Effect of Topping Schedules on the Growth and Yield Parameters of Lady’s Finger (*Abelmoschus esculentus*)

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Abstract

**Objectives:** This study was conducted to determine the optimum schedule of topping lady’s finger to enhance its growth and yield parameters. **Methods/Statistical Analysis:** The treatments (20 DAE (Days after emergence), 30 DAE, 40 DAE and without topping (control)) were arranged in RCBD using three replications. Growth parameters, viz., a number of branches and leaf area at maturity and yield parameters, viz., the length and weight of fruits, projected yield per hectare and Marginal Benefit-Cost Ratio (MBCR) were observed. Data were subjected to Analysis of Variance (ANOVA) and Least Significant Differences (LSD) using the Randomized Complete Block Design (RCBD). **Findings:** Results revealed that topping the lady’s finger at 20 DAE, 30 DAE and 40 DAE did not significantly affect the length of fruits and leaf area of plants, however, topping the lady’s finger at 20 DAE significantly increase the number of branches, the weight of fruits, number of fruits and projected yield. On the basis of economics using the marginal benefit-cost ratio, topping the lady’s finger at 20 DAE gained an 18% benefit while topping beyond this schedule resulted in a loss of 7.5%. Results indicate that the growth and yield decrease when topping is done beyond 20 DAE. The result of the present study is in conformity with the result of previous studies on the effect topping technology to crops, further it determines the optimum schedule of topping lady’s finger to help enhance the production of lady’s finger. **Application/Improvement:** The optimum schedule for topping crops could help increase the production of crop yield from a limited or from shrinking agricultural land.

Keywords: Growth, Lady’s Finger (okra), Topping Schedule, Yield Parameters, MBCR

1. Introduction

Concerns on food security are now the focus of research nowadays considering the challenge of increasing food production from a decreasing arable land for production. Planting of vegetables in the Philippines is one way of generating income among farmers.

Lady’s finger commonly known as Okra (*Hibiscus esculentus*) is a vegetable in the mallow family. It is a tall growing, warm season and annual vegetable crop. It is a popular and profitable vegetable in the country. It is valued for its edible green seed pods. The young and tender fruits can be prepared as salad, boiled, broiled or fried and can be mixed in many meat and fish dishes.

It is also an important vegetable mix of the famous Ilocano dish, pinakbet. Okra is rich in vitamins A, C and B complex, protein, calcium, fats, potassium, phosphorus, iron and carbohydrates. Generally, okra is planted for home consumption. But planting this crop extensively can give a year-round income for a farm family.

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Despite having many valuable uses, farmers have felt difficulty of growing this vegetable as primary source of income. Abundant researches have been made to enhance the production of okra like rejuvenation; Rejuvenation is a technology that reduces the inputs of cultivating okra. This technology is a regrowth cropping system from the cut stalks of previous crop while conventional methods a cropping practice of planting/growing one after another of the same kind in an area throughout the year. Another technology is the apical topping. Apical topping breaks the apical dominance and induces development of lateral branches thereby increase the site for pod development. The practice of topping has proved to be effective in increasing the yield levels of different crops. However, the proper timing for apical topping for okra has never been considered. Keeping these points in view the present investigation was carried out to study the effect of Schedules on the Growth and Yield Parameters of Lady’s Finger (okra).

2. Materials and Methods

An experiment was carried out to study the effects of topping schedules on the growth and yield of lady’s finger and evaluated the marginal benefit-cost ratio of applying the different topping schedules (that is the number of Days After Emergence or DAE) at the instructional area of the Cagayan State University, Sanchez Mira, Cagayan, keeping an area of 215 m². The experiment was laid out in RCBD with three replications having four treatments including the control. The treatments were T₀ (control-no topping applied), T₁ (topping at 20 DAE), T₂ (30 DAE) and T₃ (40 DAE). Seeds of lady’s finger (var. Smooth green) were sown in a soil media composed of 1 part vermin compost and 1 part garden soil. The crop was transplanted in the experimental area 7 Days After Sowing (DAS) at the rate of 1 seedling per hill at a planting distance of 60 x 45 cm. Chicken dung organic fertilizer was used as basal fertilizer for the crop at a rate of 300 grams per hill and was applied one week prior to transplanting. Side dressing was applied using urea fertilizer 30 Days After Transplanting (DAT) at a rate of 10 grams per hill. The tops of the lady's finger were removed at 20 DAE, 30 DAE, and 40 DAE.

Observations were made on ten randomly selected plants from each treatment. The data on growth parameters like a number of branches and leaf area at maturity and yield parameters like length of fruits, the total number of fruits, and the weight of fruits and computed yield per hectare was recorded. Analysis of variance was performed using the Statistical Tool for Agricultural Research (STAR) and the significance of differences among treatment means was performed using the Least Significant Difference (LSD).

3. Results and Discussion

3.1 Growth Parameters

The number of branches produced by the crop as affected by the different topping schedules is shown in Table 1 and the analysis of variance (ANOVA) is given in Table 2. Results revealed that the crops that were topped 20 DAE registered significantly more branches compared to the control. However, crops that were topped at 30 DAE and at 40 DAE registered a comparable number of branches with the control. This means that topping lady’s finger beyond 20 DAE could lead to lower production of branches by the plant. This could be due to the fact that the side branches are given enough time to develop since the apical buds are removed at the early age of the plants and the concentration of auxin (an acidic organic substance that promotes cell elongation in plant shoots and usually regulates other growth processes) is at the lateral branches.

This result is in agreement with the findings that early topping significantly increases the number of branches produced by the plant. Similar result was obtained in a study on topping Sesbania on 45 DAS registered number of branches. Parallel result was that the number of sweet potato cutting per plant is significantly related to the time of topping. Similar results on the effect of topping on the number of branches recorded by the sunnhemp.

There were no significant differences in the number of first and second order branches among the treatments. However, the number of total branches differed significantly among the treatments. The number of total branches was significantly higher in the control compared to the topping treatments. The number of total branches was significantly higher in the control compared to the topping treatments. The number of total branches was significantly higher in the control compared to the topping treatments.
The leaf area of the plants as affected by different topping schedules is shown in Table 1 and the Analysis of Variance (ANOVA) in Table 2. The leaf area of the plants in the control is 768.8 cm$^2$ and is higher than the leaf area of the de-topped plants. However, results revealed that the size of leaves of the plants was not affected significantly by the different de-topping schedules. The leaf size of the control is comparable with the leaf size of the de-topped plants. Although the effect is insignificant, there are reasons to believe that de-topping the plants negatively affected the leaf size of the plants as manifested by the lower leaf area of 551cm$^2$, 603.2 cm$^2$ and 578.17 cm$^2$ for $T_1$, $T_2$ and $T_3$, respectively. This result on the insignificant effect of the treatment on the leaf size the plants is in conformity to the work that was reported that leaf characteristics of plants is fixed genetically and cannot be easy altered by physical treatment on plants\textsuperscript{13}.

### 3.2 Yield Parameters

The size of the fruit of the plant as affected by the different topping schedules is shown in Table 1 and the Analysis of Variance (ANOVA) in Table 2. The result shows that longer fruits were recorded in the control followed by fruits in $T_2$ and $T_1$ and shorter fruits were recorded in $T_3$. However, the analysis of variance revealed that topping the lady's finger at different schedules did not affect significantly the length of fruits of the crop. Although the effect is insignificant, there are reasons to believe that topping negatively affects the fruit length of fruits as manifested by the decrease in size. The size of fruits could be associated with the number of branches of the plant. Since $T_2$ had the most number of branches to bear fruits, it goes that the plant has more branch and fruit to maintain. Thus, it resulted in a quit smaller in fruit size. The length of fruit is affected by season and environmental factors and crop physiology\textsuperscript{11}.

The total number of fruits of lady's finger as affected by different topping schedules is presented in Table 1 and the Analysis of Variance (ANOVA) is presented in Table 2. It was observed that $T_1$ produced the most number of fruits followed by $T_0$ and $T_3$ and the least is obtained by $T_2$. Analysis of variance revealed that there were significant differences between and among treatment means. Least significant difference test reveals an insignificant difference between and among $T_0$, $T_2$, and $T_3$. Treatment one was significantly higher than the three other treatments. This means that the different topping schedules significantly affect the fruiting of the crop in producing fruits. Topping at 20 DAE produced the most number of fruits and this could be due to the more productive branches of the plant. This result is in conformity with the study conducted with a finding...
that topping breaks the apical dominance and induces the development of lateral branches thereby increase the site for pod development\textsuperscript{7,8}. A positive influence of topping on the yield of sweet pepper under less favorable condition was obtained\textsuperscript{14,15}. The practice of topping has proved to be effective in increasing the yield levels of different crops. However, topping the crop beyond 20 DAE could significantly decrease the yield. This result is in agreement with the result of study conducted on topping tomatoes wherein significantly reduced its yield/plant was observed\textsuperscript{16}.

The weight of fruits harvested as affected by the different topping schedules is given in Table 1 and the Analysis of Variance (ANOVA) is shown in Table 2. The result showed that $T_1$ produced heavier fruits compared to the weight of fruits in $T_0$ (control), $T_2$ and $T_3$. The analysis of variance revealed that the weight of fruits produced in $T_1$ is significantly heavier compared to the weight of fruits in the control, in $T_2$ and in $T_3$.

However, the weight of fruit in $T_2$ and $T_3$ are comparable with the weight of fruits in $T_0$ (control). This means that de-topping lady’s finger at 20 DAE significantly increases the weight of harvested fruits. This could be attributed to the fact that plants in $T_1$ produced more fruits than the control and the two other treatments. This result conforms to the study\textsuperscript{2} and\textsuperscript{3} that de-topping breaks the apical dominance and induces the development of lateral branches thereby increase the site for pod development.

\begin{table}[h]
\centering
\begin{tabular}{|l|l|l|l|l|l|l|}
\hline
\textbf{Parameters} & \textbf{SOV} & \textbf{DF} & \textbf{SS} & \textbf{MS} & \textbf{F} & \textbf{P} \\
\hline
Number of Branches & Blocks & 2 & 86 & 43 & 5.03$^*$ & 0.016966 \\
 & Treatments & 3 & 200.92 & 66.97 & 7.83$^*$ & 0.052224 \\
 & Exp. Error & 6 & 51.33 & 8.56 &  &  \\
\hline
Leaf area (cm$^2$) & Blocks & 2 & 4657.51 & 2328.77 & 0.33$^{**}$ & 0.067078 \\
 & Treatments & 3 & 86468.1 & 28822.7 & 4.09$^{**}$ & 0.730674 \\
 & Exp. Error & 6 & 42240.4 & 7040.07 &  &  \\
\hline
Length of fruits (cm) & Blocks & 2 & 0.35 & 0.17 & 0.39$^{**}$ & 0.595306 \\
 & Treatments & 3 & 0.92 & 0.31 & 0.68$^{**}$ & 0.695424 \\
 & Exp. Error & 6 & 2.69 & 0.45 &  &  \\
\hline
Total number of fruits & Blocks & 2 & 518 & 259 & 0.61$^{**}$ & 0.003814 \\
 & Treatments & 3 & 18386 & 6128.67 & 14.35$^{**}$ & 0.606557 \\
 & Exp. Error & 6 & 2562 & 427 &  &  \\
\hline
Weight (g) of fruits & Blocks & 2 & 10139.4 & 5069.7 & 2.57$^{**}$ & 0.014203 \\
 & Treatments & 3 & 50023.0 & 16674.35 & 8.45$^*$ & 0.156406 \\
 & Exp. Error & 6 & 11844.9 & 1974.14 &  &  \\
\hline
Projected yield (ton/ha) & Blocks & 2 & 0.45 & 0.23 & 1.73$^{**}$ & 0.008267 \\
 & Treatments & 3 & 4.17 & 1.39 & 10.57$^{**}$ & 0.25570 \\
 & Exp. Error & 6 & 0.79 & 0.13 &  &  \\
\hline
\end{tabular}
\caption{Analysis of Variance (ANOVA) calculated for measured parameters}
\end{table}
The practice of topping has proved to be effective in increasing the yield levels of different crops. Parallel result has reported that topping had a significant effect on weight of fresh vines and leaves of sweet potato.

### 3.3 Projected Yield (ton/ha)

The yield of the crop when topping technology is applied in a hectare basis is presented in Table 1 and the Analysis of Variance (ANOVA) is presented in Table 2. The result shows that the yield in $T_1$ is significantly higher than the yield in $T_0$ (control), $T_2$ and $T_3$ as revealed by the analysis of variance. This result could be associated with the fact that $T_1$ produced more fruits than the other treatments and the plants in $T_1$ had more productive branches to produce fruits. This means that de-topping the plant at 20 DAE could increase yield. This result conforms to the study that de-topping breaks the apical dominance and induces the development of lateral branches thereby increase the site for pod development. The practice of topping has proved to be effective in increasing the yield levels of different crops.

### 3.4 Marginal Benefit Cost Ratio (MBCR)

The marginal benefit-cost ratio of de-topping Lady’s finger at different schedules is presented in Table 3. The plants that were de-topped at different schedules have the same added treatment cost of Php 19.00. De-topping the crop at 20 DAE attained the highest weight of 0.807 kg and gained an added benefit 3.329, while the crops that were de-topped at 30 DAE and 40 DAE incurred a loss of Php 1.41 and Php 1.29, respectively. The results show that for every peso cost invested in de-topping the crop at 20 DAE gained a benefit 0.18, while the crops de-topped at 30 DAE and 40 DAE incurred a loss of 0.075 and 0.07, respectively.

### 4. Conclusion

Based on the result of the present study, the following conclusions were drawn;

1. Topping lady’s fingers at 20DAE produced the highest number of branches, fruits, the weight of fruits and projected yield.
2. The leaf area and the length of fruits of the crop de-topped from 20 DAE to 40 DAE are comparable with the leaf area and length of fruits produced by the control group.
3. Topping the crop beyond 20 DAE could lead to economic loss as manifested by the decrease in the growth and yield parameters and marginal benefit-cost ratio.

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