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RESEARCH PAPER

Effect of high density planting on the growth and development characters of the banana (*Musa paradisiaca* L.) cv. GRAND NAINE

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Abstract **:** An experiment was conducted at Regional Horticultural Research Station, Navsari Agricultural University, Navsari to study the effect of high density planting on growth and development characters of banana (*Musa paradisiaca* L.) cv. 'GRAND NAINE' during the year 2005-2006. Five treatments *viz*., 2.1 x 1.5 m(T_1), 1.0 x 1.2 x 2.0 m(T_2) (triangle planting), 1.0 x 1.2 x 2.0 m (T_3)(rectangle planting), 1.5 x 1.5 m(T_4) and 1.8 x 1.8 m (T_5) (control) spacings were laid out in Randomized Block Design with four replications. Banana planted at wider spacings (T_5) induced vigorous growth in terms of pseudostem girth and total leaf area. Also the results indicated that the vegetative growth of banana in terms of height and girth of pseudostem was found maximum(187.50 and 65.68 cm) in closed spacing and wider spacing, respectively. Inflorescence emergence and maturity were also significantly affected by various treatments. The minimum days (391.85 and 297.75) for maturity and inflorescence were found in wider(T_5) spacing, respectively.

Key Words **:** Banana, High density, Grand Naine

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INTRODUCTION

'Grand naine' is a tall mutant of 'Dwarf Cavendish'. It is gaining popularity among growers of South Gujarat. It is more vigorous and robust with well-spaced hands, fingers of bigger size and heavy bunches. In India, banana is fourth important food crop in terms of gross value exceeded by paddy, wheat and milk products.

Now a days, concept of high density planting has become extremely significant. Accordingly, efforts have been made in different parts of world to find out the optimum spacing for the different fruit crops along with the related technologies so as to derive the maximum return per unit area. The available land area for the fruit cultivation has become a limiting factor by day due to rapid urbanization, fragmentation of land holding and industrialization. In addition to the present day constraints like shortage of the suitable land, high management cost, restriction of water use, labour problems and necessity of early return on the investment, have made it necessary to think in terms of the maximum possible returns with the minimum costs.

MATERIALS AND METHODS

The present investigation on effect of high density planting on vegetative characters of banana (*Musa paradisiaca* L.) cv. GRAND NAINE was carried out during year 2005-2006 at Experimental Farm of Regional Horticultural Research Station, Navsari Agricultural University, Navsari. The treatments contained five spacing treatments *viz.,* 2.1 x 1.5 m, 2.0 x 1.2 x 1.0m (Triangle method), 2.0 x 1.2 x 1.0m (Rectangle method), 1.5 x 1.5m and 1.8 x 1.8m(control). The experiment was laid out in Randomized Block Design and replicated four times. The total experiment area was 62.2 x 24

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=1492.8 m^2.

The height of plant was measured from ground level to the uppermost point of contact of petioles of two youngest leaves (Lahav, 1972) at every two months after planting and at the time of flowering. The girth of the pseudostem was measured 20 cm above ground level (Lahav, 1972) at every two months after planting and up to the time of inflorescence emergence. The numbers of fully opened leaves per plant were counted at every two months interval and at the time of shooting. The length of third leaf from top was measured from the base of leaf-petiole to the tip, and breadth was measured at the maximum breadth of the leaf blade at every two months after planting and up to the time of flowering. The leaf area was worked out as the multiplication of the product of length and breadth of the leaf with leaf area factor *i.e.* 0.8. The data recorded on growth and development characters were analyzed and presented the results.

RESULTS AND DISCUSSION

The results obtained from the present investigation have been duscussed below:

Pseudostem height and girth:

The results indicated that the vegetative growth of banana in terms of height and girth of pseudostem was significantly influenced by various treatments. The maximum pseudostem height (179.42 cm) at 9 MAP and at flowering time (187.50 cm) was observed in close spacing (Table 1). At 5(20.50 cm), 7(32.62 cm), 9(51.33 cm) MAP and inflorescence emergence stage (65.68 cm), the maximum pseudostem girth was obtained in wider spacing (T_5). Vigorous growth of banana plant was observed in terms of height at later stage of growth under high density planting. While the girth of pseudostem was found significantly higher consistently under wider spacing as compared to closer spacing. Similar results were obtained by Satyanarayana and Rao (1985) in Poovan variety of banana and Chattopadhyay *et al.* (1980) in Giant Governor. The increase in height under high density planting was primarily due to mutual shading of plants resulting in competitive growth rate to intercept the light (Nalina *et al*., 2000). It is clear from the data that spacing did not affect the growth of plants during the early stage of growth, probably due to the fact that competition was not severe during the early stage (Rajeevan and Geetha, 1989).

Number of functional leaves:

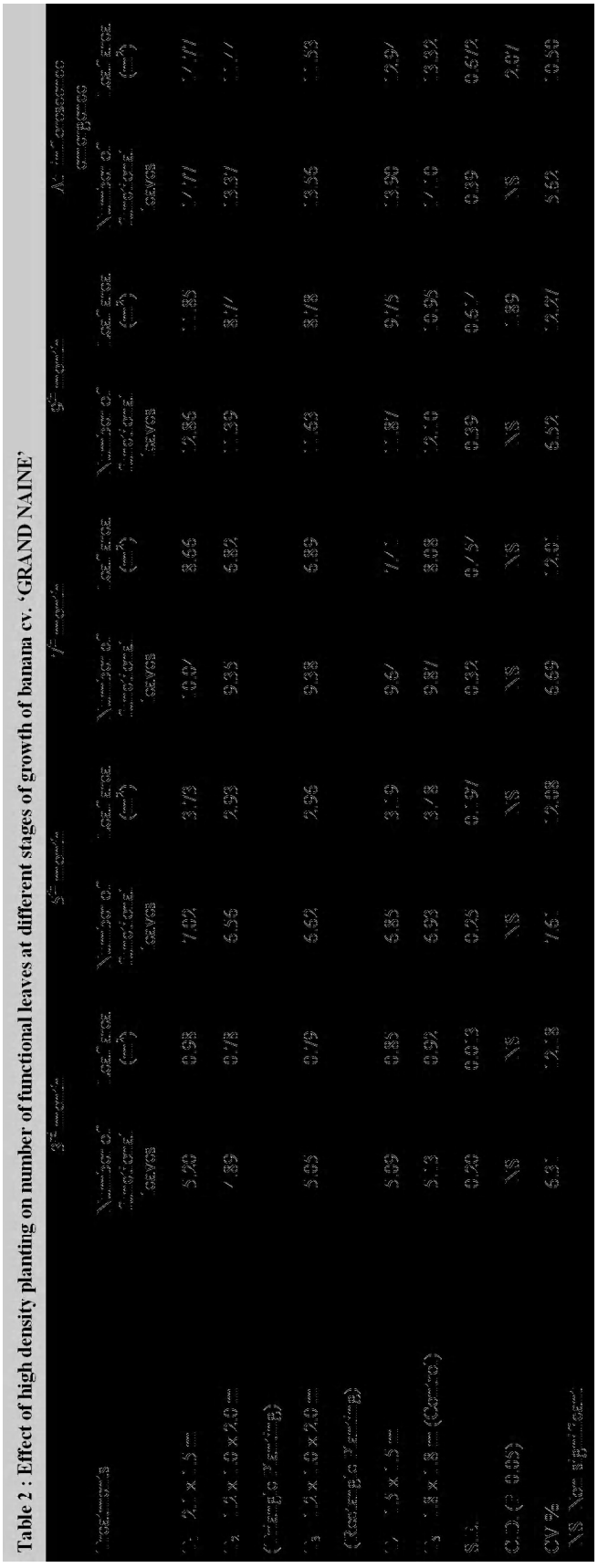
The present investigation indicated that the there were no significant differences in number of functional leaves due to various treatments but the number of functional leaves was higher (14.10) in wider spacing (T_5) while it was less at all the stages of growth under close spacing (T_2). Leaf emergence is reduced under close planting owing to lower temperature

Table 1 : Effect of high density planting on pseudostem height and girth at different stages of growth of banana cv. 'GRAND NAINE'

Treatments	3rd month		5th month		7th month		9th month		At the time of emergence	
	Height (cm)	Girth (cm)	Height (cm)	Girth (cm)	Height (cm)	Girth (cm)	Height (cm)	Girth (cm)	Height (cm)	Girth (cm)
T_1 2.1 x 1.5 m	39.20	8.29	92.82	21.62	128.82	31.12	152.61	51.82	158.50	63.32
T_2 1.2 x 1.0 x 2.0 m (Triangular planting)	40.71	8.21	112.12	18.22	139.12	30.78	179.12	71.22	187.50	60.52
T_3 1.2 x 1.0 x 2.0 m (Square planting)	40.26	8.30	110.91	19.63	138.91	30.80	178.91	78.61	185.00	61.23
T_4 1.5 x 1.5 m	39.11	8.92	105.13	19.81	128.15	31.58	162.51	79.23	171.00	62.50
T_5 1.8 x 1.8 m (Control)	39.10	9.01	101.10	20.50	128.98	32.62	154.00	81.33	165.50	65.68
S.E.	1.25	0.51	2.91	0.83	1.19	1.32	1.73	1.73	1.86	1.19
CD (P=0.05)	NS	NS	NS	2.56	NS	4.08	7.59	7.1	7.99	3.33
CV %	6.31	11.12	5.78	8.91	6.71	8.12	5.78	5.76	5.62	5.53

NS Non significant

Table 2 : Effect of high density planting on number of functional leaves at different stages of growth of banana cv. 'GRAND NAINE'



inside the canopy since temperature had significant influence on the rate of leaf emergence (Singh, 1990 and Robinson and Nel, 1989). Reduction in number of functional leaves was recorded with increase in plant density (Reddy, 1982) in Robusta. Similar results were obtained by Satyanarayana and Rao (1985) and Chattopadhyay *et al.* (1985).

Total leaf area:

Total leaf area per plant was not affected significantly by various treatments at early stages of growth while at later stages of growth it was significantly affected. The significantly maximum leaf area was recorded (13.32 m^2) at later stage of growth in wider spacing (T_5) (Table 2). It might be due to the fact that plants faced less competition for moisture, nutrients and sunlight under wider spacing. Similar results were obtained by Berrill (1963) and Jagirdar *et al.* (1963).

Duration of crop:

Inflorescence emergence and maturity were significantly affected by various treatments. The minimum days (391.85 and 297.75) were taken for inflorescence maturity and emergence were recorded under wider spacing (T_5), respectively as compared to high density planting (T_2) (Table 3). It appears that wider spacing promoted earlier flowering due to maximum exposure of leaves to sun resulting into efficient photosynthesis (Badgujar *et al.,* 2004). Similar results were obtained by Chundawat *et al.* (1982, 1983), Chattopadhyay *et al.* (1985) and Rajeevan and Geetha (1989). The maturity was delayed in close spacing which might be due to lower interception of light and low microclimatic temperature due to more shading. (Kavino *et al.,* 2004).

Table 3 : Effect of high density planting on duration of crop (days) of banana cv. 'GRAND NAINE'

Treatments	Days to flowering	Days taken to maturity
T_1 - 2.1 x 1.5 m	273.25	373.03
T_2 - 1.2 x 1.0 x 2.0 m (Triangle planting)	313.50	459.71
T_3 - 1.2 x 1.0 x 2.0 m (Rectangular planting)	312.84	452.45
T_4 - 1.5 x 1.5 m	306.47	410.13
T_5 - 1.8 x 1.8 m (Control)	297.75	391.85
S.E. $\pm$	8.66	11.15
C.D. (P=0.05)	26.69	34.37
CV %	5.76	5.34

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