



## Performance of Tomato Plant (*Lycopersicon esculentum*) As Affected By Organic Mulching

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**Abstract:** The use of organic mulching in growing crops is one of the safest, least expensive, more practical, yet equally profitable methods of enhancing the soil condition. This project aimed to provide a natural and effective way of enriching soil. It also aimed to determine the performance of tomato (*Lycopersicon esculentum*) plant as affected by organic mulching. Dried papaya and banana leaves as organic mulches were tested and compared. Shredded papaya and banana leaves were applied separately on the soil in the pots planted with tomato in four replicates. Ten days after transplanting, the plant's initial caudex was measured and it was found out that there was no significant difference among the setups on this parameter. After the determined mulch application, the researchers measured the height increases and final caudex of tomato plants. Data showed no significant differences among the setups based on ANOVA result. However, study showed positive effects because papaya mulch promoted the tomato plant's height and final caudex and it was recorded to be the best mulch.

**Key Words:** *Lycopersicon esculentum*; organic mulching; performance; and caudex

### 1. INTRODUCTION

#### 1.1 Background of the Study

Enhancing the condition of the soil using inorganic chemical is becoming expensive and most crop growers could not afford to buy this chemical. Aside from its high cost, overdependence of this inorganic source of plant nutrients increases the acidity of the soil thus limiting the population of beneficial microorganisms and percentage assimilability of available nutrients into the soil. This could in turn result to an imbalance of nutrient content in the soil.

To address the problem of the deteriorating condition of the environment especially soil quality, a natural and safest but equally profitable method of enriching the quality condition of the soil with the least expense is the use of mulch in plants. Dried leaves of selected plants such as papaya and banana which can be found locally could be used as potential mulches. The dried leaves could

be simply placed on soil surface around the plant. In this method, Acayen, Magdaraog, Matriano and Rivero concluded that it will not only enhance soil fertility, conserve moisture and promote aeration but will also limit the growth of weeds on the planted area (2005).

For this research, it aimed to determine the performance of tomato plant (*Lycopersicon esculentum*) as affected by organic mulch. It also aimed to compare the effectiveness between dried papaya leaves and dried banana leaves as organic mulches and finally, to make use of these plant remains as sources of organic materials that the soil needs.

This study provides valuable information to crop growers who are practicing organic farming. They would be informed of the simple, practical, inexpensive, yet effective way of enriching the soil quality using dried papaya and banana leaves as organic mulches.



The study tested only the performance of tomato plants using organic mulches in terms of tomato plant's height and caudex. Two types of organic mulches were used and these were dried papaya and banana leaves. However, this study did not include tests for the presence of nutrients/minerals in the dried leaves and soil.

### 1.2 Review of Related Literature

Tomato plant (*Lycopersicon esculentum*) belongs to the *Solanaceae* family. It is one of the most widely grown and commercially important vegetable crops. There are several varieties of these plants. Their fruits' size and shape varies; ranging from small currant size to nearly round, 10 cm or more in diameter. These plants are propagated from seeds. They grow best in fertile soil and well-drained areas. An application of organic materials such as dried papaya leaves could also make the plants grow fast and retard the growth of weeds around the plants (Acayen et al., 2004). These organic materials which are added to the soil are collectively termed as organic mulch. Other organic mulches include grass clippings, bark, sawdust, and manure, hay, straw, shells, wood chips, shredded newspaper, cardboard, and wool (Hynes, 2006; <http://en.wikipedia.org/wiki/Mulch>).

Mulching is an important technique for promoting plant health because it conserves soil moisture and maintains root zone temperature (Parsons, 2006). In the process also, the roots of plants can be protected from extreme temperature and moisture changes. In addition, it minimizes soil erosion and compaction from heavy rains, limits growth of weeds near plants. Organic mulch that is derived from plant material will decompose (Williams, 1997).

Papayas and tomato have the same preferences for soil pH ranging from 6.0 to 6.5 (<http://wiki.answers.com>). Soil pH does not only affect cation exchange (a process in which positively charged minerals are made available to a plant when hydrogen ions in the soil displace mineral ions from the clay particles) but also influence the chemical form of all minerals. Thus, the pH of the soil should be matched with the specific mineral needs of the plant (Campbell et al., 2004). Dried leaves are sources of carbon. As an organic matter, it allows for the best pore space arrangement for air and water

(<http://wiki.answers.com>). However, nutrients from organic material can be released slowly (Webster, 1980).

## 2. METHODOLOGY

The study was conducted in two phases:

### **Phase I - Germination of Tomato Seeds.**

Seeds from a regular-sized ripe tomato were removed, dispersed and allowed to germinate in a wooden box containing soil that was previously mixed and shook inside the sack for better mixing. The soil was moistened to hasten germination of seeds.

**Phase II - Transplanting of Tomato Seedlings.** The same process was done to the garden soil which was used in transplanting of tomato seedlings as in the process of germinating tomato seeds. However, the soil in this step was sieved using fine net to remove coarse materials like stones and sticks before it was transferred to the clay pots of the same sizes. Each pot has 18 cm diameter and 14 cm height. The same amount of garden soil was poured into each pot. The pots were then set aside for mulching.

Dried papaya and banana leaves which were gathered, shredded, finely cut into pieces and placed separately in the containers were subjected to 60°C oven temperature for 2 hours. A day after heating the dried leaves, pots for the experimental setups were added with 50 grams of dried papaya leaves. The same amount of dried banana leaves was added to the other pots as experimental setups also. Pots in the control setup were not added with dried leaves. There were three treatments replicated four times per treatment in this study. The treatments were laid out with the following treatments: garden soil (control setup), dried papaya leaves and dried banana leaves (experimental setups). Figure 1 shows all setups after transplanting.



Figure 1. All setups after transplanting. (a) control setup; (b) treated with dried banana leaves; (c) treated with dried papaya leaves.

Three week-old tomato seedlings obtained from the wooden box, where germination of tomato seeds had taken place, were transplanted in clay pots. The setups were transferred in an area where there is enough sunlight. Watering was done after transplanting and was repeated as needed for proper growth and development of the plants. Ten days after transplanting, the initial caudex of the tomato plants was measured. After the determined period of mulch application, the height and final caudex of tomato plants and weed density in the pots were obtained.

### 3. RESULTS AND DISCUSSION

The factor being investigated in this present study is the use of organic mulching in growing tomato plants. Materials used as organic mulches were laid on the soil. Two kinds of mulches were utilized and these include dried papaya and banana leaves. The effectiveness of these leaves was compared based on the plants' height and caudex.

Study showed that plants treated with dried papaya leaves were tallest with a mean of 29.875 cm, and the shortest were those in the control setup with a mean of 14.625 cm (Table 1).

Table 1. Summary of tomato plants' heights and caudex in the three treatments (Mean).

TREATMENT	AGRONOMIC PARAMETERS		
	Height (cm)	Initial caudex diameter (cm)	Final caudex diameter (cm)
Control (not applied with mulch)	14.625	0.225	0.400
Mulched with dried banana leaves	20.875	0.250	0.500
Mulched with dried papaya leaves	<b>29.875</b>	<b>0.275</b>	<b>0.650</b>

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The results were subjected to analysis of variance (ANOVA) tests (Appendix). Analysis revealed that plants treated with papaya mulch did not significantly differ from the control but was comparable with those plants treated with dried banana mulch. The increase in plants' height in all soils applied with dried leaves may be due to the nutrients present in those organic materials. However, comparing the two types of mulches, dried papaya leaves decomposed faster than the dried banana leaves. Thus, tomato plants treated with dried papaya leaves obtained nutrients from the soil faster than those plants with dried banana leaves which in turn made the plants grew faster than the others (Acayen et al., 2004). It could also be attributed to the common pH of both tomato plants and dried papaya leaves. The soil pH should be matched with the mineral needs of the plants (Campbell, 2004). In addition, no weeds grew on the mulched soil that may compete the tomato plants from obtaining nutrients. While there were weeds growing on the soil planted with tomato plants in the control setup, competition in obtaining nutrients from the soil occurred.

The application of different mulches did not significantly influence the diameter of the caudex 10 days after transplanting (Figure 2). However, the widest diameter of the caudex was obtained from plants treated with dried papaya leaves with a mean of 0.275 cm followed by plants treated with dried banana leaves with a mean of 0.250 cm. The smallest caudex was obtained from control plants with a mean of 0.225 cm. This observation may be attributed to the slow release of nutrients from the organic material (Webster, 1980).



(a) (b)



(c)

Figure 2. All setups 10 days after transplanting. (a) control setup; (b) treated with dried banana leaves; (c) treated with dried papaya leaves.

In terms of the final caudex of the tomato plants, data showed that there was no significant effect on the average final diameter of the caudex as affected by the application of dried leaves. However, it can be noted that plants treated with dried papaya leaves recorded the widest caudex diameter (0.650 cm) while the smallest caudex diameter (0.400 cm) was obtained from plants without dried leaves. The increase in final diameter in the plants treated with dried papaya leaves may be due to the nutrients present in the dried leaves of papaya. Figure 3 shows the setups after a determined mulch application.



(a)

(b)



(c)

Figure 3. All setups after a determined mulch application. (a) control setup; (b) treated with dried banana leaves; (c) treated with dried papaya leaves.

#### 4. CONCLUSIONS

The study was conducted to determine the performance of tomato plants as affected by organic mulching. In addition, effectiveness of dried papaya and banana leaves on tomato plants' growth was also compared. Data showed that application of different dried leaves did not significantly affect the plants' height. However, tomato plants treated with dried papaya leaves were the tallest followed by those treated with dried banana leaves and the shortest were those without organic mulch. There was also no significant difference among the setups in terms of initial and final caudex. But, the widest was recorded in the plants treated with dried papaya leaves.

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