Table 7. Relative growth rate (RGR) of banana cultivars belonging to AB genomic group

Cultivars	Growth parameters				
	Height	Girth	Leaves/plant	Leaf area/plant	Petiole length
Krishna vazhai	42.20	28.40	36.90	107.50	20.53
Vannan	50.80	37.60	45.10	166.30	21.61
Virupakshi	41.80	29.90	32.90	126.30	29.99
Sirumalai	52.30	43.70	51.50	172.00	26.53
Agniswar	51.20	38.00	58.20	189.20	23.31
Adakka kunnan	32.30	28.60	39.40	153.50	32.10
Valiya kunnan	37.40	33.00	39.70	161.20	29.20
Thaen kunnan	37.60	25.60	35.20	121.30	17.41
Padali moongil	33.90	24.70	38.80	116.20	23.57
Ney poovan	52.00	46.10	50.20	159.20	41.40
Kostha bontha	39.40	27.40	43.40	91.65	26.30
Venneettu mannan	25.00	16.50	23.80	59.00	15.10

References

Darlington CD and LF La Cour (1976) *The Handling of Chromosomes*, 6th ed, London, George Allen and Unwin Ltd., pp 36-39.

INIBAP (2001) Minutes of the second PROMUSA steering committee meeting, Bangkok, Thailand, 7-8, November 2000 *INFOMUSA* **9:** I-XIV.

Jacob KC (1966) Note on classification of banana *Madras Agric. J.* **53:** 220.

Raman VS (1970) *Breeding New Varieties of Banana*, Souvenir, All India banana and miscellaneous fruit show, Madras, Part B, pp 9-10.

Simmonds W (1966) *Bananas.* 2nd ed, London, Longman, NW.

Simmonds and K Shepherd, 1955. The taxonomy and origin of cultivated bananas. *J. Linn Soc. London* **55:** 302-312.

Assessing Variability among Indian *Capsicums* by AFLP

Ambika Baldev Gaikwad, Sunil Archak, Diksha Gautam, JL Karihaloo

National Research Centre on DNA Fingerprinting, National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi-110012

Chilli pepper is one of the most widely grown spice crops of India. Cultivated *Capsicum* comprising of *C. annuum*, *C. frutescens*, *C. baccatum*, *C. pubescence* and *C. chinense* originated in Central and South America. Chillies were introduced into India in the sixteenth century and from the agricultural perspective, the most important species is C. *annuum*. The widely different agro-climatic regimes of the country have led to the selection of a wide range of hot pepper, bell pepper and paprika types, thus, giving rise to a large amount of variability. Extensive diversity has been reported among the chilli germplasm in India (Singh and Singh, 1976). Variation in chilli germplasm has been analysed using AFLP, RFLP and ISSR markers (Prince *et al.* 1995; Paran *et al.* 1998). Molecular markers have also been used for constructing intra-specific integrated linkage maps of pepper (Lefebvere *et al.* 1995). In the present study, 28 Indian accessions that included released varieties as well as landraces were characterised using AFLP markers. The latter detect polymorphism within a subset of genomic DNA defined by the restriction sites of the enzymes, and the additional nucleotide used for selective amplification in the technique.

Seeds of 28 accessions of *C. annuum* were sown in pots under green house conditions. Two grams of young leaves were ground to a fine powder using liquid nitrogen, suspended in 10 ml of homogenisation buffer (100 mM Tris, pH 8, 20 mM EDTA, 1.4 M NaCl, 2% CTAB, 0.2% 2-Mercaptoethanol), by vortexing and incubated at 65°C for 1h. The homogenate was extracted

twice with chloroform:isoamyl alcohol (24:1) by centrifugation at 12,000 rpm at 25°C for 15 min. Total cellular DNA was precipitated with 0.6 volumes of isopropanol and pelleted by centrifugation at 15,000 rpm for 20 min. The pellet was washed with 70% ethanol, air dried, dissolved in TE buffer (Tris 10 mM, EDTA 1 mM, pH 8.0), treated with bovine pancreatic RNase and extracted with phenol:chloroform:isoamyl alcohol (25:24:1) and chloroform:isoamyl alcohol (24:1).

The AFLP reactions were performed with the AFLP Plant Mapping Kit (regular genomes) of Perkin Elmer according to the manufacturers protocol. Six primer combinations were employed for generation of markers. These were *Mse*I+CTC/*Eco*RI+ACG, *Mse*I+CTC/*Eco*RI+ACT, *Mse*I+CTC/*Eco*RI+ACC, *Mse*I+CTG/*Eco*RI+ACA, *Mse*I+CTG/*Eco*RI+AGC, *Mse*I+CTG/*Eco*RI+AAG. The *Eco*RI primers were labelled with fluorescent dyes which allowed detection of amplification products that were resolved by an ABI Prism 310 Genetic Analyzer. Fragment sizes were determined in relation to the GeneScan - 500 ROX size standard. The binary matrix was obtained for the presence and absence of markers by sequential analyses using softwares GeneScan Version 3.1 and Genotyper version 2.5.

Six primer pairs were used to amplify targeted sites of the genome. A total of 332 amplification products (visualised as peaks) were detected. These ranged from 50 to 350 nucleotides in size. The average number of bands/primer-pair was 55, with all but one of the markers being polymorphic. The polymorphism information content detected by AFLP markers among the Indian cultivars was 0.29 which is higher than that obtained for a collection including the exotic types. Based on the AFLP data a matrix of genetic similarity was constructed for these accessions. The value of Jaccard's coefficient ranged from 0.15 to 0.83 with the maximum similarity existing between K-2 and PMK-1. In the phenetic analysis, loose clusters were distinguished on the basis of the geographical locations, with the accessions from south India being close to each other.

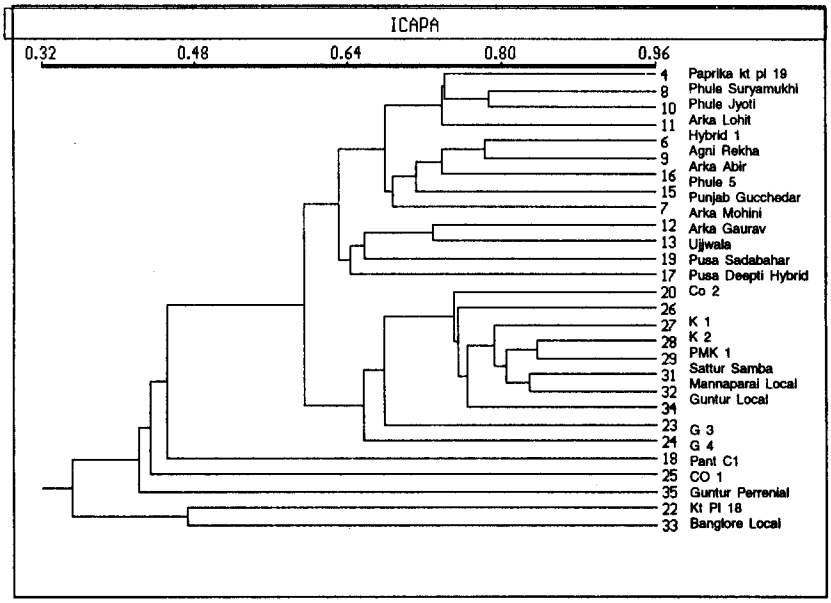

Fig. 1. UPGMA dendrogram based on AFLP analysis of Indian Capsicums

The high Marker Index of 15.5 obtained from the analysis of AFLP data can be attributed to the high multiplex ratio of the AFLP markers. The polymorphic bands obtained in this study were seven times more than that reported previously (Paran *et al.* 1998). The high percentage of polymorphism may be a reflection of the highly divergent group of hot chilli types that dominate the accessions included in this study. These results indicate the presence of a high level of genetic diversity in the Indian accessions of *C. annuum* and support the contention of some workers of India being the secondary centre of diversity of chilli pepper.

References

Lefebvre V, A Polloix, C Caranta and E Pochard (1995) Construction of an integrated linkage map of pepper using molecular markers and doubled haploid progenies. *Genome* **38:** 112-121.

Paran I, E Aftergoot and C Shifriss (1998) Variation in *Capsicum annuum* revealed by RAPD and AFLP markers. *Euphytica* **99:** 167-173.

Prince JP and VK Lackney (1995) A survey of DNA polymorphism within the genus *Capsicum* and the fingerprinting of pepper cultivars. *Genome* **38:** 224-231.

Singh A and HN Singh (1976) Genetic divergence in chilli. *Indian J.Genet. Plant Breed.* **36:** 425-430.