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Original Research Article

Effect of Pruning on Growth, Yield and Quality of Coffee

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Abstract: The experiment was carried out at the existing plantation of Hill Agricultural Research Station at Khagrachari during 2021-22 to find out the pruning method for maintaining tree size and impact of pruning on yield and quality of coffee. Coffea canephora (syn. Coffea robusta) commonly known as robusta coffee from the existing coffee orchard of HARS, Khagrachari was selected for the study. All treatments produced higher yield than control treatments. Maximum yield was found in P_3 (9.14 kg/plant) followed by p_5 (8.86 kg/plant). On the other hand, control treatments produced lowest amount of coffee per plant. All treatments showed higher yield than control treatment. Yield increased maximum 49.7% found in P3 treatment over control. In a nutshell the present finding shows that pruning increase yield potentiality of old coffee orchard.

Keywords: plantation of Hill Agricultural Research Station, Coffea canephora, control treatment.

INTRODUCTION

Coffee was not commercially grown in Bangladesh in the past, now the scenario has been changing gradually in the hills. The area of the Chittagong Hill Tracts is about 13, 184 km^2, which is approximately one-tenth of the total area of Bangladesh. Coffee is one of the most important non-alcoholic beverage crops grown in over 80 countries and exported in different forms to more than 165 nations of the world (Dessalegn *et al*., 2008). The *Coffea* genus belongs to the family Rubiaceae and *Coffea arabica* and *Coffea canephora* are the commonly cultivated species in the globe. The two species are the major commercially cultivated types of coffee that contribute about 70% (*Coffea arabica*) and 30% (*Coffea canephora*) of the total coffee production in the world. Globally, the two coffee species are grown in 80 countries in Africa, Asia and South America (International Coffee Organization-ICO 2014, Musoli *et al*., 2010 and Vega *et al.*, 2008).

Farmers are getting increasingly interested in the cultivation of coffee besides that of fruits like mango, orange, jackfruit, banana and pineapple. Some people in CHT and Madhupur Upazila in Tangail regions have already started growing coffee on small scale and earning money, more people are being encouraged to grow coffee there. In order to change the life style of hill people, the government has taken a project. But production technologies and intercultural operation, pruning etc. are new to farmers. The coffee plant is a woody perennial evergreen dicotyledon that belongs to the Rubiaceae family. Because it grows to a relatively large height, it is more accurately described as a coffee tree. It has a main vertical trunk (orthotropic) and primary, secondary, and tertiary horizontal branches (plagiotropic). Both the Robusta and Arabica coffee plant can grow to heights of 10 meters if not pruned, but producing countries will maintain the coffee plant at a height reasonable for easy harvesting.

One of the main reasons is to control the size and shape of the tree, making it easier to maintain and harvest the coffee berries. Pruning also promotes the growth of new branches and leaves, which can increase the yield of the tree. Additionally, pruning can also help to improve the quality of the coffee beans by removing diseased or damaged branches and allowing for better sunlight and air circulation within the tree. Overall, pruning helps optimizing coffee trees' health, productivity, and quality.

As mentioned in a previous article, coffee trees experience two types of vegetative and productive growth. Constantly new branches are developed through plagiotropic and orthotropic growth. With time, old

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branches stop producing flowers and fruit, but the new vertical and horizontal branches will yield. The objective of pruning is to stimulate growth and production.

However, the ideal time for the actual pruning and stumping is after harvest, during cold weather. The trees will not grow sprout by pruning/stumping during this time. Since farmers will not harvest anything that grows from the trees during this time, there will be no risks of diseases or fungal infections. Therefore, the present study has been undertaken to find out the suitable pruning method and impact of pruning on yield and quality of coffee.

MATERIALS AND METHODS

The experiment was carried out at the existing plantation of Hill Agricultural Research Station at Khagrachari during 2021 to 2022. There were six treatments, P_1: 10 cm from apex, P_2: 20 cm from apex, P_3: 30 cm from apex, P_4: 40 cm from apex and P_5: 50 cm from apex and P_0: Control (without pruning) in a randomized complete block design replicated three times. Pruned has been done from apex of branch. Different types of natural shade trees are existing in coffee orchard. Plant to plant and row to row distance was 3m. The plants were about near about 21 years old. Fertilizers were applied in four equal installments by pegging method at hill slope. Data on fruit characteristics, quality, harvesting period and yield were recorded and the data have been presented in the Table.

RESULT AND DISCUSSION

This experiment was carried out in old orchard near about 21 years old. No significant differences were observed in the plant height but maximum plant height was found in control treatment. Significant differences were observed in branch length of all treatments. Maximum branch length was found in P_5 where minimum found in P_3 treatment. No significant differences were observed in the number lateral branch with fruits. Maximum number of fruits per node were observed in P_3 (12.50) and minimum was found in control (P_0). Significant differences were observed in the number of nodes, number of nodes with fruits and inter node distance. Similarity of number of leaf's was found and no significant differences was found.

The coffee plant responds to increasing the amount of yield with pruning. All treatments produced higher yield than control treatments. Maximum yield was found in P_3 (9.14 kg/plant) followed by p_5 (8.86 kg/plant). On the other hand, control treatments produced lowest amount of coffee per plant.

All treatments showed higher yield than control treatment. Yield increased maximum 49.7% found in P_3 treatment over control.

Table 1: Yield and yield contributing characters

Prunning	Plant height (cm)	Branch length (cm)	L.B. with fruit (no)	Number of fruits per node (no)	Number of node (no)
P_0	526.75 a	101.63 b	2.94 a	9.34 bc	13.00 d
P_1	510.00 a	113.00 ab	3.13 a	12.18 ab	15.94 c
P_2	495.75 a	112.88 ab	3.25 a	9.35 bc	16.25 bc
P_3	517.00 a	99.75 b	2.94 a	12.50 a	18.31 a
P_4	515.25 a	103.81 b	2.94 a	8.70 c	15.56 c
P_5	516.00 a	120.19 a	3.00 a	11.13 a-c	17.94 ab
CV(%)	**8.70**	**8.58**	**35.81**	**17.93**	**6.95**
$LSD_{(0.05)}$	**67.36**	**14.04**	**1.64**	**2.85**	**1.69**

Table 2: Yield and yield contributing characters

Prunning	Number of node with fruits (no)	Inter node Distance (cm)	N. of leaf (no)	Yield (kg/plant)	Increased over control (%)
P_0	2.88 d	4.91 c	4.69 b	4.60 b	--
P_1	6.19 a-c	6.84 ab	8.13 a	7.55 ab	39.1
P_2	6.88 ab	5.69 bc	10.13 a	7.05 ab	34.8
P_3	7.00 a	5.16 c	9.19 a	9.14 a	49.7
P_4	5.38 c	4.99 c	9.81 a	7.49 ab	38.6
P_5	5.44 bc	7.11 a	8.25 a	8.86 a	48.1
CV(%)	**17.32**	**15.81**	**21.42**	**29.57**	--
$LSD_{(0.05)}$	**1.47**	**1.38**	**2.70**	**3.32**	--

The data on total number of fruits per nodes were regressed against total yield kg per plant of Coffee and a positive linear relationship was obtained between them (Figure 1). A significant relationship was found between the total number of fruits per node and total yield of Coffee when correlation was made between these two parameters. The highly significant ($p<0.05$), very strong ($R^2 = 0.3835$) and positive ($y = 0.6197x + 0.9211$) correlation was found between total number of fruits per nodes and total yield of Coffee, i.e. total yield

of Coffee increased with the total number of fruit/ nodes increased.

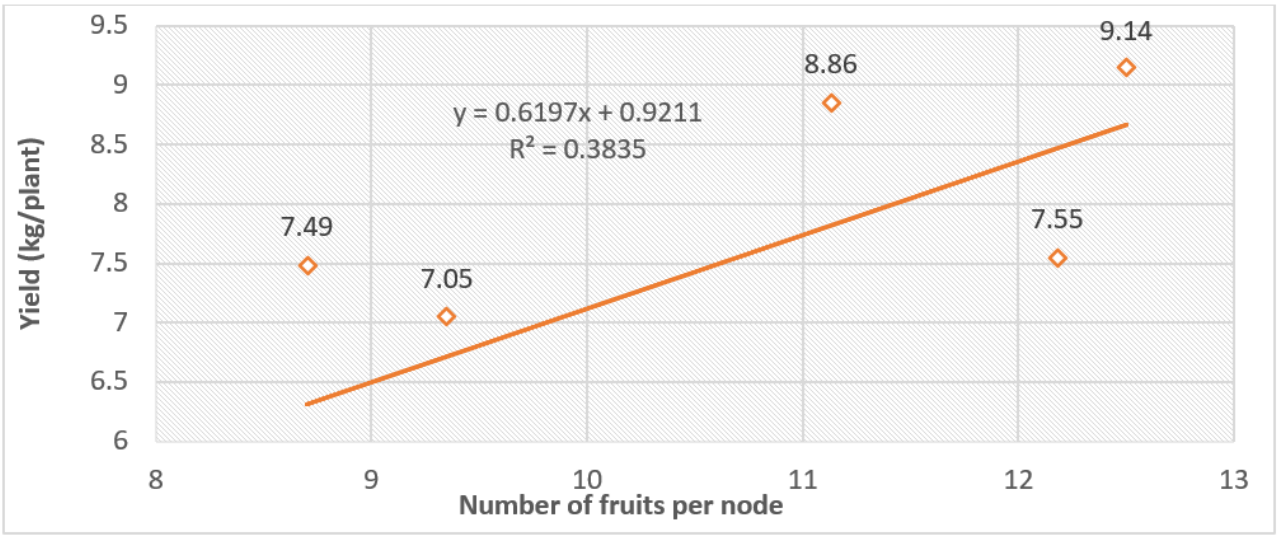

Fig 1: Relationship between total number of fruits per nodes and total yield of Coffee

The data on number of nodes were regressed against total yield kg per plant of Coffee and a positive linear relationship was obtained between them (Figure 1). A significant relationship was found between the total number of nodes and total yield of Coffee when correlation was made between these two parameters. The highly significant ($p<0.05$), very strong ($R^2 = 0.9498$) and positive ($y = 0.8282x - 5.941$) correlation was found between total number of nodes and total yield of Coffee, i.e. total yield of Coffee increased with the total number of nodes increased.

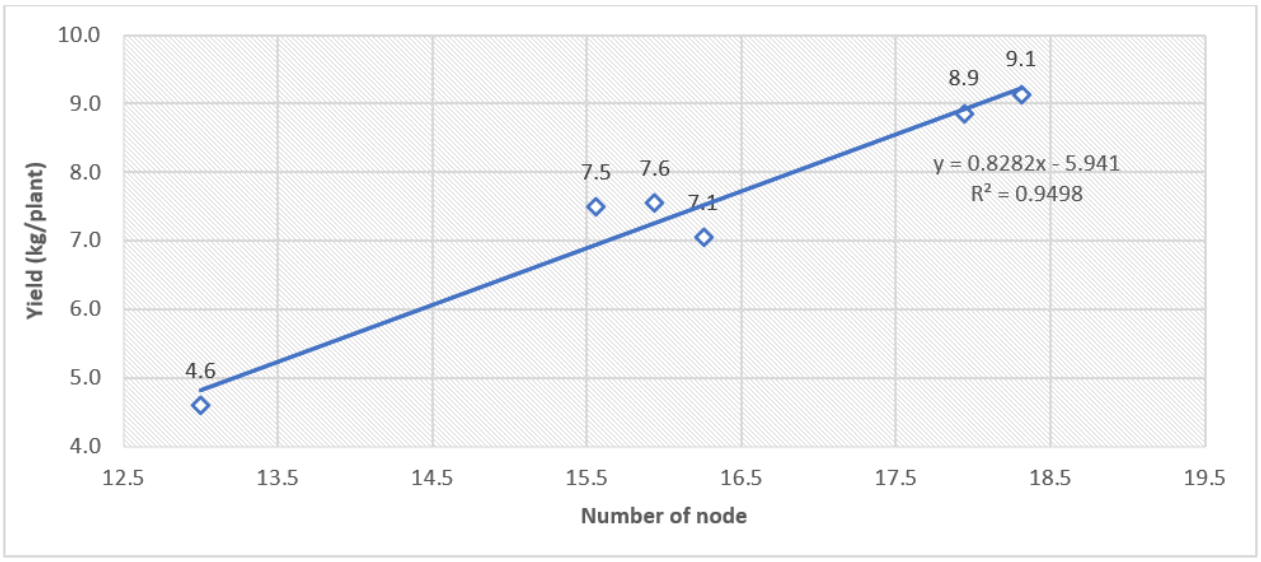

Fig 2: Relationship between total number of nodes and total yield of Coffee

The data on total number of nodes with fruits were regressed against total yield kg per plant of Coffee and a positive linear relationship was obtained between them (Figure 1). A significant relationship was found between the total number of nodes with fruits and total yield of Coffee when correlation was made between these two parameters. The highly significant ($p<0.05$), very strong ($R^2 = 0.5931$) and positive ($y = 0.8262x + 2.7979$) correlation was found between total number of nodes with fruits and total yield of Coffee, i.e. total yield of Coffee increased with the total number of nodes with fruits increased.

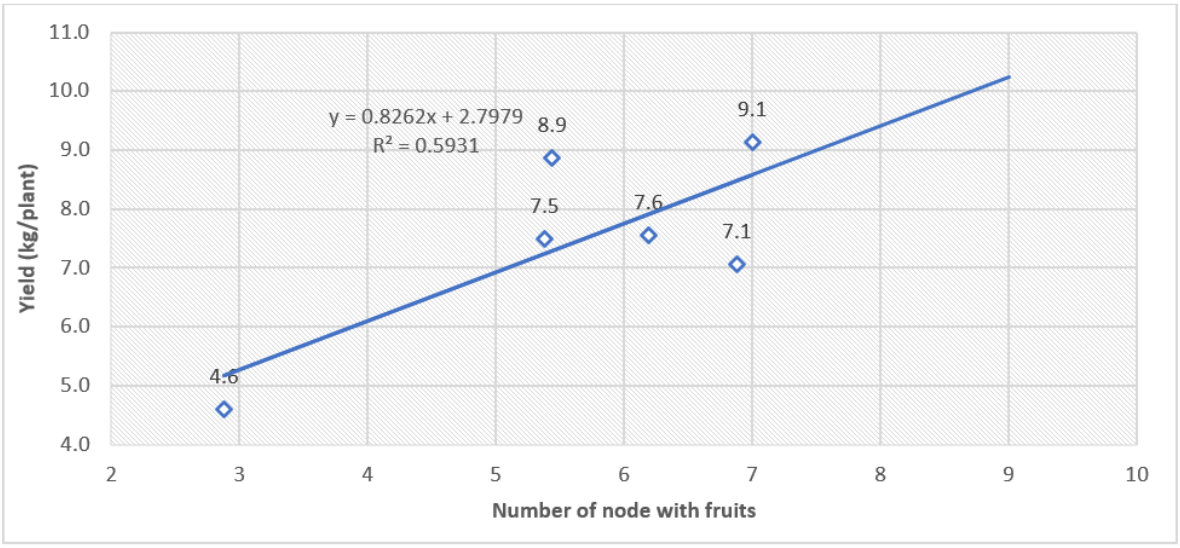

Fig 3: Relationship between total number of nodes with fruits and total yield of Coffee

The data on total number of nodes distance were regressed against total yield kg per plant of Coffee and a positive linear relationship was obtained between them (Figure 1). A significant relationship was found between the total number of nodes distance and total yield of Coffee when correlation was made between these two parameters. The highly significant ($p<0.05$), very strong ($R^2 = 0.1905$) and positive ($y = 0.7324x + 3.2125$) correlation was found between total number of nodes distance and total yield of Coffee, i.e. total yield of Coffee increased with the total number of nodes distance increased.

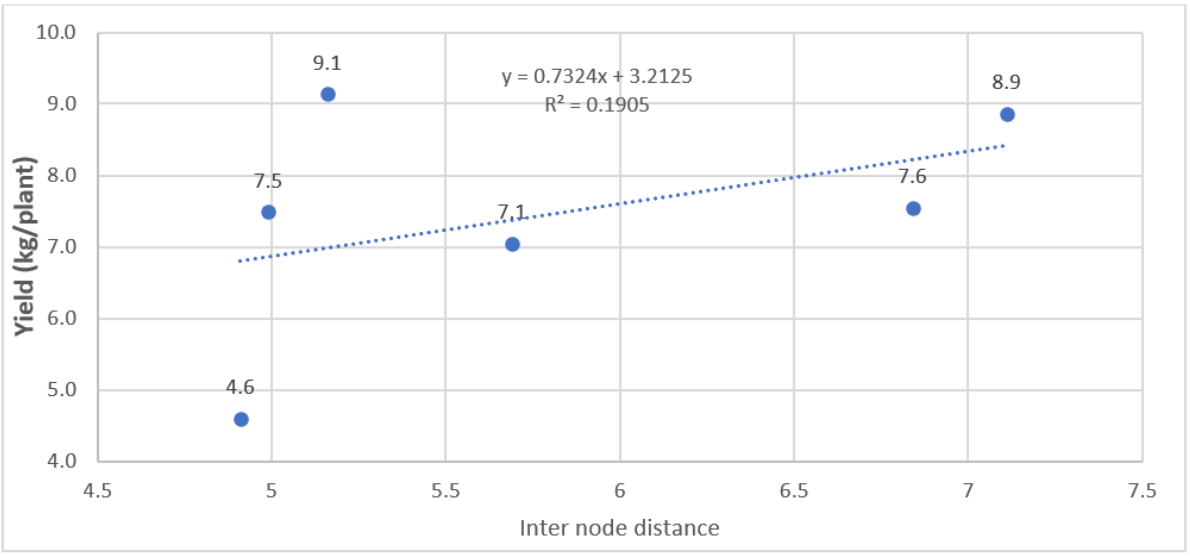

Fig 4: Relationship between total number of nodes distance and total yield of Coffee

Disease and Insect Pest Incidence: No major pest and diseases were found during study period.

CONCLUSION

On the basis of yield, pruning was much better than non-pruning trees. The present finding shows that pruning increase yield potentiality of old coffee orchard.

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