

## Effect of Planting Time, Plant Density and Method of Fertilizer Application on Growth and Yield of Banana cv. China Kela-ABB (Syn. Karpooravalli) in Andaman and Nicobar Islands

L. Brojendra Singh<sup>\*1</sup>, Goutam Paul<sup>\*\*</sup>, Nagesh Ram<sup>\*</sup> and V. Damodaran<sup>\*\*\*</sup>

**ABSTRACT:** Field experiments to study the effect of different time of planting (May, June and July), density (one and two suckers hill<sup>-1</sup>), method and time of fertilizer application (dibbling, basin application, fertigation) on Banana cv. China Kela - ABB (*Musa paradisiaca*) were carried out at Indian Council of Agricultural Research – Krishi Vigyan Kendra, Central Island Agricultural Research Institute, Port Blair, South Andaman district. The data revealed that 15<sup>th</sup> June planting with two suckers hill<sup>-1</sup> + fertilizer applied at basal, 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> month of planting through dibbling method was found better for maximum plant height, number of leaves, number of hands, no of fingers hand<sup>-1</sup> and yield. This was followed by 15<sup>th</sup> May planting with one sucker hill<sup>-1</sup> + fertilizer applied at 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month of planting through dibbling method.

### INTRODUCTION

The Andaman and Nicobar Islands enjoys humid tropical climate with annual rainfall of about 3100 mm received from May to November. The climatic conditions are highly suited for cultivation of horticultural crops. Presently they are grown in an area of about 37,160 ha. Among the horticultural crops fruit crops occupy an area of 3,620.95 ha with a production of 31, 390.60 tones year<sup>-1</sup>. Banana is the major fruit crop of these Islands which is grown in an area of 1,817.50 ha with a production of 14, 042.30 tones year<sup>-1</sup> (Table 1). In spite of the conducive and favorable agro- climatic conditions, the production of banana in these islands are very low. Considering the scarcity of the land holdings, population influx of these Islands the only option is to increase the productivity of fruit crops is by adoption of proper management and advanced scientific techniques in cultivation. Standardization of appropriate time of planting for banana is crucial because drought can be expected during the terminal phase of crop growth and thus leads to considerable reduction in yield. Earlier studies shows that increase in number of plants hectare<sup>-1</sup> has a direct influence on growth factors, on

output unit<sup>-1</sup> area and percentage of bunches harvested etc. in banana. High density planting in banana can be achieved by decrease in the spacing or increasing the number of sucker hill<sup>-1</sup> (Suganthi, 2002). As bananas require large supplies of NPK (Nitrogen Phosphorous and Potash) fertilizers, constituting a considerable part of the input cost, efficient use of these nutrients is in need of suitable methods of application, thereby reducing the cost of production (Park, 1994). Hence a field experiment was conducted at Indian Council of Agricultural Research - Krishi Vigyan Kendra, Central Island Agricultural Research Institute, Port Blair, Andaman and Nicobar Islands during, 2011 -13 to study the effect of time of planting, plant density and method of fertilizer application on the growth and yield of banana (*cv. China Kela - ABB (Musa spp.)*) under Island conditions.

### MATERIALS AND METHODS

The experiment was laid out in a split plot design with two replications. Three different time of planting i.e. on 15<sup>th</sup> May, 15<sup>th</sup> June and 15<sup>th</sup> July with two different planting density viz., one sucker hill<sup>-1</sup> and two suckers hill<sup>-1</sup> as main plot treatments, while methods of fertilizer

\* ICAR- KVK, Central Island Agricultural Research Institute, Port Blair -744101, Andaman District, <sup>1</sup>E-mail: lbrojendra@gmail.com

\*\* Dean, Science, Department of Physiology, University of Kalyani, West Bengal.

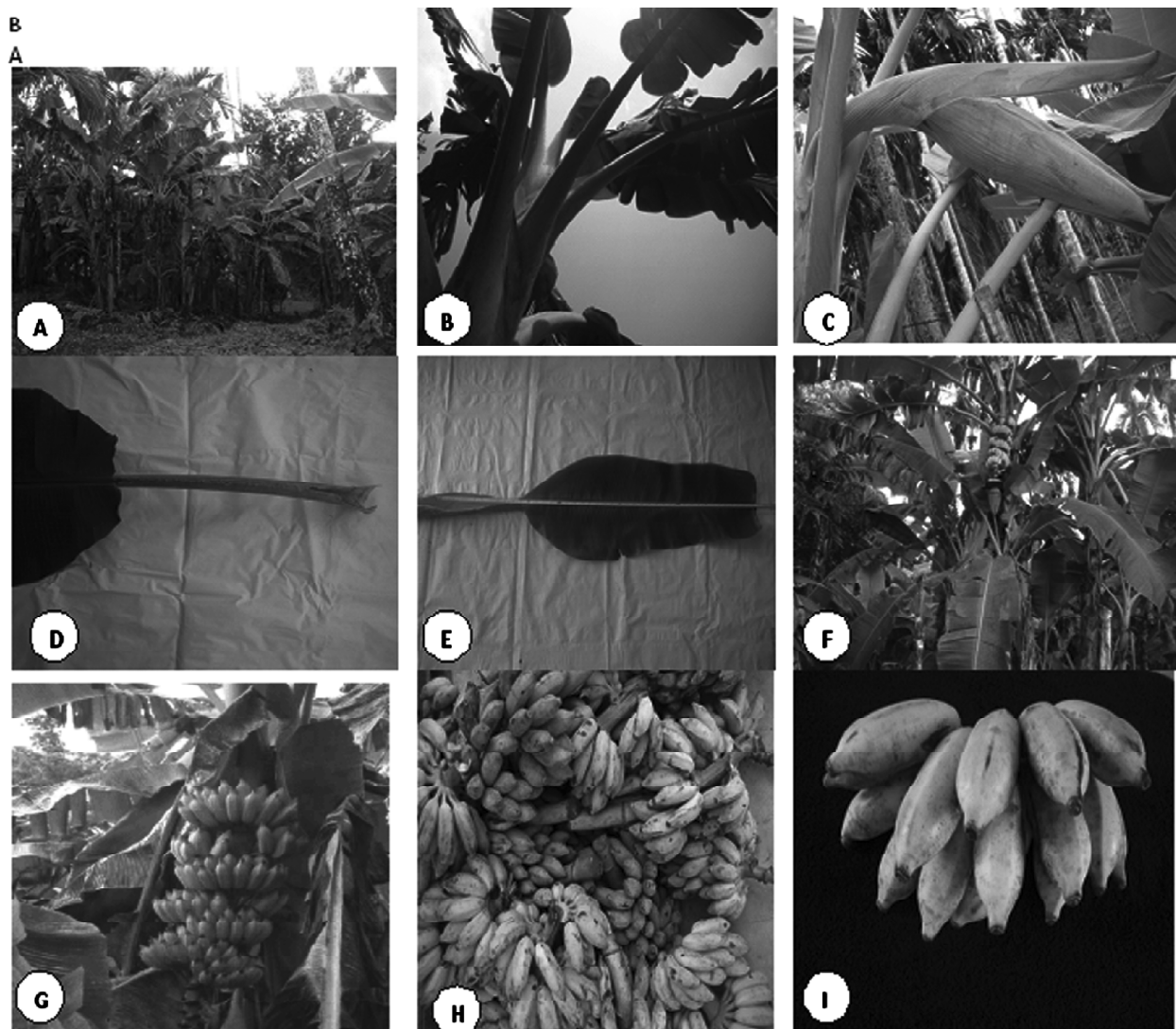
\*\*\* ACTO, ICAR-Central Island Agricultural Research Institute, Port Blair -744101.

**Table 1**  
**Area and Production of fruits crop grown in Andaman and Nicobar Islands Areas in Hectare (ha) and Production in Metric tons (mt)**

Fruits	Area and production of major fruit crops for last three years					
	2011-12		2012-13		2013-14	
	Area	Production	Area	Production	Area	Production
Mango	292.00	2750.00	295.00	2800.00	402.38	3853.00
Banana	1681.00	18535.00	1675.00	18350.00	1817.50	14042.30
Citrus fruits	280.00	1350.00	280.50	1305.00	348.40	2305.94
Papaya	320.00	2350.00	325.00	2380.00	323.40	2701.00
Pineapple	148.00	700.00	230.00	685.00	119.27	2302.36
Sapota	162.00	3100.00	163.00	3120.00	276.62	3286.47
Miscellaneous	367.00	1815.00	287.50	2183.00	333.30	2899.53
Total	3250.00	30600.00	3256.00	30823.00	3620.95	31390.60

Source: State Agriculture Statistics section A & N Islands, 2013 -14.

**Figure 1: China Kela-ABB (Musa paradisiaca) plant habit and fruit characters**



**Figure 1: China Kela-ABB (Musa paradisiaca).**A: Magnified view of Habit. B: Banana shooting. C: Banana Inflorescence. D: Leaf based with petiole. E: Top leaf sheath. F: Inflorescence axis with fruit bunch lux . G: Banana bunch with stalk. H: Harvested fruit bunches. I: A single hand

Figure 2: China Kela-ABB (*Musa paradisiaca*) floral characters

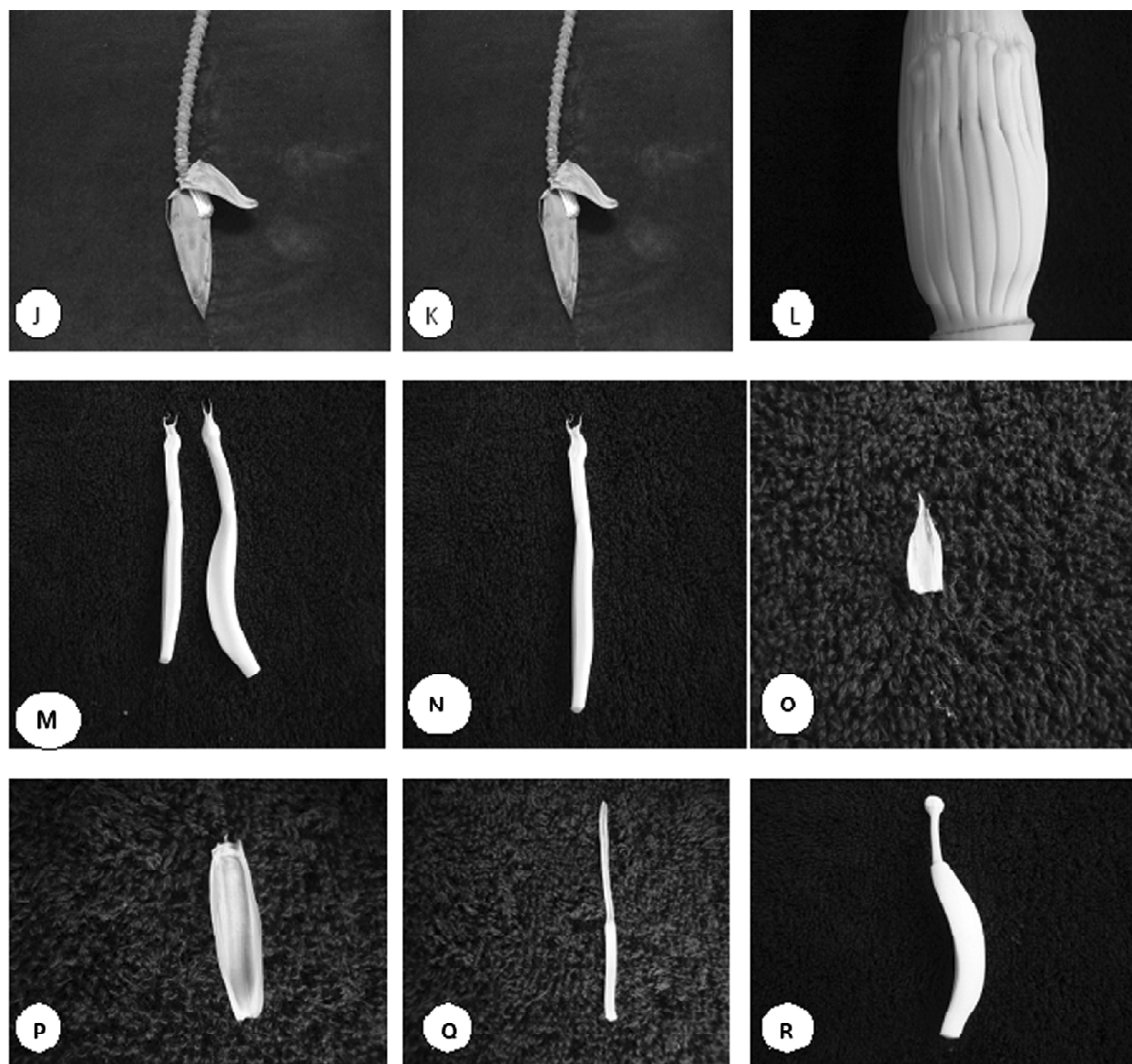


Figure 2: China Kela-ABB (*Musa paradisiaca*).J: Magnified view of apex. K: Inflorescence. L: Magnified View of basal flowers. M: Hermaphrodite flower. N: Open hermaphrodite flower. O: Magnified view of lower tapal. P: Magnified view of upper tapal. Q: Magnified view of a stamen. R: Magnified view of a pistil

application viz., dibbling (indigenous method), basin application and fertigation (local method) and time of fertilizer application viz., basal, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month of planting 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month of planting and basal, 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> month of planting as sub plot treatments. The growth parameters viz., plant height at the harvest, plant girth at one meter height from the ground level during the harvest, number of leaves, leaf area was observed at three months interval. Yield parameters viz., weight of the bunch, number of hands and fingers were also observed.

## RESULT AND DISCUSSION

The results indicated that maximum plant height (275 cm), girth (65 cm) and minimum days taken for shooting (236 days) was recorded in 15<sup>th</sup> June planting with one sucker hill<sup>-1</sup> + fertilizer applied at basal, 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> month of planting through dibbling method which is on par with 15<sup>th</sup> May planting with one sucker hill<sup>-1</sup> + fertilizer applied at 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month of planting through dibbling method. In banana, the plant vigour is judge in terms of height and girth of pseudostem (Simmonds, 1966). Compared to height,

**Table 2**  
**Influence of time of planting, plant density and method of fertilizer application on the growth of banana (cv. China Kela)**

Treatments	Plant height	Plant girth	No. of leaves	Days of shooting	Average bunch weight	No. of hands bunch <sup>-1</sup>	No. of fingers bunch <sup>-1</sup>	Fruit yield (t ha <sup>-1</sup> )
M <sub>1</sub> S <sub>1</sub>	250.25	52.20	9.0	355.40	9.45	7.54	105.56	23.62
M <sub>1</sub> S <sub>2</sub>	175.20	40.10	8.0	375.25	7.23	6.31	88.34	18.08
M <sub>1</sub> S <sub>3</sub>	240.52	43.15	8.0	360.12	8.53	7.70	107.8	21.32
M <sub>1</sub> S <sub>4</sub>	289.50	62.30	8.5	331.53	9.84	7.76	108.64	24.60
M <sub>1</sub> S <sub>5</sub>	180.20	43.20	8.0	375.85	7.52	6.48	77.76	18.80
M <sub>1</sub> S <sub>6</sub>	250.15	51.30	8.5	360.74	8.16	7.25	87.00	20.40
M <sub>1</sub> S <sub>7</sub>	260.10	57.25	9.0	345.25	9.63	7.86	110.04	24.08
M <sub>1</sub> S <sub>8</sub>	235.42	43.85	8.5	385.36	8.10	6.16	73.92	20.25
M <sub>1</sub> S <sub>9</sub>	235.63	51.00	8.0	370.35	8.52	7.20	86.40	21.30
M <sub>2</sub> S <sub>1</sub>	240.60	58.75	8.5	350.85	10.20	9.22	147.52	51.00
M <sub>2</sub> S <sub>2</sub>	210.21	45.65	8.0	391.00	8.44	7.24	101.36	42.20
M <sub>2</sub> S <sub>3</sub>	225.10	54.54	8.5	368.94	10.85	8.78	122.92	44.25
M <sub>2</sub> S <sub>4</sub>	270.15	54.25	8.5	356.00	10.73	9.13	146.08	43.80
M <sub>2</sub> S <sub>5</sub>	250.54	50.45	8.5	380.25	8.00	7.50	105.00	40.00
M <sub>2</sub> S <sub>6</sub>	250.50	56.85	9.0	363.73	8.36	9.18	128.52	41.80
M <sub>2</sub> S <sub>7</sub>	250.10	56.75	8.5	345.32	10.55	9.30	130.20	42.75
M <sub>2</sub> S <sub>8</sub>	210.20	48.21	8.0	382.21	7.89	7.56	105.84	39.45
M <sub>2</sub> S <sub>9</sub>	250.25	52.30	8.5	370.35	9.275	9.20	128.80	46.38
M <sub>3</sub> S <sub>1</sub>	250.14	55.65	9.0	345.30	9.46	7.60	106.40	23.65
M <sub>3</sub> S <sub>2</sub>	200.30	45.14	8.0	385.70	7.57	6.12	73.44	18.93
M <sub>3</sub> S <sub>3</sub>	220.65	50.85	8.5	362.54	9.18	7.17	86.04	22.95
M <sub>3</sub> S <sub>4</sub>	250.30	62.65	9.0	348.75	9.54	7.63	122.08	23.85
M <sub>3</sub> S <sub>5</sub>	180.75	56.00	8.5	360.26	7.35	6.32	88.48	18.37
M <sub>3</sub> S <sub>6</sub>	220.20	55.24	8.5	350.68	8.46	7.00	84.00	21.15
M <sub>3</sub> S <sub>7</sub>	295.10	65.50	10.0	320.55	9.87	8.38	117.32	24.67
M <sub>3</sub> S <sub>8</sub>	200.00	55.20	8.0	380.12	7.21	6.67	93.38	18.03
M <sub>3</sub> S <sub>9</sub>	210.20	45.30	8.5	368.05	8.13	7.15	100.10	20.32
M <sub>4</sub> S <sub>1</sub>	282.10	57.25	8.5	361.48	10.64	9.20	147.20	43.20
M <sub>4</sub> S <sub>2</sub>	200.30	45.21	8.5	390.25	8.69	7.85	109.90	43.45
M <sub>4</sub> S <sub>3</sub>	252.35	58.62	9.0	374.45	10.55	8.63	120.82	52.75
M <sub>4</sub> S <sub>4</sub>	260.25	58.62	9.0	368.84	11.00	9.20	147.20	55.00
M <sub>4</sub> S <sub>5</sub>	230.95	43.25	8.5	380.80	8.45	7.25	101.50	42.25
M <sub>4</sub> S <sub>6</sub>	240.62	55.24	8.5	371.60	11.25	9.45	151.20	46.25
M <sub>4</sub> S <sub>7</sub>	270.84	65.21	9.0	365.65	12.76	9.89	258.24	60.80
M <sub>4</sub> S <sub>8</sub>	235.30	50.58	8.0	382.32	8.25	7.45	104.30	41.25
M <sub>4</sub> S <sub>9</sub>	252.15	55.47	9.0	371.00	9.85	8.23	115.22	49.25
M <sub>5</sub> S <sub>1</sub>	275.20	57.36	8.5	350.36	8.21	7.10	85.20	20.52
M <sub>5</sub> S <sub>2</sub>	170.00	45.24	7.0	390.60	6.86	6.00	72.00	17.15
M <sub>5</sub> S <sub>3</sub>	280.80	50.28	8.5	375.25	8.52	8.50	80.06	37.50
M <sub>5</sub> S <sub>4</sub>	280.60	62.36	9.0	354.20	9.20	9.06	82.00	35.42
M <sub>5</sub> S <sub>5</sub>	210.52	46.00	9.0	372.74	7.86	9.45	75.23	37.20
M <sub>5</sub> S <sub>6</sub>	254.60	54.65	8.0	360.76	8.63	8.00	94.00	36.07
M <sub>5</sub> S <sub>7</sub>	270.00	57.58	10.0	356.37	9.12	10.00	87.20	35.62
M <sub>5</sub> S <sub>8</sub>	225.30	35.57	9.0	382.15	9.58	9.00	95.12	38.20
M <sub>6</sub> S <sub>9</sub>	262.20	55.24	9.0	361.14	9.42	9.20	85.00	36.12
M <sub>6</sub> S <sub>1</sub>	250.30	53.10	8.5	374.00	8.56	8.50	93.00	37.39
M <sub>6</sub> S <sub>2</sub>	180.25	43.35	9.0	385.25	8.46	9.00	83.15	38.50
M <sub>6</sub> S <sub>3</sub>	240.30	53.15	8.0	370.23	9.16	8.21	93.45	37.00
M <sub>6</sub> S <sub>4</sub>	245.56	54.06	9.0	380.21	8.45	9.00	84.24	38.00
M <sub>6</sub> S <sub>5</sub>	250.00	45.05	8.5	384.60	7.58	8.50	95.36	38.40
M <sub>6</sub> S <sub>6</sub>	250.20	50.36	9.0	355.70	7.65	9.25	90.86	35.56
M <sub>6</sub> S <sub>7</sub>	260.42	52.68	8.5	376.36	7.98	8.50	72.15	37.60
M <sub>6</sub> S <sub>8</sub>	240.30	45.60	8.5	385.60	8.68	8.50	75.42	38.50
M <sub>6</sub> S <sub>9</sub>	250.00	50.25	9.0	370.25	7.63	9.00	90.53	37.00

plants with more girth are desirable as they influence the bunch size and other desirable characters. Moreover the time of planting and planting density had marked influence in the yield parameters also. 15<sup>th</sup> June planting with two suckers hill<sup>-1</sup> + fertilizer applied at basal, 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> month of planting through dibbling method recorded the maximum no. of hands bunch<sup>-1</sup> (9.45), number of fingers bunch<sup>-1</sup> (151.20) and yield of 46.35 t ha<sup>-1</sup> followed 15<sup>th</sup> May planting with two suckers hill<sup>-1</sup> + basal 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month of planting through fertigation (44.25 t ha<sup>-1</sup>). The study reveals that planting of banana during the second fortnight of June with two sucker hill<sup>-1</sup> along with the nutrient management is ideal for getting higher yield under these Island conditions.

**Treatments** (Table 2. Time of planting and fertilizer application)

- a) **Main plot:** M<sub>1</sub> : 15<sup>th</sup> May, one sucker, M<sub>2</sub> : 15<sup>th</sup> May, two suckers, M<sub>3</sub> : 15<sup>th</sup> June, one sucker, M<sub>4</sub> : 15<sup>th</sup> June, two suckers, M<sub>5</sub> : 15<sup>th</sup> July, one sucker, M<sub>6</sub> : 15<sup>th</sup> July, two suckers.
- b) **Sub Plot:** S<sub>1</sub> : Dibbling + Basal, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month, S<sub>2</sub> : Dibbling + 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month, S<sub>3</sub> : Dibbling + Basal, 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> month, S<sub>4</sub> : Basin application + Basal, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month, S<sub>5</sub> : Basin application + 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month, S<sub>6</sub> : Basin application + Basal, 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> month, S<sub>7</sub> : Fertigation + Basal, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month, S<sub>8</sub> : Fertigation + 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month and S<sub>9</sub> : Fertigation + Basal, 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> month.

## CONCLUSION

The study reflects that planting of banana (*cv. China Kela - ABB*) during the second fortnight of June (15<sup>th</sup> June planting with two suckers hill<sup>-1</sup> + fertilizer applied at basal, 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> month of planting through dibbling method recorded the maximum no. of hands bunch<sup>-1</sup> (9.45), no. of fingers bunch<sup>-1</sup> (151.20) and yield of 46.35 t ha<sup>-1</sup>) with two suckers' hill<sup>-1</sup> along with the nutrient management is ideal for getting higher yield under these Islands conditions.

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