

## Performance of gima kalmi (*Ipomoea reptans*) under lemon and guava tree as influenced by plant density

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**Abstract:** The experiment was conducted at the Germplasm Centre, Horticulture Farm, Bangladesh Agricultural University, Mymensingh during the period from April to May 2007 to study the effect of different plant density and tree canopy on the growth and yield of Gima Kalmi (*Ipomoea reptans*). The experiment consisted of three levels of plant density viz., 30 cm × 15 cm, 30 cm × 25 cm and 30 cm × 30 cm and three tree canopy orientation viz. no canopy (open condition), lemon canopy and guava canopy were included in this experiment. The experiment was laid out following RCBD with three replications. Performance of Gima Kalmi grown under no canopy, lemon canopy and guava canopy in different orientation were evaluated. The plant height, number of leaves per plant, number of branches per plant, fresh weight of foliage per plant, yield per plot and yield per hectare grown under lemon and guava canopy showed significantly reduction than those grown in no canopy. The ranked order of different canopy orientation for better performance were no canopy > lemon canopy > guava canopy. In case of plant density The maximum growth and yield of the plant were observed in 30 cm × 30 cm and 30 cm × 15 cm density, respectively. The highest yield (8.85 t/ha) was found at the closest density (30 cm × 15 cm) whereas the lowest yield (4.77 t/ha) was obtained from the widest density (30 cm × 30 cm) at 45 DAS. The combined effect of plant density and canopy showed that is the highest yield (12.60 t/ha) was produced in 30 cm × 15 cm density at 45 DAS under no canopy whereas the lowest yield (3.20 t/ha) was obtained from 30 cm × 30 cm density at same harvest time under guava canopy. Moderate yield (7.98 t/ha) was found under lemon canopy of plant density on the same harvesting time.

**Key word :** Gima kalmi, canopy, plant density, lemon and guava

### Introduction

Gima Kalmi (*Ipomoea reptans*) is a leafy vegetable which belongs to the family Convolvulaceae. The crop is also known as kangkong, swamp cabbage, water convolvulus, water spinach etc. (Tindal, 1983). Now a days, Canopy orientation is an important practice for Bangladesh as well as in the world because of people can get more return round the year from the same orchard from the same time through tree based intercropping system. Again, optimum plant spacing ensures judicious use of natural resources, makes the intercultural operations easier, which help increase the number of leaves and branches.

In Bangladesh information about spacing to be used in Gima Kalmi cultivation is scanty. The farmers cultivate this crop according to their own conception due to absence of standard production technique. As a result they do not get satisfactory yield and ultimately become financially loser. Keeping this in view the present study was taken to evaluate the performance of Gima kalmias under storied crops in a lemon and guava orchard

### Materials and Methods

The experiment was conducted in the field laboratory of Germplasm Centre of Fruit Tree Improvement Project, Horticulture Farm of Bangladesh Agricultural University, Mymensingh during the period from 3<sup>rd</sup> April to 17<sup>th</sup> May, 2007 to investigate the performance of Gima kalmi (*Ipomoea reptans*) under guava and lemon as influenced by plant density. The present experiment comprised of two factors, viz. Factor A: It included three canopy orientations: No (without tree) canopy, (C<sub>0</sub>) Lemon canopy (C<sub>1</sub>) and Guava canopy (C<sub>2</sub>); Factor B: three plant density, D<sub>1</sub> = 30 cm × 15 cm, D<sub>2</sub> = 30 cm × 25 cm and D<sub>3</sub> = 30 cm × 30 cm was laid out following Randomized Complete Block Design (RCBD) with three replications. Gima Kalmi

seeds were used. Seeds rate 1 gm/1 m<sup>2</sup> land. The following doses of manure and fertilizers were applied as recommended by BARI (1983). Cowdung 1 kg/plot, Triple superphosphate (TSP) 11 gm/plot, Muriate of potash (MP) 11 gm/plot, Urea 37 gm/plot. The unit plot size was 1.0 m × 1.0 m. Two seeds were sown in each planting hole at one cm depth and covered with a thin layer of soil. Thinning was done seven days after emergence and only one seedling was allowed to grow in each hill. Intercultural operation was done as and when necessary. Data were recorded on plant height, number of leaves per plant, number of branches per plant, yield per plant, yield per plot, yield per hectare. The mean differences were evaluated by Least Significant Difference (LSD) test (Freed, 1992).

### Results and Discussion

**Effect of canopy orientation:** Performance of Gima Kalmi (*Ipomoea reptans*) grown under 3 years old lemon (*Citrus aurantifolia*), guava (*Psidium guajava*) canopy and no canopy in different orientation were evaluated. Morphological characteristics as well as the yield of Kangkong were significantly influenced by different tree canopy. The morphological characteristics on the studied parameters decreased remarkably by tree canopy. Higher plant height was observed in different orientation under tree canopy, where significantly the tallest plant (26.49 cm) was observed in no canopy orientation and the shortest (15.51 cm) plant was recorded in guava canopy and moderate (21.50 cm) was under lemon canopy. In case of number of leaves per plant (50.24), number of branches per plant (5.77), fresh weight of foliage per plant (50.54 g/plant) were always lower under guava canopy compared to no canopy (70.97, 9.36 & 80.20 g/plant). The maximum yield per hectare (8.00 t/ha) was found under no canopy, moderate (6.40 t/ha) under lemon canopy and lowest (4.80 t/ha) under guava canopy at 45 DAS (Table 1).

**Table 1. Effect of tree canopy on the growth and yield of Gima Kalmi.**

Treatment	Plant height (cm)	Number of leaf per plant	Number of branches per plant	Fresh weight of foliage per plant(g)	Yield per plot (Kg)	Yield per hectare (t/ha)
<b>Canopy Orientation</b>						
No (Control)	26.49a	70.97a	9.36a	80.20a	0.80a	8.00a
Lemon canopy	21.50b	64.21b	7.16b	64.20b	0.64b	6.40b
Guava canopy	15.51c	50.24c	5.77c	50.54c	0.48c	4.80c
S $\bar{X}$	0.06	0.10	0.04	0.09	0.01	0.10
Level of significance	**	**	**	**	**	**

The figures in a column having the same letter(s) do not differ significantly.

**Effect of Plant density:** Levels of plant density significantly influenced on all the parameters studied. The values of yield contributing characters increased with the decrease in plant density. The maximum plant height (22.45 cm), number of leaves per plant (63.91), number of branches per plant (8.20) and fresh weight of foliage per plant (67.00 g/plant) were found at 45 DAS with 30 cm × 30 cm plant density. The highest yield per plot (0.89 kg/plot) and yield per hectare (8.85

t/ha) were found at 45 DAS with 30 cm × 15 cm plant density. The minimum plant height (19.92 cm), number of leaves per plant (59.63), number of branches per plant (6.66) and fresh weight of foliage per plant (62.80 g/plant) were observed in 30 cm × 15 cm plant density at 45 DAS under guava canopy. The lowest yield per plot (0.48 kg/plot) and yield per hectare (4.77 t/ha) were observed at 45 DAS under guava canopy at 30 cm × 30 cm plant density (Table 2).

**Table 2. Effect of plant density and canopy on growth and yield of Gima Kalmi**

Treatment	Plant height (cm)	Number of leaf per plant	Number of branches per plant	Fresh weight of foliage per plant(g)	Yield per plot (Kg)	Yield per hectare (t/ha)
<b>Plant density</b>						
30 cm × 15 cm	19.92c	59.63c	6.66c	62.80c	0.89a	8.85a
30 cm × 25 cm	21.12b	61.88b	7.43b	65.14b	0.56b	5.58b
30 cm × 30 cm	22.45a	63.91a	8.20a	67.00a	0.48c	4.77c
S $\bar{X}$	0.06	0.10	0.04	0.09	0.01	0.10
Level of significance	**	**	**	**	**	**

The figures in a column having the same letter(s) do not differ significantly.

**Combined effect of tree canopy and plant density on the growth and yield of Gima Kalmi:** The combined effect of different canopy and different plant density on the growth and yield of Gima Kalmi at 45 DAS was presented Table 3. Under no canopy and 30 cm × 15 cm gave the highest plant height, number leaves per plant, number of branches per plant, fresh weight of foliage per plant, yield per plot and yield per

hectare were (27.83, 72.93, 10.62, 82.27, 1.10 and 11.03) respectively. Under lemon canopy and 30 cm × 25 cm Gave the lowest plant height, number leaves per plant, number of branches per plant, fresh weight foliage per plant, yield per plot and yield per hectare were (14.38, 48.29, 5.41, 48.58, 0.36 and 3.59), respectively.

**Table 3. Combined effect of canopy and plant density on the growth and yield of Gima Kalmi at 45 DAS**

Treatment	Plant height	Number of leaf per plant	Number of branches per plant	Fresh weight of foliage per plant	Yield per plot	Yield per hectare
C <sub>0</sub> D <sub>1</sub>	25.17	68.93c	7.96c	77.81	1.10a	11.03a
C <sub>0</sub> D <sub>2</sub>	26.46	71.04b	9.50b	80.53	0.70c	7.00c
C <sub>0</sub> D <sub>3</sub>	27.83	72.93a	10.62a	82.27	0.60d	5.97d
C <sub>1</sub> D <sub>1</sub>	20.21	61.67f	6.62e	62.03	0.88b	8.79b
C <sub>1</sub> D <sub>2</sub>	21.43	64.48e	7.07d	64.31	0.56d	5.64d
C <sub>1</sub> D <sub>3</sub>	22.85	66.47d	7.78c	66.26	0.48e	4.75e
C <sub>2</sub> D <sub>1</sub>	14.38	48.29i	5.41h	48.58	0.67c	6.73f
C <sub>2</sub> D <sub>2</sub>	15.47	50.10h	5.70g	50.57	0.41f	4.10f
C <sub>2</sub> D <sub>3</sub>	16.67	52.32g	6.19f	52.48	0.36g	3.59g
S $\bar{X}$	0.10	0.17	0.07	0.16	0.02	0.17
Level of significance	NS	**	**	NS	**	**

C<sub>0</sub> = No (control); C<sub>1</sub> = Lemon canopy; C<sub>2</sub> = Guava canopy D<sub>1</sub> = 30 cm × 15 cm; D<sub>2</sub> = 30 cm × 25 cm; D<sub>3</sub> = 30 cm × 30 cm

The figures in a column having the same letter(s) do not differ significantly; \*\* = Significant at 0.01 level; NS = Not significant

### **Conclusion**

Among different canopy orientation Gima Kalmi grown in no canopy orientation showed the best performance and guava canopy orientation showed lowest performance, where lemon canopy orientation showed comparatively moderate performance. According to the performance the ranked order of canopy orientation were no canopy > lemon canopy > guava canopy. According to the experimental results it may be concluded Gima Kalmi can be grown under lemon tree maintaining at the 30 cm × 15 cm spacing.

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