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## MAXIMIZATION OF GROWTH AND YIELD OF CAYENNE PEPPER WITH TEA LEAF DREGS COMPOST

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Diterima: 7 Desember 2021

Direvisi: 7 Januari 2022

Disetujui terbit: 27 Januari 2022

### ABSTRACT

Fertilization is needed by plants, including cayenne pepper. Organic fertilizers have advantages because of the complete composition of nutrients. Tea leaf dregs which is an organic fertilizer that contains a number of nutrients that are quite good for cayenne pepper plants. This study aims to determine the effect of tea leaf dregs compost on the growth and yield of cayenne pepper. The research was carried out in Beji village, East Ungaran, Semarang district from February to June 2017 with latosol soil type. The design used was a single factor completely randomized design with 18 replications. The levels were without tea leaf dregs compost, doses of tea leaf dregs compost were 10, 20, 30 and 40 tons/ha. The results showed that the most productive branches were at a dose of tea leaf dregs compost of 20 tons/ha, dry weight of stover 40 tons/ha, fruit weight per plant 30 tons/ha and flowering age 20 tons/ha and harvest age 30 tons/ha. The conclusion of this study was that tea leaf dregs compost increased the number of productive branches, dry weight of stover and fruit weight per plant and accelerated flowering and harvesting ages. The implication of this research is that the cultivation of cayenne pepper should use tea leaf dregs compost at a dose of 30 tons/ha.

**Keywords:** fruit weight per plant, cayenne pepper, yield, tea leaf dregs compost, growth

### INTRODUCTION

Cayenne pepper or *Capsicum frutescens* L. is one of the important vegetable commodities that are widely cultivated in Indonesia. Cayenne pepper contains capsaicin compounds, carotenoids, ascorbic acid, essential oils, resins, flavonoids (Howard et al. 2000). Cayenne pepper is widely consumed in fresh or processed form which is generally used as an additive and flavoring to enhance the taste of food and is highly nutritious. In addition, cayenne pepper is widely used for raw materials for the food industry such as sauces, chili powder, flavoring and the pharmaceutical industry.

The prospect of cayenne pepper is quite promising to fulfill domestic consumers and export demands. In 2017-2021, demand for cayenne pepper is projected to increase by 2.65% annually covering the need for seeds,

consumption, and industrial raw materials. In contrast, the projected production of cayenne pepper is estimated to decrease 0.4% per year during 2017-2021. This condition is due to the projected harvest area decreasing by 0.85% in the same year. If chili production is lower than the consumption level, there will be an increase in prices so that it can affect the inflation rate, especially in certain seasons and occurs almost every year (Anonymous, 2016; Anonymous, 2017).

The demand for cayenne pepper that is evenly distributed throughout the year makes farmers carry out continuous planting without paying attention to environmental factors that cause cayenne pepper production to decline. The factors that cause the production of cayenne pepper to decline, namely, the low level of soil fertility (Rukaman, 2002).

To overcome the emergence of various problems in the cultivation of cayenne pepper, it



is necessary to properly cultivate cayenne pepper plants that are environmentally friendly. One way to overcome the low level of soil fertility is to use organic fertilizers. The use of compost as organic fertilizer allows increased fertility, in addition to being an excellent soil conditioner, improving physical, chemical and biological characteristics, such as water retention, aggregation, porosity, cation exchange capacity, soil fertility and microbial life, however, the value of compound fertilizers depends on materials used as raw materials (Abadi 2015); (Ahmad et al. 2007); Fiorentino and Fagnano, 2011). Masairambi et al. 2010) they reported that the content of macro and micro nutrients in lettuce produced with organic fertilizers was relatively higher than those grown with conventional fertilizers.

Tea leaf dregs compost is also very rich in phytohormones and growth regulators. It stimulates microorganisms that have direct or indirect effects on the plant rhizosphere, in addition to improving the physical and chemical properties of the soil and suppressing several plant disease pathogens (Abbasi et al., 2002, Biocyde, 2004 and Meshref et al., 2010). Tea dregs contain organic carbon, copper (Cu) 20%, magnesium (Mg) 10% and calcium 13% (Panghutan, Yetty, and Isnaini 2017). Tea leaf dregs compost increases plant growth and yield quantity and quality. This effect may be due to the beneficial effect of tea leaf dregs compost which contains many macro and micro nutrients in available form, natural hormones such as cytokines, vitamins and antioxidants present available to plants and reflects plant growth and composition (Abbasi et al., 2002, Biocyde, 2004 and Meshref et al., 2010) leading to increased yield and quality of lettuce.

According to Maulana (2011), a mixture of medium top soil with 1:1 tea pulp showed a significantly different effect on the growth of cocoa seedlings on the parameters of plant height, stem circumference, number of leaves, root length, root volume and root crown ratio. The purpose of this study was to determine the effect of tea leaf pulp compost on the growth and yield

of cayenne pepper. The results of Aisyah research (2018) concluded that fertilizing various types of organic tea waste fertilizer, leaf litter fertilizer, market waste fertilizer and their combination can produce higher growth and production of pakchoy plants than without fertilization and fertilization using urea

## MATERIALS AND METHODS

### Study site

This research was carried out from Februari to Juni 2017 at desa Beji, Ungaran timur, kabupaten Semarang. The geographical position of the study area is between 110° 22'-110° 50' east longitude and between 7°07' - 7°36' south latitude with an altitude of 239 m above sea level, and latosol and the average amount of rainfall is 3286 mm per year.

### Experiment design

The experimental design used in this research was a completely randomized design one-factor with 18 replications. The level is i.e. without tea leaf dregs compost, the dose of tea leaf dregs compost was 10, 20, 30 and 40 tons/ha.

### Research procedures

Soil tillage is done by plowing then the dose of manure according to the treatment. The plots were made with a size of 3.0 m x 3.0 m. Seedling is done by sowing cayenne pepper seeds on the prepared planting media. Cayenne pepper seeds were planted with a spacing of 40 cm x 15 cm. Phonska fertilizer was given according to the treatment, namely the first stage at the age of 14 days and the second stage at the age of 30 days after planting. Leaf fertilizer with a dose of 75 kg/ha was given simultaneously at the age of 30 days after planting (DAP) in all plots. Plant maintenance carried out included transplanting at 7 DAP and weed control at 14 DAP.



## Parameters observed

The parameters observed were the number of productive branches, dry weight of stover, flowering age, harvest age, weight of fruit/plant.

## Statistical analysis

The data of observations were analyzed using analysis of variance (ANOVA) at 5% significant levels. The treatment means were compared using Duncan's new multiple range test (DMRT) at 5% significant levels.

Table 1. Analysis of variance in the number of productive branches, dry weight of stover, flowering age, harvest age and fruit weight per plant

	Number of productive branches	Dry weight of stover	Flowering age	Harvest age	Fruit weight per plant
Dosage of tea leaf dregs compost	33.57**	272.58**	167.82**	294.85**	325.17**
CV (%)	10.67	10.28	2.05	1.14	14.19

## Number of productive branches

Based on Table 2, the number of productive branches fertilized with tea leaf dregs compost fertilized with doses starting at 20 tons/ha was significantly different with a dose of 10 tons/ha or without fertilizing with tea leaf dregs compost. However, the dose of 20 tons/ha was not different from the doses of 30 and 40 tons/ha. The higher the dose of tea leaf dregs compost given, the higher the number of productive branches (Figure 1). The number of productive branches, without

## RESULTS AND DISCUSSION

Based on the analysis of variance, there were significant differences in various doses of tea leaf dregs compost on the number of productive branches, dry weight of stover, flowering age, harvest age and weight of fruit/plant (Table 1).

fertilizing with tea leaf dregs compost, showed the lowest number.

This is due to the use of compost as an organic fertilizer which has many advantages of increasing cation exchange capacity, increasing water retention, greater temperature stability and increasing the availability of nutrients, which are basically needed for the growth of pea plants (El-Etr et al., 2004); beans (Hafez and Mahmoud 2004), leafy vegetables (Xu et al., 2005) and red lettuce (Masarirambri et al., 2010).

Table 2. Effect of tea leaf dregs compost on the number of productive branches of cayenne pepper

	Dosage of tea leaf dregs compost (ton/ha)				
	0	10	20	30	40
Number of productive branches	6.00 c	7.00 b	8.33 a	8.39 a	8.56 a

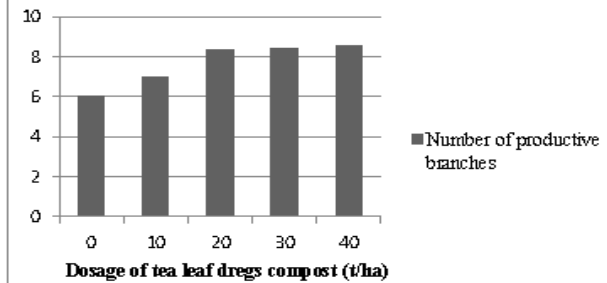


Figure 1. Number of productive branches in various tea leaf dregs compost

### Dry Weight of Stover

Based on Table 3, the increasing dose of tea leaf dregs fertilizer showed a significant increase in the dry weight of the stover. The dose of tea leaf dregs compost of 40 tons/ha showed the highest dry weight of stover and vice versa without fertilizing the tea leaf compost resulted in the lowest dry weight of stover.

Treatment without compost of tea leaves resulted in the lowest dry weight of the stover. This is because tea dregs contain potassium, where potassium is very important for plants to help form protein and carbohydrates. Potassium can also strengthen plant tissue and increase resistance to disease. So, if in plant growth a lack of potassium can cause damage to the plant. Thus, the soil given the compost of tea leaves will contain good nutrients, especially potassium. Meanwhile, in the soil that was not given tea dregs, plant growth was not very good. This is because the soil does not contain nutrients that are good for growth.

According to Sutejo (2007), the rate of plant growth tends to increase, if the nutrients

needed by plants are sufficiently available. Some nutrients such as nitrogen will function as a constituent of protein, for the growth of plant shoots and fertilize vegetative growth so that it is suitable for fruit vegetable plants such as cayenne pepper plants. In line with the opinion of Harlina (2003), which states that if the element of N is available in large quantities, more protein is formed so that plant growth can be better. Organic matter can increase soil aggregation, improve aeration and percolation, and make the soil structure more crumbly and easier to cultivate (Siti Maryam et al, 2006).

The dry weight of the stover had a positive correlation with the weight of fruit per plant ( $r=0.86$ ) (Table 7), this means that the higher the dry weight of the stover, the higher the weight of fruit per plant. The dry weight of the stover is the result of the accumulation of photosynthate, the greater the photosynthate produced, the sink organ (generative organ) will accommodate the photosynthate that has been produced in previous photosynthesis both during vegetative and generative growth.

Table 3. Effect of tea leaf dregs compost on dry weight of stover of cayenne pepper

	Dosage of tea leaf dregs compost (ton/ha)				
	0	10	20	30	40
Dryweight of stover (g)	33.39 e	54.39 d	61.89 c	78.33 b	104.22 a

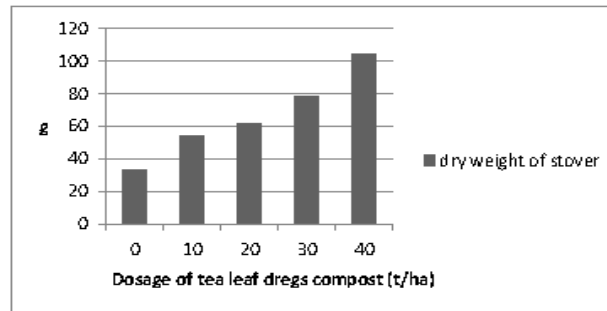


Figure 2. Dry weight of stover at various doses of tea leaf dregs compost

### Flowering Age

Based on the analysis of variance (Table 1), the flowering age was influenced by the dose of tea leaf compost. To find out the levels of treatment with significantly different doses of tea leaf pulp compost, Duncan's test with 5% significance level was carried out.

Based on Duncan's test (Table 4), the addition of tea leaf compost can reduce the

Tabel 4. Effect of tea leaf dregs compost on flowering age of cayenne pepper

	Dosage of tea leaf dregs compost (ton/ha)				
	0	10	20	30	40
Flowering age (days)	39.28 a	35.56 b	34.22 c	34.28 c	34.00 c

flowering time of cayenne pepper plants. Flowering age with doses of 20, 30 and 40 tons/ha did not differ and showed the fastest flowering period, while without tea leaf pulp compost the flowering age was the longest. In this case, tea leaf dregs compost contains a number of nutrients, both macronutrients and micronutrients. With sufficient and complete nutrients, the growth of cayenne pepper plants will be faster so that it will accelerate the flowering period.

### Harvest Age

Based on Table 1, the addition of tea leaf pulp compost showed a significant difference in the age of harvest. Cayenne pepper plants without fertilizing tea leaf compost showed the longest harvest age and were different from other treatments and the dose of 10 tons/ha was not significantly different from the other compost doses (Table 5).

The age of harvest is quite long in the treatment without being given tea leaf compost,

this is due to the lack of supply of nutrients to the roots so that the absorption of nutrients, both macro and micro nutrients for photosynthesis is relatively low. This results in plant growth tends to be slow so that it prolongs the age of the harvest. Harvest age is not only influenced by the genetic characteristics of a plant but also by environmental factors, including fertilization. Harvest age is positively correlated with flowering age with  $r=0.88^{**}$  (Table 7), the faster the flowering age, the faster the harvest age.



Table 5. The effect of tea leaf dregs compost on the harvest age of cayenne pepper

Harvest age (days)	Dosage of tea leaf dregs compost (ton/ha)				
	0	10	20	30	40
	109.67 a	99.50 bc	99.72 b	98.72 c	99.00 bc

### Fruit weight per plant

Based on Table 1, the provision of tea leaf pulp compost showed a significant difference in fruit weight per plant. To find out which levels were significantly different, Duncan's test was carried out with a 5% significance level. Based on table 6, the lowest fruit weight per plant was in

cayenne pepper plants without tea leaf compost and different from other treatments. Compost dose of 40 tons/ha resulted in the largest cayenne pepper fruit weight but not different from the dose of 30 tons/ha. In Figure 3, it can be seen that as the dose of tea leaf pulp compost increases, the graph will increase but the doses of 30 and 40 tons/ha, the graph height is almost the same.

Table 6. The effect of tea leaf dregs compost on fruit weight per plant of cayenne pepper

Fruit weight per plant	Dosage of tea leaf dregs compost (ton/ha)				
	0	10	20	30	40
	907.4 d	1253.3 c	1916.2 b	3765.2 a	3980.8 a

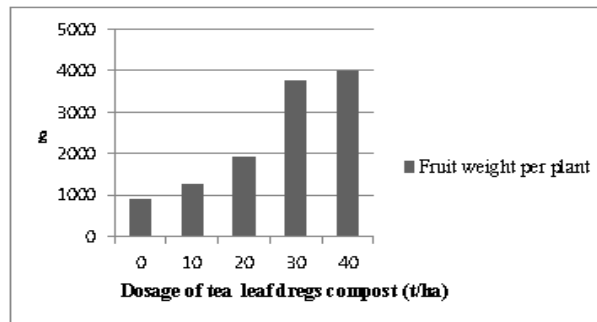


Figure 3. Fruit weight per plant at various dosage of tea leaf dregs compost

Plants that were given compost of tea leaves could produce cayenne peppers with a greater weight than those without compost. This is due to the availability of several elements that contain elements for fruit formation such as phosphate, nitrogen and other micro elements contained in sufficient planting media and are able to provide elements available to plants both vegetatively and generatively. This is as stated by Sutejo. (2002), element P functions as one of the constituent elements of protein needed for the formation of flowers, fruit and seeds. Likewise,

according to Nyakpa et al., (1988), the administration of a dose of organic fertilizer combined with NPK fertilizer will be more effective when given in doses needed and according to Harjowigono (2003), the amount of fertilizer given is related to the plant's need for nutrients, the content of nutrients contained in the soil, and the levels of nutrients contained in the fertilizer, so that when all of these are met, the plant will grow and gives good results.

These are agreement with those obtained by Khalid et al. (2006) they reported that using





compost with tea of compost increased the production and medicinal properties of *Ocimum basilicum* L. Fruit weight per plant has a positive correlation ( $r = 0.62^{**}$ ) with the number of

productive branches, the higher the number of productive branches, the higher the fruit weight per plant (Table 7).

Table 7. Correlation of various observed parameters

	Number of productive branches	Dry weight of stover	Flowering age	Harvest age	Fruit weight per plant
Number of productive branches	-	0.63**	-0.72**	-0.67**	0.62**
Dry weight of stover		-	-0.73**	-0.70**	0.86**
Flowering age			-	0.88**	-0.66**
Harvest age				-	-0.58**
Fruit weight per plant					-

## CONCLUSION

From the results of the discussion, it can be concluded that the addition of tea leaf dregs compost can increase the number of productive branches, dry weight of stover and fruit weight per plant and accelerate flowering and harvesting ages. The implication of this research is that the cultivation of cayenne pepper should use tea leaf pulp compost at a dose of 30 tons/ha.

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