Effects of Pruning on the Growth of Okra (*Abelmuscus esculentus* L.)

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ABSTRACT

The experiment on "The Effects of Pruning on the Growth of Okra (*Abelmoschus esculentus* (L.) Moench)" was conducted in a Screen House with the aim of determining the response of okra plants to pruning, using the Clemson Spineless variety. The study consisted of 12 experimental potted plants, which were divided into three groups; A, B, and C. with four replicates. All plants received the same treatment except for the pruning (treatment). Group "A" served as the control, while groups "B" and "C" were pruned. Group B had the pruning at the terminal buts while the plants in group C had the pruning at axillary buds. Pruning was done 2 weeks after planting and reading started on the day of pruning. The readings were taken every two days and the parameters taken are; plant height, number of leaves, number of branches, Girth of plants and number of flowers. The Pearson Bivariate Correlation Coefficient was used to analyze the correlation among the variables as the plants grow while ANOVA was used to check for any significant differences among the groups, using SPSS with $\alpha = 0.05$ (Two Tail Test). The correlation test showed no significance for all parameters at $\alpha = 0.05$ while the ANOVA revealed significant difference in the number of flowers, number of branches and number of leaves, axillary pruning produced a greater number of flowers hence a greater number of fruits.

Key Words: Growth, Okra, Pruning

1 INTRODUCTION

OKRA

Okra (*Abelmoschus esculentus* (L.) Moench) is a member of the family; Malvaceae, and order Malvales. It was earlier included in the *Genus*; Hibiscus, Section; Abelmuschus (Priya, et al., 2014; Tripathi, Govila, Ranjini, & Vibha, 2011; Kumar, et al., 2013). The okra is the only vegetable crop of significant importance in the Malvaceae family (Kumar, et al., 2013)

It is believed by many to have originated from Ethiopia in Africa and is widely cultivated in tropical, sub-tropical and worm temperate regions (Priya, et al., 2014; Tesfa & Yosef, 2016)

The plant forms a major part of the human diet as it has a lot of nutritive values (Priya, et al., 2014; Rakesh & Vishal , 2016), as it has proteins, carbohydrates, vitamins, calcium, potassium, enzymes, and total minerals. The plant is also known to have a lot of medicinal/health benefits (Habtamu , Negussie , Gulelat , & Ashagrie , 2014)

Okra is grown as a garden crop at the backs of many homes and also as a commercial crop in many parts of the world (Tripathi, Govila, Ranjini, & Vibha, 2011)

PRUNING

Pruning can simply be looked at as the removal of undesirable (or just some) portions of a plant (University of Maryland Extension, 2005; Peter , Joseph , & Manfred , 1995)

Some reasons for Pruning include: Removal of dead, damaged or diseased plant tissue to maintain plant health and vigor. Prune to remove crowded and rubbing branches, to increase flowering and fruiting. Prune to train plants to a particular size or shape, including hedge and espalier forms. Prune to rejuvenate old, overgrown shrubs and restore plant density, shape and vigor, etc. (Bill , Alina , & Rich , 2008; Rohr, 2008)

The time of pruning, varies and depends on the reasons for pruning and also the type of plants as all plants also respond differently to the time (season) of pruning but it is best to prune at the early life of the plant so that pruning wounds will heal on time and for early response to pruning (Hagen, 1991)

"Each tree is an individual and should be treated accordingly. Varieties differ in growth characteristics and response to pruning cuts, rootstocks, soil, and growing conditions" (Richard , 2014)

The knowledge of the different types of buds is very important because buds play very vital roles in the size and quality of crops. (Richard , 2014)

OGJECTIVES

- To observe the effects of pruning on a shrub crop
- Th see which type of pruning produced more desirable traits

NULL HYPOTHESIS

Pruning does not produce any significant changes in the growth of Okra

METHOD

EXPERIMENTAL ARRANGEMENT

Seeds of okra cultivar were planted in plastic buckets with holes of equal sizes created at the bottom of the buckets to allow drainage of excess water from the buckets.

The study consists of 12 experimental plastic buckets, which were divided into three groups, labeled; A, B, and C. Each group has four replicates arranged in serial number.

Group A served as the control, while groups C and D were pruned but differently. The plants in group B had their pruning at the terminal buts while the plants in group C had the pruning at axillary buds.

Below are the arrangements of the buckets: -

Buckets A = A1 A2 A3 A4

Buckets B = B1 B2 B3 B4

Buckets C = C1 C2 C3 C4

SOIL PREPARATION

Loamy soil from around the garden of the biological research center was used, manure was added to the soil and the whole soil was properly mixed for a good homogenous mixture. Equal amounts of the soil were added to each pot and they were then well watered and allowed to drain for about 2 hours before the planting was done.

PLANTING

Three seeds of the okra were sown in each bucket and were all given the same treatment (watering and all other cultural care), after germination, the seedlings were thinned to one seedling per bucket. This was done to take care of any cases of seeds refusing to germinate. The seedlings were then allowed to grow for two more weeks before pruning was done.

PRUNING PROCEDURE

The okra plants were allowed to reach 2 weeks before pruning was done, in group A; the seedlings were left without pruning; this group served as the control. In group B; terminal buts were pruned while in group C; two axillary buts were pruned alongside the leaves.

A sterile pruning knife was used for the pruning procedure were the knife was used to cut off the but that terminated the young seedlings in group B (terminal but) while in group C, two leaves were cut in such a manner that they were cut alongside the buds on their axils (axillary buds)

READING

Reading began from the day the pruning was done and the parameters that were considered are:

- The length (height) of the plant; this was done using a normal commercial measuring tape and the measurement from the soil level to the tip of the terminal bud.

- Number of leaves; this was done by manually counting the number of leaves on each plant.
- Number of branches; this was also done by manually counting the number of branches.
- Number of flowers/fruits; as in 2 and 3 above, this was also counted, manually.
- Girth of plants; this was done by tying a thread round the plant and noting the circumference, it was then placed on a ruler and the length measured.

The measurement was taken once in every two days and was done for a period of two months.

RESULTS

Table 1: Result of Correlation of increase in Height of plants

		Group A	Group B	Group C
Group A	Pearson Correlation	1	.986**	.983**
	Sig. (2-tailed)		.000	.000
	N	17	17	17
Group B	Pearson Correlation	.986**	1	.971**
	Sig. (2-tailed)	.000		.000
	N	17	17	17
Group C	Pearson Correlation	.983**	.971**	1
	Sig. (2-tailed)	.000	.000	
	N	17	17	17

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2: Result of Correlation of increase in number of leaves

		Group A	Group B	Group C
Group A	Pearson Correlation	1	.866**	.882**
	Sig. (2-tailed)		.000	.000
	N	17	17	17
Group B	Pearson Correlation	.866**	1	.948**
	Sig. (2-tailed)	.000		.000
	N	17	17	17
Group C	Pearson Correlation	.882**	.948**	1
	Sig. (2-tailed)	.000	.000	
	N	17	17	17

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3: Result of Correlation of increase in Number of Branches of plants

		Group A	Group B	Group C
Group A	Pearson Correlation	.a	.a	.a
	Sig. (2-tailed)		.	.
	N	17	17	17
Group B	Pearson Correlation	.a	1	.a
	Sig. (2-tailed)	.		.
	N	17	17	17
Group C	Pearson Correlation	.a	.a	.a
	Sig. (2-tailed)	.	.	
	N	17	17	17

a. Cannot be computed because at least one of the variables is constant.

Table 4: Result of Correlation of increase in Stem Girth of plants

		Group A	Group B	Group C
Group A	Pearson Correlation	1	.976**	.980**
	Sig. (2-tailed)		.000	.000
	N	17	17	17
Group B	Pearson Correlation	.976**	1	.981**
	Sig. (2-tailed)	.000		.000
	N	17	17	17
Group C	Pearson Correlation	.980**	.981**	1
	Sig. (2-tailed)	.000	.000	
	N	17	17	17

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5: Result of Correlation of increase in Height of plants

		Group A	Group B	Group C
Group A	Pearson Correlation	1	.715**	.945**
	Sig. (2-tailed)		.001	.000
	N	17	17	17
Group B	Pearson Correlation	.715**	1	.888**
	Sig. (2-tailed)	.001		.000
	N	17	17	17
Group C	Pearson Correlation	.945**	.888**	1
	Sig. (2-tailed)	.000	.000	
	N	17	17	17

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6: Descriptives of all parameters on day 17

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Height of	1	4	63.875	11.1831	5.5916	46.080	81.670	52.5	77.0
Plants	2	4	44.000	12.5167	6.2583	24.083	63.917	30.0	56.0
	3	4	61.375	10.5623	5.2812	44.568	78.182	51.0	75.0
	Total	12	56.417	13.8742	4.0051	47.601	65.232	30.0	77.0
Number of	1	4	6.25	1.258	.629	4.25	8.25	5	8
Leaves	2	4	10.00	.816	.408	8.70	11.30	9	11
	3	4	6.00	.000	.000	6.00	6.00	6	6
	Total	12	7.42	2.065	.596	6.10	8.73	5	11
Number of	1	4	.00	.000	.000	.00	.00	0	0
Branches	2	4	2.75	.957	.479	1.23	4.27	2	4
	3	4	.00	.000	.000	.00	.00	0	0
	Total	12	.92	1.443	.417	.00	1.83	0	4
Girth of	1	4	3.250	.1732	.0866	2.974	3.526	3.1	3.5
Plants	2	4	2.850	.2380	.1190	2.471	3.229	2.5	3.0
	3	4	2.975	.2062	.1031	2.647	3.303	2.7	3.2
	Total	12	3.025	.2563	.0740	2.862	3.188	2.5	3.5
Flowers	1	4	2.75	1.500	.750	.36	5.14	1	4
	2	4	1.75	1.708	.854	-.97	4.47	0	4
	3	4	4.75	.500	.250	3.95	5.55	4	5
	Total	12	3.08	1.782	.514	1.95	4.22	0	5

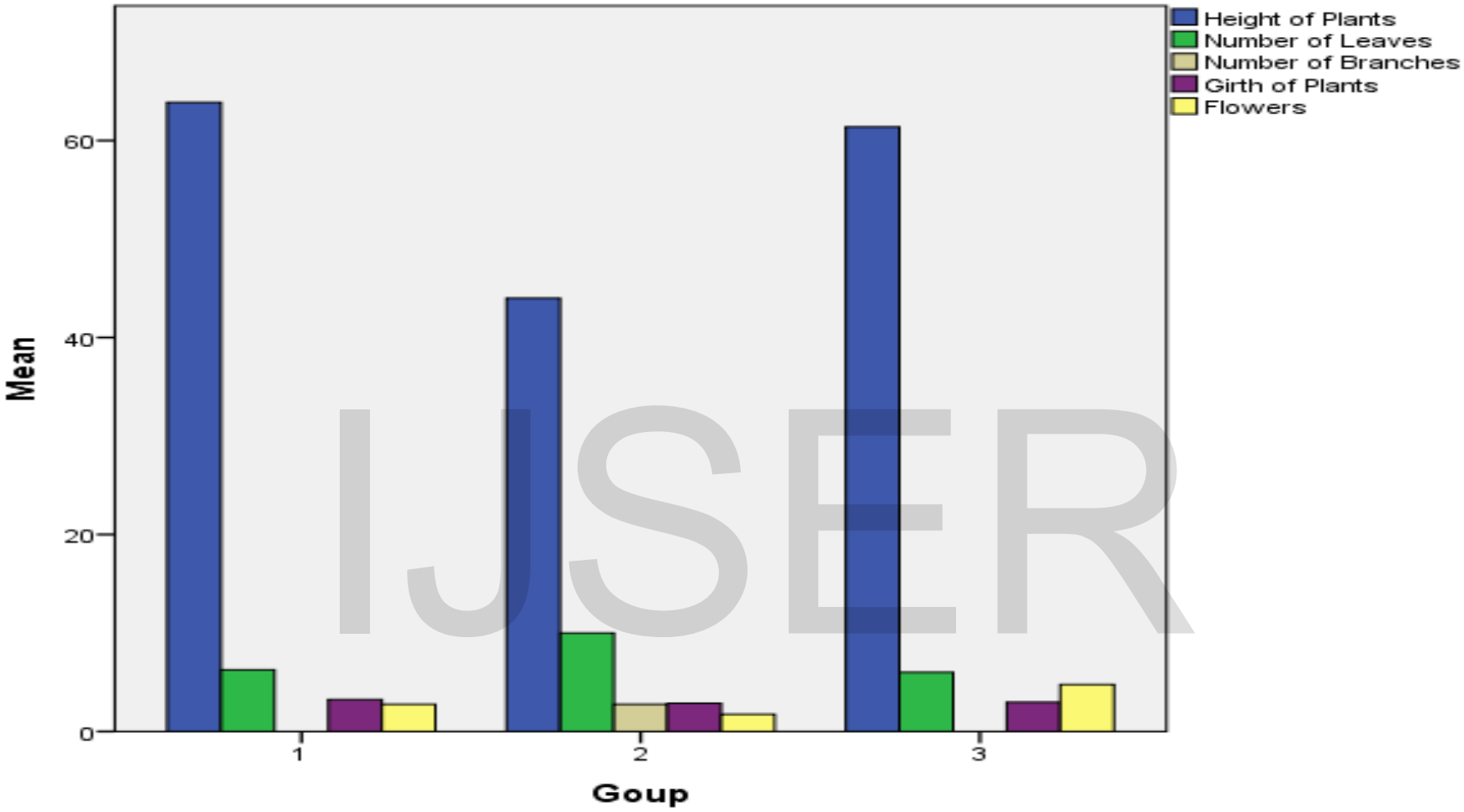

Figure 1: Graph of all parameters taken on day 17

Table 7: Results of One-way ANOVA of all parameters on day 17

		Sum of Squares	df	Mean Square	F	Sig.
Height of Plants	Between Groups	937.542	2	468.771	3.576	.072
	Within Groups	1179.875	9	131.097		
	Total	2117.417	11			
Number of Leaves	Between Groups	40.167	2	20.083	26.778	.000
	Within Groups	6.750	9	.750		
	Total	46.917	11			
Number of Branches	Between Groups	20.167	2	10.083	33.000	.000
	Within Groups	2.750	9	.306		
	Total	22.917	11			
Girth of Plants	Between Groups	.335	2	.167	3.890	.061
	Within Groups	.387	9	.043		
	Total	.722	11			
Flowers	Between Groups	18.667	2	9.333	5.169	.032
	Within Groups	16.250	9	1.806		
	Total	34.917	11			

Post Hoc Tests

Dependent Variable	(I) Goup	(J) Goup	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Height of Plants	1	2	19.8750	8.0962	.084	-2.730	42.480
		3	2.5000	8.0962	.949	-20.105	25.105
	2	1	-19.8750	8.0962	.084	-42.480	2.730
		3	-17.3750	8.0962	.135	-39.980	5.230
	3	1	-2.5000	8.0962	.949	-25.105	20.105
		2	17.3750	8.0962	.135	-5.230	39.980
Number of Leaves	1	2	-3.750*	.612	.000	-5.46	-2.04
		3	.250	.612	.913	-1.46	1.96
	2	1	3.750*	.612	.000	2.04	5.46
		3	4.000*	.612	.000	2.29	5.71
	3	1	-.250	.612	.913	-1.96	1.46
		2	-4.000*	.612	.000	-5.71	-2.29
Number of Branches	1	2	-2.750*	.391	.000	-3.84	-1.66
		3	.000	.391	1.000	-1.09	1.09
	2	1	2.750*	.391	.000	1.66	3.84
		3	2.750*	.391	.000	1.66	3.84
	3	1	.000	.391	1.000	-1.09	1.09
		2	-2.750*	.391	.000	-3.84	-1.66
Girth of Plants	1	2	.4000	.1467	.055	-.010	.810
		3	.2750	.1467	.201	-.135	.685
	2	1	-.4000	.1467	.055	-.810	.010
		3	-.1250	.1467	.682	-.535	.285
	3	1	-.2750	.1467	.201	-.685	.135
		2	.1250	.1467	.682	-.285	.535
Flowers	1	2	1.000	.950	.565	-1.65	3.65
		3	-2.000	.950	.144	-4.65	.65
	2	1	-1.000	.950	.565	-3.65	1.65
		3	-3.000*	.950	.028	-5.65	-.35
	3	1	2.000	.950	.144	-.65	4.65
		2	3.000*	.950	.028	.35	5.65

*. The mean difference is significant at the 0.05 level.

DISCUSSION

Pruning as a horticultural practice, has a lot of positive effects on plants (trees, shrubs, ornamental plants etc.) (Bill , Alina , & Rich , 2008). The pruning technique will depend on the purpose of pruning. In the case of okra, the aim is to improve yield production hence, the increase in the number of flowers and the quality of the fruits is the target of this research.

The pruning of the terminal buds had a significant improvement in the increase in number of branches while the pruning of the axillary buds produced a significant increase in the height of the plants.

The number of flowers (which is our main point of interest) was increase by the pruning of the axillary buds, this is due to the production of more flowers at the terminal of the plants as seen in the control.

CONCLUSION

With the results above, we will reject the null hypothesis since there were differences of significance among the different groups as regards the different types of pruning.

RECOMMENDATIONS

Since pruning is a very simple procedure that is not stressful, and does produce significant changes in the yield of okra, there is need for local farmers to be educated on the pruning procedures and which crop plants can be pruned.

More research can be carried on other crop plants, to see if the same effects will be observed.

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