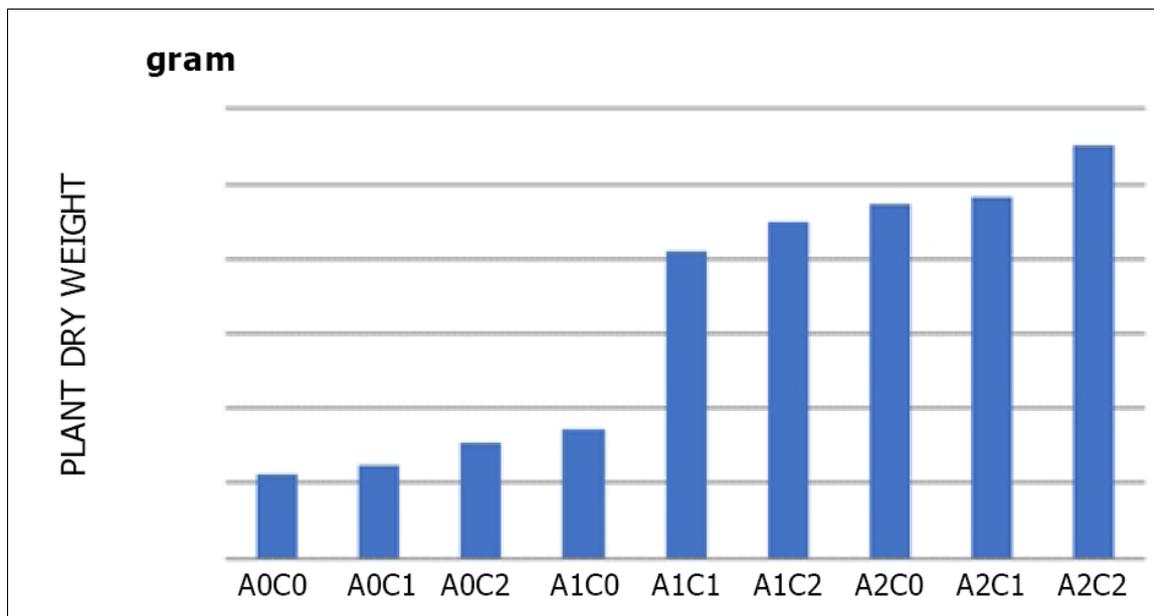


Figure 4. Histogram of Plant Dry Weight

In Figure 4, the highest dry plant weight of *ciplukan* (95.33 grams) was obtained in the A_2C_2 treatment combination. Conversely, the lowest dry weight of the *ciplukan* plant (17.33 grams) was obtained in the combination of A_0C_0 treatment.

3.5. The Effectiveness of Using Chicken Manure and OLF on the Number of Fruits

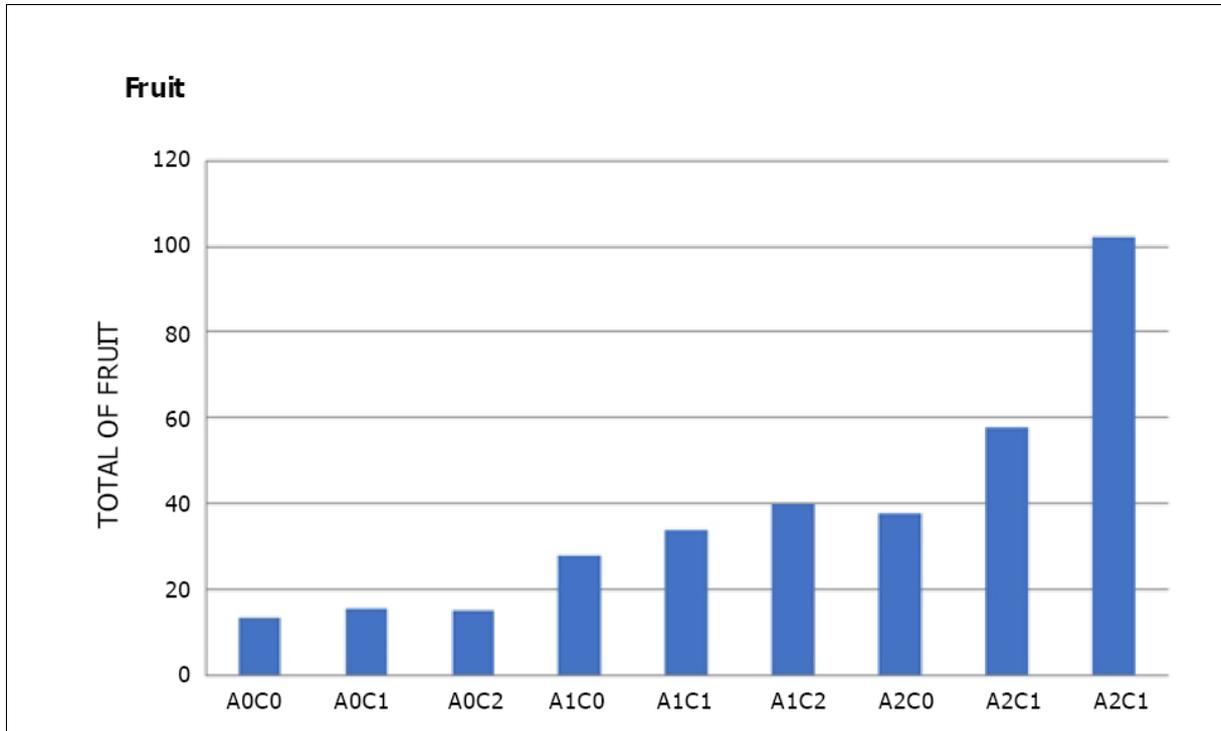


Figure 5. Histogram of Fruit Number

In Figure 5, the highest number of ciplukan fruit (37 pieces) was obtained in the A₂C₂ treatment combination. On the other hand, the lowest ciplukan fruit (4 pieces) was obtained in the A₀C₀ treatment combination.

3.6. The Effectiveness of Using Chicken Manure and OLF on Fruit Weight

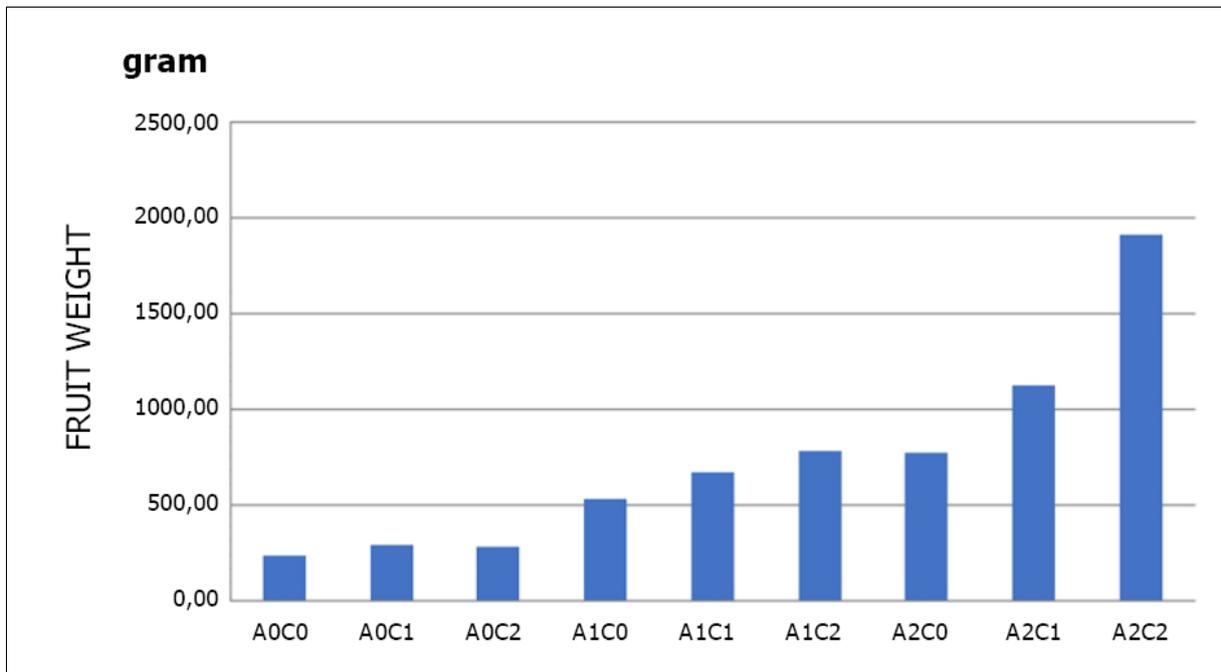


Figure 6. Histogram of Fruit Weight

In Figure 6, the highest ciplukan fruit weight (730 grams) was obtained in the A₂C₂ treatment combination. Conversely,

the lowest *ciplukan* fruit weight (63.33 grams) was obtained in the A₀C₀ treatment combination.

3.7. Test DMRT

The results of the further CRD test showed significantly different values, then proceeded to the DMRT test. The results of the 5% DMRT test in the study can be seen in table 1.

Table 1. The resume yield of the research.

No	Parameter	Chicken Manure	Concentration OLF			Average
			C ₀	C ₁	C ₂	
1	Plant growth					
	a. Plant height (cm)	A ₀	57.56a	66.22b	69.44b	64.40a
		A ₁	69.56b	69.33b	70.11c	69.66b
		A ₂	71.00c	72.44c	74.44d	72.62c
		Average	66.04a	69.33b	71.33c	
	b. Number of leaves (Sheet)	A ₀	25.44a	25.67a	39.44b	30.18a
		A ₁	51.00b	53.11b	62.11c	55.40b
		A ₂	46.56b	66.00c	84.33d	65.63c
		Average	41.00a	57.37b	61.96c	
	c. Plant Wet Weight (gram)	A ₀	38.56a	41.44a	51.00a	43.66a
		A ₁	57.44a	133.89b	150.11b	113.81b
		A ₂	163.56c	192.00d	195.33d	183.63c
		Average	86.52a	122.44b	132.14c	
	d. Plant dry Weight (gram)	A ₀	18.89a	20.56a	25.56a	21.67a
		A ₁	28.56b	68.22c	74.89c	57.22b
		A ₂	78.78c	80.22d	92.11d	83.70c
Average		42.07a	56.33b	64.18c		
2	Plant production					
	a. number of fruit	A ₀	4a	5a	5a	4.6a
		A ₁	9a	11ab	13c	11b
		A ₂	13c	19d	34e	22c
		Average	8.66a	11.66b	17.33c	
	b. fruit weight (gram)	A ₀	80	98	96	91.33a
		A ₁	178	224	261	221b
		A ₂	259	377	639	425c
Average		172.33a	233b	332c		
Note: Numbers followed by the same letter in the same row or column are not significantly different in Duncan's 5% test.						

The treatment using doses of chicken manure had a very significant effect on all observation parameters. The purpose of treatment using chicken manure is to overcome nutrient deficiencies, especially nitrogen (N), phosphorus (P), and potassium (K) which are micronutrients that play an essential role in plant growth and production. Chicken manure organic fertilizer has a high nitrogen content [23]. The availability of N, P, and K in the soil is the most limiting factor in obtaining maximum cultivated plants' growth and yield. Organic fertilizers provide sufficient nutrients and improve the soil environment [24]–[26]. The use of OLF has a very significant effect on all observation

parameters. The purpose of treatment using OLF is to balance essential nutrients needed by plants for plant production. Organic Liquid fertilizer has a positive impact on plant growth [27], [28]. In this study, it is hoped that OLF concentration can be obtained, increasing optimal plant productivity. The sensitivity level of OLF can affect the permeability of leaf cells and determine how much or how plants can absorb little nutrients so that OLF impacts whether or not optimal plant growth. Each treatment has different effects to improve organic matter and its physical properties [29].

The treatment of using chicken manure and OLF had a

very significant effect on all observation parameters. The combination of treatments (OLF and manure) supported the vegetative and generative growth of ciplukan plants. Chicken manure applied through soil media can help meet the availability of soil nutrients and help improve soil structure so that it can be a good growing medium for plants. Nutrient content in livestock manure that is important for plants includes elements of Nitrogen (N), Phosphorus (P), and Potassium (K). Plants most need these three elements. Each of these nutrients has a different and complementary function for plants. Thus growth becomes optimal. Organic Liquid Fertilizer applied through the soil can directly meet the nutrient needs of plants to be used in the photosynthesis process.

4. Conclusions

The application of chicken manure had a significant effect on the six research parameters. Organic Liquid Fertilizer administration has a significant effect on the six research parameters. The application of a combination of chicken manure and OLF significantly affected the six research parameters. The existence of organic fertilizers is expected to increase production and provide benefits for humans. Therefore, organic ciplukan is expected to positively influence farmers who cultivate economically, socially, and healthily.

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