



## Antibacterial Effect of Calabash (*Crescentia Cujete*) Leaf and Fruit Extract on Preservation of Lettuce (*Lactuca Sativa*) Leaves with *Escherichia Coli*

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### ABSTRACT

This study was carried out to determine the antibacterial effect of Calabash Leaf and Fruit Extracts on the preservation of lettuce affected with *Escherichia coli*. Additionally, this was done to assess the following: change in length of lesion on lettuce leaves depending on the effectiveness of the different concentrations of treatments; and significant difference of the extracts. The experimental research design was employed in which 2 set-ups were prepared by setting Calabash Leaf Extract and Calabash Fruit Extract. Each set-up has 3 treatments with different concentrations. The antibacterial activity of different concentrations of extracts was evaluated after 3 days of observation through interpreting the change in the size of the 1 mm purposively-made lesion on lettuce leaves. The investigations were focused on the damaged part measured. t-test results revealed that the t-value calculated was smaller than the critical value at a 5% level of significance, thus the difference is not significant. These findings revealed that the Calabash extracts equally possess a high antibacterial effect against *Escherichia coli*. The Calabash Leaf and Fruit Extracts can potentially be considered as an alternative tool to prevent plant-tissue deterioration and to prolong the shelf life of crops and vegetables.

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## 1. INTRODUCTION

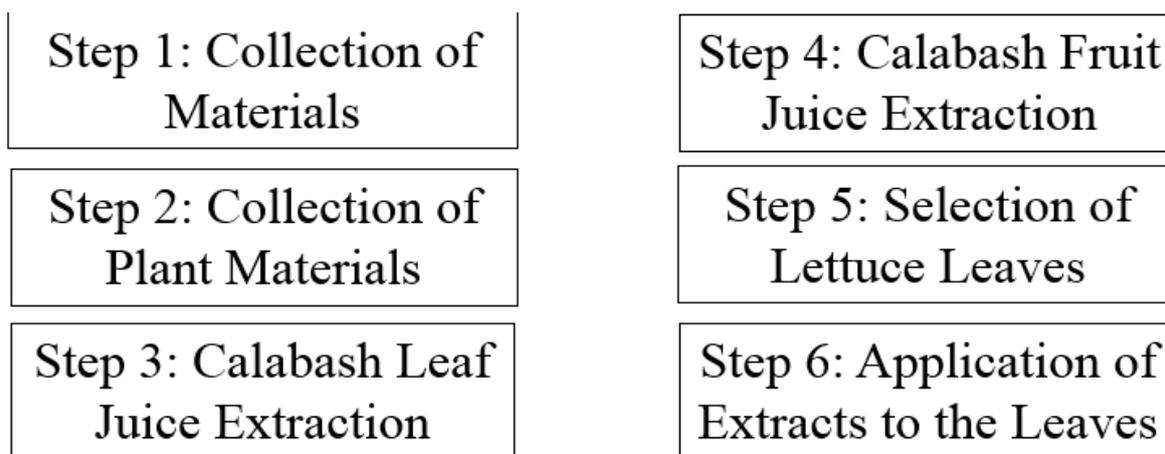
The agricultural sector might be flourishing, yet the sixth most consequential woe in the world is inadequate access to healthy nutrition. Due to the aggravating state of the environment along with the persistence of plant pathogens, only one (1) in nine (9) persons is receiving sufficient supplies of clean food.

Lettuce can be infected by *Escherichia coli* when planted in places with improperly contaminated manure (Solomon et al., 2002). Further, the only bacterial transmission that is happening from manure-contaminated soil is done by *E.coli*. This conclusion is further upheld when mainly raw vegetables are asserted to contain *E.coli*. Hence, lettuce leaves are likely to be penetrated by this bacteria (Jang et al., 2017). Although most strains of *E.coli* are harmless, some of them can still produce toxins that can make humans sick. With the rife invasion of bacteria among vegetables, it was revealed that the bark of Calabash (*Crescentia kujete*) has antibacterial effects against bacteria that cause threats to people's lives. Its antibacterial properties are from the metabolites it contains. However, there was no specific study that conferred the antibacterial effect of its leaves and fruit against *E.coli*.

This study was carried out to determine the antibacterial effect of Calabash Leaf and Fruit Extracts on the preservation of lettuce affected with *E.coli*. In the study, 2 set-ups were prepared: Set-up 1 using Calabash Leaf Extract and Set-up 2 using Calabash Fruit Extract. The antibacterial activity of different concentrations of extracts was evaluated after three (3) days of observation through interpreting the change in the size of the 1mm purposively-made lesion on lettuce leaves. Additionally, this was done to assess the following: change in length of lesion on lettuce leaves depending on the effectiveness of the different concentrations of treatments; and significant difference of the extracts.

## 2. METHOD

To determine the antibacterial effect of Calabash (*Crescentia kujete*) Leaf and Fruit Extracts, this study utilized an experimental research design where the data derived from experimentations were used to infer precise and accurate conclusions (see **Figure 1**).



**Figure 1.** The data gathering procedure of the study.

### 3. RESULT AND DISCUSSION

#### 3.1. Effectiveness of Calabash Leaf and Fruit Extracts

**Table 1** showed that the mean lesion for all the 3 treatments of the Calabash Leaf Extract was 1.02 mm, while the average lesion length for all the treatments of the Calabash Fruit Extract was 1.01 mm. Also, as the concentration of the extracts became higher, the average size of lesions became smaller.

The gathered data inflicted that both Calabash Leaf and Fruit Extracts successfully inhibited the growth of *Escherichia coli* in the lettuce leaves. Calabash contains metabolites that have antibacterial properties. Some of these metabolites are alkaloids, steroids, flavonoids, saponins, tannins, and glycosides.

The most active part of the plant contains the greatest amount of alkaloids (Bonjean, 1998). Meanwhile, the most active parts of the Calabash plant are its fruits and leaves. It can therefore be denoted that the higher concentrations of the Leaf and Fruit extracts, the more efficient they become in deteriorating the growth of *E.coli* applied on the plant leaf.

**Table 1.** Mean Size of Lesions (mm) on Varying Concentrations of *C.cujete* Leaf and Fruit extract on *E.coli* after 72 hours (3 days).

Replication	Lesion size influenced by the calabash leaf extract			Lesion size influenced by the calabash fruit extract		
	Mean of T1 (50%)	Mean of T2 (75%)	Mean of T3 (100%)	Mean of T1 (50%)	Mean of T2 (75%)	Mean of T3 (100%)
	1.07	1.02	0.96	1.1	1.02	0.91
<i>Mean</i>	1.02			1.01		

#### 3.2 Significant Difference of Calabash Leaf and Fruit Extracts

The t-test results evaluated the significant difference in the effectiveness of the Calabash Leaf and Fruit Extracts (**Table 2**). At a 5% level of significance, the absolute value of the t-value calculated was smaller than the critical value. This implied that the difference is not significant. Hence, the Calabash Leaf and Fruit Extracts have the same antibacterial effectiveness against *E.coli*.

The most active part of the plant contains the greatest amount of alkaloids which have antibacterial properties against bacteria like *E.coli* (Bonjean, 1998). Meanwhile, the most active parts of the Calabash plant are its fruit and leaves. It indicated that the two (2) extracts have no significant difference. Thus, either of the Leaf and Fruit Extract can be used as an effective antibacterial agent against the pathogen that is a causative agent of bacterial diseases in plants such as lettuce.

**Table 2.** Result of the t-test for significant difference on the effect of leaf extract and fruit extract.

Variable	SD	Degrees of Freedom	T-value	Critical Value	Interpretation
Leaf	0.0557	4	0.1045	2.776	Not significant
Fruit	0.0954				

#### 4. CONCLUSION

Based on the findings of the study, it has been concluded that both Calabash Leaf and Fruit Extracts have an antibacterial effect that can control the growth of *E.coli*. The rate of effectiveness is directly proportional to the amount of concentration of the extracts. As the concentration becomes higher, the chance of impeding bacterial growth becomes higher, too. Moreover, the effectiveness of the extracts is not significantly different. Therefore, the Leaf and Fruit Extracts of Calabash are equally efficient in controlling the bacterial activity of *E.coli* on lettuce leaves.

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#### 6. AUTHORS' NOTE

The author(s) declare(s) that there is no conflict of interest regarding the publication of this article. The authors confirmed that the data and the paper are free of plagiarism.

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