

EVALUATION OF BANANA GENOTYPES FOR GROWTH AND YIELD UNDER NORTHERN DRY ZONE OF KARNATAKA

B. S. SAGAR*, B. RAJU, KULAPATI HIPPARAGI, S. N. PATIL AND B. R. SAHITHYA

Department of Fruit science, Sector 70 (Fruit Orchard),

University of Horticultural Sciences, Bagalkot, College of Horticulture Bagalkot - 587 103

e-mail: Sagar99022@gmail.com

KEYWORDS

Banana
Dry zone
Genotypes
Growth and Yield

Received on :

13.09.2014

Accepted on :

24.11.2014

*Corresponding author

ABSTRACT

Banana is one of the most important food and cash crops in Karnataka. However, most of the cultivars grown particularly the local ones are low yielders and are thus not very suitable for commercial production. To find the suitable genotype twenty three genotypes were evaluated. Among them, the maximum plant height (305.00 cm) was recorded in the genotype Monthon which found the tallest at 240th day after planting and the minimum plant height (147.81cm) was recorded in the genotype Kayipallebale. The genotype YangaviKM-5 exhibited the maximum plant girth (76.27 cm) however, it was found minimum (46.45cm) in the genotype Pisanglilin. The highest leaf length (166.67 cm) and leaf area (0.82 m²) were observed in Robusta genotype. Whereas, the lowest leaf length (123.63cm) and leaf area (0.45m²) were recorded in the genotype Mitli. The genotype Hanuman recorded the maximum number of leaves (17.33) and finally the highest yield (43.07 t ha⁻¹) and the minimum number of leaves (10.67) was recorded in the genotypes Elakkibale and Pisanglilin. Among the genotypes evaluated, the genotype Mitli performed very poor with the lowest yield (3.84 t ha⁻¹). From the present investigation, it could be concluded that the genotype Hanuman is suitable to maximize the yield under Northern Dry Zone of Karnataka.

INTRODUCTION

The existing banana cultivars are distinguished by the number of A and B genomes, e.g., AAA predominantly for dessert bananas, AAB for plantains, and ABB for cooking bananas (Robinson, 1996). For example, genes for parthenocarpy and yield are generally considered to be contributed by the A genome, whereas the B genome harbors genes for hardiness, drought tolerance, and increased starchiness (Robinson, 1996). Banana (*Musa spp.*) is the best known tropical fruit. It is one of the economically important fruit crops grown in Karnataka both in homestead and commercial farms. Banana contributes 31.72% of the total fruit production. In India, annual production of banana is 284.55 lakh tones from an area of 7.96 lakh hectares. The area under banana in Karnataka is 0.91 lakh ha with the production of 23.51 lakh tones (Anon., 2012).

Yield evaluation trials provide yield estimates for each genotype in each environment, based on statistical techniques that detect and partition important agronomic variation into components (Gauch, 1992; Gauch and Furnas, 1991). Field evaluation of introduced banana cultivars like Zelic, Grand Naine, Williams along with Basrai in Jalgaon region of Maharashtra showed all the three introduced cultivars are better with respect to growth as well as yield in comparison with Basrai (Deshmukh *et al.*, 1995). A large number of banana cultivars are grown in North Karnataka. Though, North Karnataka is having congenial condition for commercial cultivation of banana, the average yield obtained is not satisfactory compared to many other states. This might be due

to improper selection of high yielding varieties and lack of systematic management practices or good management practices. Thus it necessitates a suitable study to identify the high yielding genotype under northern dry zone of Karnataka. With this background the present investigation was carried out with twenty three banana genotypes and observed for growth parameters as well as the yield components.

MATERIALS AND METHODS

The present study was carried out to find the suitable genotype for growth and yield of banana at the Sector-70 (Fruit orchard), University of Horticultural Sciences, Bagalkot, Karnataka during 2012-14 with twenty three genotypes *viz.*, Karibale, Kayipallebale, Rajapuri, Red banana, Rasabale, Elakkibale, Kanayibanasi, Mitli, Bargibale, *Musa balbisiana*, Pisanglilin, FHIA-3, Lalchakrakeli, Basrai Dwarf, Monthon, Robusta, Kadali, YangaviKM-5, Sakkarebale, Karpuravalli, Poovan, Pisangawak and Hanuman. Bagalkot is located in Northern Dry Zone (Zone-3) of Karnataka State at 16°10' North latitude, 75°42' East longitudes and at an altitude of 542.0m above the mean sea level. The uniform sized sword suckers from healthy and vigorous banana plants of different genotypes free from viruses and other diseases were selected for planting. Planting of suckers was done in the month of November in the study area. All the cultural operations were done at the proper time. One genotype was considered as a treatment and each treatment was replicated thrice. In each replication three plants were randomly selected for recording the observations. The observations on vegetative growth parameters were recorded at monthly interval after planting till shooting stage. Plant height

was measured by taking length from base of pseudostem upto bifurcation of leaves and expressed in centimeters, leaving 30 cm from the ground, finally the 30 cm was compensated by adding it to the total height of the plants. Circumference was measured at 5cm above the ground level using tape and expressed in centimeters. The leaves were counted from each tagged plant. Leaf length was measured from leaf pedicel to leaf tip and the average was worked out and expressed in centimeters. Leaf breadth was measured from the widest point of leaf lamina and expressed in centimeters. The leaf area was calculated by multiplying the leaf length and breadth with a constant 0.80 to arrive at the actual leaf area (Hewitt, 1955). Banana bunches were harvested with a curved knife when fingers were fully developed at 75 per cent maturity, angles with less prominent and fingers in hand started to change their color from dark green to light green. Selected bunches were weighed just after harvest. The experiment was laid out in Randomized Complete Block Design (RCBD) and results were tested at 5 per cent level of significance by using Fischer's method of analysis of variance as suggested by Cochran and Cox (1957).

RESULTS AND DISCUSSION

Table 1 depicts that there was a significant differences among the genotypes and there was linear increase in plant vegetative characteristics in all the genotypes with the advancement of age. The genotype Monthon grown luxuriously and recorded the maximum plant height (305.00 cm) at 240th day after planting. This might be due to it's genetical characters and its

vigorous growth. Whereas, the minimum plant height (147.81 cm) was recorded in the genotype Kayipallebale. Similar findings were obtained by Devi *et al.* (2011). Medhi (1994) found that pseudostem height was significantly more in Athiakal cultivar.

YangaviKM-5 recorded the maximum plant girth (76.27 cm), probably the plant height was contributed to the plant girth. Whereas, the minimum plant girth (46.44 cm) was recorded in the genotype Pisanglilin. Usually cooking bananas are vigorous in growth and size of the plant is also more. These results are in line with Devi *et al.* (2011). Biswal *et al.* (2004) observed that girth of the pseudostem at the base was greatest (88.66 cm) in BatishaBantala and MendhiBantala.

The genotype Robusta recorded the maximum leaf length (166.67 cm) this might be due to its genetical characters and the genotype Mitli recorded the minimum leaf length (123.63 cm). These results are in line with Hanumanthaiah (2012).

The Maximum leaf breadth (66.86 cm) was observed in the genotype Poovan. Whereas, minimum leaf breadth (43.62 cm) was recorded in the genotype Mitli. This might be due to its genetical characters. These results are in conformity with Hanumanthaiah (2012).

Robusta recorded the maximum leaf area (0.82 m²). It might be due to maintenance of upright growth habit and maximum light interception, leaf length also contributed to increase the area of leaves. Whereas, the minimum leaf area (0.45 m²) was recorded in the genotype Mitli. (Biswal *et al.*, 2004).

The maximum number of leaves per plant (17.33) was recorded in the genotype Hanuman. Whereas, the minimum

Table 1: Performance of banana genotypes in respect of vegetative characteristics

Treatment	Vegetative characteristics					
	Plant height (cm)	PlantGirth (cm)	Leaf length (cm)	Leaf breadth (cm)	Leaf area (m ²)	Number of leaves per plant
T ₁ -Karibale (AAA)	169.24	59.91	139.73	61.99	0.64	14.33
T ₂ - Kayipallebale (ABB)	147.81	61.54	132.07	58.08	0.62	13.33
T ₃ -Rajapuri (AAB)	154.38	62.76	127.00	49.87	0.50	11.67
T ₄ - Red banana(AAA)	181.27	62.23	148.33	59.03	0.69	11.67
T ₅ - Rasabale (AAB)	154.14	59.11	153.67	58.52	0.71	13.33
T ₆ - Elakkibale (AB)	252.33	66.75	143.40	60.03	0.69	10.67
T ₇ -Kanayibanasi (AAA)	219.00	60.08	138.63	62.77	0.69	11.00
T ₈ -Mitli (AB)	201.15	49.20	123.63	43.62	0.45	11.33
T ₉ -Bargibale (AAB)	161.65	61.28	127.30	61.59	0.63	13.67
T ₁₀ - <i>Musa balbisiana</i> (BB)	186.33	52.53	135.00	50.81	0.54	12.67
T ₁₁ -Pisanglilin (AA)	161.00	46.45	141.97	50.72	0.57	10.67
T ₁₂ -FHIA 3 (AABB)	265.00	69.34	154.77	52.28	0.65	12.33
T ₁₃ -Lalchakrakeli (AAA)	206.33	68.25	139.33	65.44	0.72	15.00
T ₁₄ -Basrai Dwarf (AAA)	173.00	72.31	155.30	62.43	0.77	13.67
T ₁₅ -Monthon (ABB)	305.00	62.95	132.03	65.18	0.68	12.33
T ₁₆ -Robusta (AAA)	224.00	66.97	166.67	61.75	0.82	13.67
T ₁₇ -Kadali (AA)	254.33	75.34	150.43	62.07	0.75	12.67
T ₁₈ -Yangavi KM -5 (AAA)	261.00	76.28	148.00	66.65	0.78	14.33
T ₁₉ - Sakkarebale (AB)	293.67	71.45	160.20	59.83	0.77	12.67
T ₂₀ -Karpuravalli (AAB)	212.67	65.38	129.00	59.93	0.69	13.00
T ₂₁ - Poovan (AAB)	273.67	72.86	148.00	66.86	0.80	12.33
T ₂₂ - Pisangawak (ABB)	220.00	60.08	148.33	62.13	0.73	13.00
T ₂₃ - Hanuman (AAA)	173.33	70.27	131.67	58.48	0.62	17.33
F- test	**	**	**	**	**	**
SEm ±	8.63	2.46	4.66	2.72	0.04	0.47
CD (0.05)	24.62	7.01	13.29	7.77	0.12	1.34

*Significant at 0.05 % **Significant at 0.01 % and 0.05 %

Table 2: Performance of banana genotypes in respect of yield

Treatment	Yield Yield ha ⁻¹ (t)
T ₁ -Karibale (AAA)	11.09
T ₂ - Kayipalle bale (ABB)	10.46
T ₃ -Rajapuri (AAB)	10.43
T ₄ - Red banana (AAA)	9.26
T ₅ - Rasabale (AAB)	8.19
T ₆ - Elakkibale (AB)	13.29
T ₇ -Kanayibanasi (AAA)	13.47
T ₈ -Mitli (AB)	3.84
T ₉ -Bargibale (AAB)	18.99
T ₁₀ - <i>Musa balbisiana</i> (BB)	7.66
T ₁₁ -Pisanglilin(AA)	8.17
T ₁₂ -FHIA 3 (AABB)	25.47
T ₁₃ -Lalchakrakeli (AAA)	24.46
T ₁₄ -Basrai Dwarf (AAA)	22.77
T ₁₅ -Monthon (ABB)	19.18
T ₁₆ -Robusta (AAA)	19.88
T ₁₇ -Kadali (AA)	16.02
T ₁₈ -YangaviKM -5 (AAA)	17.16
T ₁₉ - Sakkarebale (AB)	11.98
T ₂₀ -Karpuravalli (AAB)	15.04
T ₂₁ - Poovan (AAB)	12.81
T ₂₂ - Pisangawak (ABB)	12.53
T ₂₃ - Hanuman (AAA)	43.07
F- test	**
SEm ±	1.16
CD(0.05)	3.32

*Significant at 0.05 % **Significant at 0.01 % and 0.05 %

number of leaves per plant (10.66) was recorded in the genotype Elakkibale. This might be due to its genetical character. These results were in accordance with Biswal *et al.* (2004). Number of leaves were highest in Borjahajee followed by Malbhog banana (Medhi, 1994).

Yield

The yield varied significantly among the genotypes which is presented in table 2. The highest estimated yield (43.07 t ha⁻¹) was recorded in the genotype Hanuman, followed by the genotype FHIA-3 (25.47t ha⁻¹). This might be due to more plant girth, more number of leaves helped in enhanced photosynthesis and accumulation of food, number of fingers per bunch, finger weight, compactness of bunch led to increased yield. In general Hanuman belongs to the *acuminata* (AAA) group which yields comparatively more due to their genetical characters. Whereas, the lowest estimated yield per hectare (3.84 tha⁻¹) was recorded in genotype Mitli which might be due to its poor vegetative growth with the minimum leaf area and leaf length, less photosynthetic efficiency and poor accumulation of food. Similar findings were obtained by Deshmukh *et al.* (2004), Medhi (1994), Biswal *et al.* (2004) and Gaidashova *et al.* (2008).

ACKNOWLEDGEMENTS

I am very grateful to my M.Sc. guide Dr. B. Raju Director of Education, University of Horticultural Sciences, Bagalkot and Dr. Kulapati Hipparagi, Professor and Head, Department of Fruit science, College of Horticulture, Bagalkot, for their guidance and help in writing this manuscript.

REFERENCES

- Anonymous. 2012.** Indian Horticulture Data Base. *National Horticulture Board, September*, pp. 36-43.
- Biswal, M. K., Lenka, P. C. and Dash, D. K. 2004.** Evaluation of culinary banana genotypes. *Orissa. J. Hort.* **32(1)**: 63-65.
- Cochran and Cox 1957.** Experimental design procedure for the behavioural sciences. *Cole Publ. Co.* pp. 319-380.
- Crossa, J., Gauch, H. G. and Zobel, R. W. 1990.** Additive main effect and multiplicative interaction analysis of two international maize cultivar trials. *Crop Sci.* **30**: 493-500.
- Deshmukh, S. S., Badgajar, C. D. and Dusane, S. M. 2004.** Comparative evaluation of banana varieties under Jalgaon condition of Maharashtra state. *Agric. Sci. Digest.* **24**: 118-120.
- Devi, P. S., Thangam, M., Ladaniya, M. S. and Korikanthimath, V. S. 2011.** Evaluation of local banana cultivars under coconut shade in Goa. *J. Biol. Chem. Res.* **28**: 63-76.
- Gaidashova, S. V., Karemera, F. and Karamura, E. B. 2008.** Agronomic performance of introduced banana varieties in lowlands of Rwanda (Uganda). *African Crop Sci. J.* **16(1)**: 9-16.
- Gauch, H. G. 1992.** Statistical analysis of regional yield trials: AMMI analysis of factorial designs. *Elsevier, Amsterdam, The Netherlands.*
- Gauch, H. G. and Furnas, R. E. 1991.** Statistical analysis of yield trials with MATMODEL. *Agron. J.* **83**: 916-920.
- Hanumanthaiah, M. R. 2012.** Response of soil and foliar application of silicon on growth, yield and quality of banana cv. *Elakkibale Under Hill Zone of Karnataka. M.Sc. (Hort.) Thesis University of Horticultural Sciences, Bagalkot.*
- Hewit, C. W. 1955.** Leaf analysis as a guide to the nutrition of bananas. *Emp. J. Exp. Agric.* **23**: 11-16.
- Mandel, J. 1971.** A new analysis of variance model for non additive data. *Technometrics.* **13**: 1-18.
- Medhi, G. 1994.** Performance of some cultivars of banana in Assam. *Haryana J. Hort. Science.* **23(3)**: 181-185.
- Robinson, J. C. 1996.** Bananas and Plantains. *CAB International, Wallingford, UK.* p. 238.
- Ortiz, R., Iwanaga, M. and Mendoza, H. A. 1988.** Combining ability and parental effects in 4x-2x crosses for potato breeding. *Potato Res.* **31**: 643-650.
- Zobel, R. W., Wright, M. J. and Gauch, H. G., Jr. 1988.** Statistical analysis of a yield trial. *Agronomy J.* **80**: 388-393.

