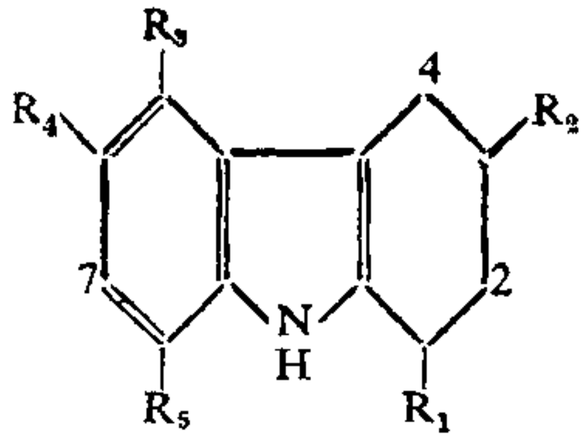
TABLE II
*Substituted tetrahydrocarbazoles**



Compd. No.	R_1	R_3	R_2	R_4	R_5	C_1-CH_3	C_3-CH_3	H-5	H-6	H-7	H-8
XIV	H	H	H	Br	NO_2	..	..	7·65,d, J = 2	..	7·93,d, J = 2	..
XV	H	H	Cl	H	NO_2	..	..	..	7·01,d, J = 8·5	7·90,d, J = 8·5	.. ..
XVI	CH_3	H	Cl	H	NO_2	1·18,d, J = 6	..	..	7·01,d, J = 8·5	7·90,d, J = 8·5	..
XVII	H	CH	Cl	H	NO_2	..	1·00,d, J = 5·5	..	7·01,d, J = 9	8·05,d, J = 9	..
XVIII	H	H	H	NO_2	H	..	..	8·28 d, J = 2	..	7·96,dd, J = 2,9	7·23,d, J = 9
XIX	CH_3	H	H	NO_2	H	1·16,d, J = 6	..	8·40,d, J = 2	..	8·06,dd. J = 2,9	7·30,d, J = 9
XX	H	H	Cl	Cl	NO_2	..	..	..	..	8·00,s	..

* NMR spectra recorded on Varian A–60 D instrument using TMS reference and $CDCl_3$ as solvent. The chemical shifts are expressed in δ units with J values in Hz.

Thanks are due to Dr. Nitya Anand (Director), Dr. R. S. Kapil, Dr. P. C. Jain of C.D.R.I., Lucknow, for analytical data and also to Dr. S. P. Gupta, Head of the Department, for his keen interest and valuable suggestions during the course of this work.

Chemical Laboratories, O. P. MALIK.
D.N. College, Meerut, U.P.,
May 3, 1975,

1. Zsolnai, Tibor, (Med. Univ., Debrecen Hung.), *Biochem. Pharmacol.*, 1962, **11**, 995.
2. Perkin, W. H., Jr. and Plant, S. G. P., *J. Chem. Soc.*, 1923, **123**, 1825.
3. Campbell, N. and Barclay, B. M., "Recent advances in the chemistry of carbazole," *Chemical Review*, 1947, 40, 359.
4. Adolfo, R., *Frasca. Anales. Asoc. Quim. Arg.*, 1962, **50**, 162.

A NOTE ON TRANSAMINASES IN THE RIPENING OF BANANAS ON STORAGE

TRANSAMINASES catalyze the reactions involving the transfer of an amino group from an alpha-amino acid to an alpha-keto acid. Leonardo and Eurris[1] reported the presence of transaminase activity in various plants and plant tissues. Schales and Schales[2] gave indirect evidence for the presence of transaminase in 42 different plants and plant organs. The present study reports the variation of aspartate-alanine amino-transferase during the ripening of different varieties of banana, *viz.*, Basrai, Harichal, Lalkel (variety of Musa Cavendishii), Rajeli, Safed velchi (variety of *Musa paradisiaca*) at 13° C.

In order to get banana bunches of uniform maturity, nearly 100 banana plants were tagged at the time of inflorescence emergence, in a nearby banana plantation. From these lots, two bunches each of uniform development were harvested at 100 days after the inflorescence

emergence. The upper hands of these bunches were stored in an incubator at 13° C. The weight ratio of pulp to skin was determined to assess the maturity of the fruits. Three fingers from each of the five banana hands were removed at a time and the average values are reported.

With a view to finding out the solubility of transaminases, distilled water, 3% sodium chloride and phosphate buffer (pH 7·0, 0·1 M) were employed and the enzyme activity was determined by the method of Reitman and Frankel[3]. The phosphate buffer was the best medium for transaminases of the banana fruit pulp.

TABLE 1

Aspartate aminotransferase and alanine aminotransferase activities during the ripening of bananas

(Values expressed in sp. activity per 100 g fresh tissue)

	Storage period (days after harvesting)	0	8	16	24	32
Variety	Fractions					
Basrai	I	1·35	1·61	1·65	1·76	3·00
	II	0·60	1·61	1·77	2·12	4·05
Harichal	I	0·30	1·34	1·33	2·63	2·95
	II	0·50	0·79	1·28	2·53	5·04
Lalkel	I	0·52	0·76	2·42	2·68	3·18
	II	0·51	1·05	2·12	3·00	3·48
Rajeli	I	0·50	1·04	2·44	4·39	4·88
	II	0·59	0·69	2·70	5·95	6·64
Safed velchi	I	0·36	2·47	3·00	6·07	Over ripe
	II	0·47	0·91	3·04	4·30	

Fraction I : Aspartate aminotransferase.
Fraction II : Alanine aminotransferase.

The banana pulp (15 g) was homogenised in a Waring blender with 50 ml of phosphate buffer for one hour at 5° C. The mass was squeezed through a muslin cloth and the filtrate centrifuged at 3000 r.p.m. for 20 minutes. The residue was re-extracted with 40 ml of the buffer and the combined extracts were again centrifuged after one hour. The supernatant layer was used as an enzyme source for the determination of aspartate-alanine transaminase. The assay procedure is based upon the fact that aspartate and alanine amino transferase enzyme, transfer amino group from amino acids, aspartic acid and alanine to keto acid, alpha-ketoglutaric acid forming respectively oxaloacetic acid and pyruvic acid which were colorimetrically estimated. Enzyme activity was expressed in terms of unit activity and defined as 1 μg of pyruvic acid formed in one hour and the specific activity was expressed as μg of pyruvic acid formed per mg protein per hour. Protein was determined according to the method of Lowry *et al.*[4].

It can be seen from Table I that aspartate aminotransferase and alanine aminotransferase activities increased slowly in the early stages of ripening and then rapidly in the advanced progress of ripening. Giri *et al.*[5] reported that the transaminase activity increased on germination. Romani[6] also reported the presence of aspartate-alanine transaminase in the cortical tissue. In the present investigation, aspartate and alanine aminotransferase activities were found to be 0·36–6·07 and 0·47–6·64 unit activity respectively. At full ripe stage, the highest activity of aspartate aminotransferase was found in Safed velchi banana while alanine aminotransferase was highest in Rajeli banana. The increased activity of aspartate and alanine aminotransferase during storage and ripening of bananas demonstrate their important role of linking protein and organic acid metabolism.

The financial assistance provided by University Grants Commission to one of us (D. L. P.) is thankfully acknowledged. Thanks are also due to Mr. Prabhakar H. Raut for supplying fresh bananas.

Department of Biochemistry, Institute of Science, 15, Madam Cama Road, Bombay 400 032, India, *March* 21, 1975.

D. L. PATIL.
N. G. MAGAR.

1. Leonard, M. J. K. and Burris, R. H., *J. Biol. Chem.*, 1947, 170, 701.
2. Schales, O. and Schales Selma, *Arch. Biochem. Biophy.*, 1957, 69, 378.
3. Reitman, S. and Frankel, S., *Am. J. Clin. Pathol.*, 1957, 28, 56.
4. Lowry, P. H., Rosenbrough, J. N., Farr, L. A., and Randall, R. J., *J. Biochem.*, 1951, 193, 265.
5. Giri, K. V., Radhakrishnan, A. N. and Vaidyanathan, C. A., *J. Ind. Inst. Sci.*, 1952, 34, 305.
6. Romani, R. J., *Plant Physiology*, 1962, 37, 523.

OCCURRENCE OF MICROPLANKTONS IN THE MIDDLE DEVONIAN ROCKS OF SASKATCHEWAN AND ALBERT, CANADA

In the course of microplankton studies of the Frasnian sequences of the interior plains of Canada, and to evaluate the genera and species of acritarchs and other microplanktons crossing the Middle-Upper Devonian boundary in the Saskatchewan and Alberta areas the author (Nautiyal, 1972[1]) analysed some samples from the Middle Devonian Elk Point Group of these regions for their microfaunal (microfloral) content. This report provides the first occurrence of acritarchs from the Middle Devonian sequences of Saskatchewan and Alberta (Figs. 1-8).