GERDEMANN, J.W. and NICOLSON, T.H. (1963). Spores of mycorrhizal Endogone species extracted from soil by wet sieving and decanting. **Trans. Br. Mycol. Soc., 46:** 235-246.

PHILLIPS and HEYMAN, D.S. (1970). Improved procedure for clearing roots and staining parastic and VAM fungi for rapid assessment of infection. **Trans. Br. Mycol. Soc., 55:** 158-161.

PORTER, W.M. (1979). The Most Probable Number Method for enumerating infective propagules of vesicular arbuscular mychorrhizal fungi in soil. **Aust. J. Soil Res., 17:** 515-519.

QURESHI, J.M. (1956). Mortality of *Casuarina equisetifolia* in plantations in Bombay state. **Proc. 8th Silvic Conf.** DehraDun, 1951. 329-330.

ROSS, J.P. (1972). Influence of Endogone mycorrhiza on Phytophthora rot of soybean. **Phytopath., 67:** 1507-1511.

SAFIR, G.R., BOYER, J.S. and GERDEMANN, J.W. (1971). Nutrient status and mycorrhizal enhancement of water transport in soybean. **Plant Physiol., 49:** 700-703.

SCHENCK, N.C. and KELLAM, M.K. (1978). The influence of vesicular arbuscular mycorrhizae on disease development. **Fla. Agric. Exp. Stn. Bull.,** 799.

SCHENCK, N.C., RIDINGS, W.H. and CORNELL, J.A. (1977). Interaction of vesicular arbuscular mycorrhizal fungi and *Phytophthora parasitica* on two citrus root stocks (Abstr.) p. 9 in : Proc. Third North Am. Cont. Mycorrhizae Corvallis Oregon.

SCHOENBEECK, F. (1980). Endomycorrhizae Ecology, Function and Phytopathological aspects. **Forum Microbiol., 3:** 90-96.

SCHOENBECK, F. and DEHNE, H.W. (1981). Mycorrhiza and plant health. **Gesunde pflanzen, 33:** 186-190.

ZAK, B. (1964). Role of mycorrhizae in root disease. **Ann. Rev. Phytopath., 2:** 377-392.

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SEASONAL VARIATION IN PROLINE CONTENT IN CERTAIN BANANA VARIETIES

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ABSTRACT

The seasonal fluctuation in proline content in 11 banana varieties belonging to three genomic groups were studied. The proline content increased from March to June and the started declining irrespective of the varieties. Among the three genomic groups ABB record higher amount of proline accumulation during June than the other two groups (AAA and AAB). Drought was observed during the months of April, May and June in the crop growing period of March to August. During this period, the accumulation of proline occurred and there was variation in proline accumulation among the varieties studied. The highest accumulation of 265 ug/g of proline was recorded in Karpooravalli followed by 260 ug/g in Monthan suggesting that the ABB types have better tolerance to drought than AAA or AAB. The number of functional leaves, height and girth of pseudostem were also high in Karpooravalli and Monthan than in other varieties. The decline in proline content immediately on receipt of monsoon was more pronounced in Karpooravalli and Monthan indicating the better diversification of the accumulated proline for protein synthesis.

KEY WORDS: Proline accumulation, Banana, Karpooravalli, Monthan

Banana is an important choice fruit for all occations. The area under this crop in Tamil Nadu has been estimated to be 62.5 thousand hectares with a production of 1104.7 thousand tonnes (Anon. 1981). The choice of varieties for a particular region is decided by numerous factors like profitability, disease prevalance and marketability. Sometimes, polyclonal cultivation is also practiced. The varieties differ in their reaction to varied agro-climatic conditions. The variation is attributed to be due to bispecific origion from the combination of parental species *Musa acuminata* colla and *Musa balbisiana* (colla Simmonds, 1962). Accumulation of proline is often attributed to

drought effect and the quantity of proline thus accumulated has a direct relavance to the drought tolerance nature of the genotypes (Kemble and MC Pherson), 1954 : Levy, 1980). The seasonal variation in proline content in various varieties may throw some light in understanding the relative ability of the varieties for withstanding the drought.

MATERIALS AND METHODS

Eleven banana cultivars belonging to three genomic constitution were employed in the study. The suckers were planted during December 1988. under wetland conditions. Normal recommended dose of fertilizers at 110:35:330 g NPK / plant were applied in two equal split applications at 3rd and 5th month after planting. Third leaf from the top was sampled every month starting from March upto August and ten plants in each varieties were sampled. The samples were analysed for proline content as per the procedure described by Bates *et al.*. (1973).

RESULTS AND DISCUSSION

The morphological characters such as plant height, girth and number of functional leaves recorded at 5th and 7th month of planting are presented (Table 1). The plant height ranged from 121.5 in Robusta to 195.8 cm in Karpooravalli followed by Monthan. Similarly, the girth and number of functional leaves both at 3rd and 5th month were highest in Karpooravalli. The robust nature of Karpooravalli (ABB) indicates its relative tolerance to drought. The proline content (Table 2) at different months indicated that Karpooravalli could accumulate more, than the other varieties especially during the drought period. The highest proline content of 265 ug/g was recorded in Karpooravalli during June and the lowest conten

Table 1. Morphological characters of some banana varieties of different genomes

Genome /	Height (cm)		Girth (cm)		No.of functional leaves	
Variety	5th	7th	5th	7th	5th	7th
AAA						
Red Banana	141.5	185.5	30.5	42.4	13.5	20.4
Robusta	121.5	140.6	41.5	49.0	15.3	24.8
ABB						
Neyvanan	160.5	225.5	40.5	54.2	19.5	23.5
Sakkia	165.5	190.5	40.0	52.5	16.5	20.0
Karpooravalli	195.8	255.5	60.2	70.6	21.5	28.8
Monthan	182.3	222.6	51.5	63.2	17.4	21.5
AAB						
Nendran	119.5	164.5	30.5	43.2	11.5	19.5
Pachanadan	150.0	190.5	35.0	42.5	14.4	19.0
Co-1	141.0	200.0	31.0	41.5	15.5	21.0
Poovan	151.5	208.8	37.5	45.5	16.0	24.5
Rasthali	171.5	218.0	50.0	65.5	18.5	22.0
CD (P0.05)	21.4	26.8	8.71	9.39	2.54	2.63

Table 2. Seasonal variation in proline content in certain banana varieties

Genome / Variety	Proline content (ug/g)					
	March	April	May	June	July	August
AAA						
Red Banana	130	195	215	220	160	159
Robusta	120	187	200	218	175	160
Mean	125	191	207.5	219	167.5	159.5
ABB						
Neyvanan	120	185	225	228	176	128
Sakkia	125	165	241	241	172	123
Karpooravalli	145	195	261	265	145	112
Monthan	132	213	252	260	165	120
Mean	130.5	189.5	244.8	248.5	164.5	120.8
AAB						
Nendran	141	170	195	198	143	136
Pachanadan	142	175	198	215	180	142
Co-1	121	165	215	242	175	165
Poovan	135	160	213	241	200	182
Rasthali	140	190	212	245	215	180
Mean	135.8	172	206.6	228.2	182.6	161.0
CD (P=0.05)	8.5	14.7	19.9	18.2	19.1	22.1

of 112 ug/g was recorded during August. This showed that immediately on receipt of rain during August, the proline is diverted to protein synthesis. Among the genomic groups the ABB group accumulated more of proline than other groups indicating the drought tolerant capacity. The avoidance of protein loss under drought condition may be due to a decreased rate of protein break down or an increased rate of its synthesis (Anon. 1975). It was reported that in wheat crop grown as unirrigated the proline content increased upto midday (Rajagopal *et al.*, 1977). Thus in our present study it was seen that the Karpooravalli and Mondan are the two promising cultivars which can be employed in breeding programmes for incorporating drought resistant nature.

REFERENCES

ANONYMOUS. (1975). Annual report for 1974. IRRI. Losbanos Philippines.

ANONYMOUS. (1981). Agricultural situation in India 38: 187.

BATES, L.S., WALDREN, R.P. and TEARE, T.D. (1973). Rapid determination of free proline for water stress studies. **Plant and Soil 39:** 205-207.

KEMBLE, A.R. and MC PHERSAN, H.T. (1954). Liberation of aminoacids in perennial rye grass during wilting. **Biochem.J. 58:** 46-49.

LEVY, Y. (1980). Field determination of free proline accumulation and water stress in lemon trees. **Hort. Sci. 15:** 302-303

RAGAGOPAL, V., BALASUBRAMANIAN, V. and SINHA, S.K. (1977). Diurnal fluctuations in relative water content, nitrate reductase and proline content in water stressed and non-stressed wheat. **Physiol. Plant. 40:** 69-71.

SIMMONDS, N.W. (1962). The evolution of Bananas. Longman, London.

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