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1. Suryanarayana, C. V. and Somasundaram, K. M., *Acta Chem. Acad. Sci. Hung. Tomus.*, 1959, 20 (2), 231.
2. — and —, *Ibid.*, 1960, 24 (1), 31.
3. Omayorupakam Pillai, S., Krishnamoorthy, K. and Kuppusami, J., *Ind. J. Pure and Appl. Phys.*, September 1973, 11, 677.
4. Bonner, W. D., *J. Phys. Chem.*, 1910, 14, 732.

EVALUATION OF AVERAGE L-SHELL FLUORESCENCE YIELDS INVOLVING PHOTO-EXCITATION

THE extensive data on average L-shell fluorescence yields ($\bar{\omega}_L$) using direct fluorescent excitation for creating primary vacancies, that are available at present, dates back to 1934[1]. Since then more reliable data on L subshell photoelectric absorption, L subshell fluorescence yields and Coster-Kroning yields, needed for the evaluation of $\bar{\omega}_L$ have been made available in literature. We have evaluated $\bar{\omega}_L$ for some elements in the range Z varying from 65 to 96 by using Scofield's[2] data of 1973 for the determination of primary vacancy distribution among L subshells involving photo-excitation at 20 keV (except for Cm) and 200 keV and most recent values of L subshells fluorescence yields and Coster-Kroning yields as recommended in a recent review article[3] of 1972. The values at 20 keV agree with those at 200 keV within errors involved because of the uncertainties in the experimental data on L subshell fluorescence yields and Coster-Kroning yields, showing that $\bar{\omega}_L$ does not depend very much upon the energy of exciting radiations. Our values for $\bar{\omega}_L$ at 20 keV are compared with those of Lay obtained in 1934 at 17·443 keV (Energy of Mo K_α X-rays) in Table I. It is seen that the values of Lay for all elements except W are at least 10% higher than the present values. Reliable data on the fluorescence yields are needed because of their many applications in a large variety of measurements in the fields of Atomic and Nuclear Physics as outlined by Bambynek *et al.*[3].

TABLE I

The present values of average L shell fluorescence yields involving photoelectric excitation are compared with the existing data

Z	Element	Average L shell fluorescence yield	
		Present value	Existing data Lay[1]
65	Tb	0·218	..
73	Ta	0·248	..
74	W	0·264	0·298
78	Pt	0·297	0·348
79	Au	0·306	0·365
81	Tl	0·321	..
82	Pb	0·344	0·398
96	Cm	0·635	..

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1. Lay, H., *Z. Phys.*, 1934, 91, 533.
2. Scofield, J. H., *Lawrence Livermore Laboratory*, U.C.R.L.-51326, 1973, Unpublished.
3. Bambynek *et. al.*, *Rev. Mod. Phys.*, 1972, 44, 716.

ASCORBIC ACID OXIDASE IN THE RIPENING OF BANANAS

THE most significant factor responsible for the formation of dehydroascorbic acid in plant extract is the role of ascorbic acid oxidase. Thornton[1] reported that fruit contained an enzyme capable of destroying ascorbic acid. The present study reports the variation of ascrobic acid oxidase 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.

Basrai banana was obtained from Jalgaon District, Maharashtra State, while other varieties of bananas were obtained from Bassein Road, Bombay. 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 where uniform cultural practices were maintained throughout the growing season. From the above lots, two bunches each of uniform development were harvested at 100 days of growth after the inflorescence emergence. Harvesting period from inflorescence emergence was almost the same in all varieties. These bunches were immediately brought to the laboratory, separated into hands and upper hands of the bunches were stored in an

incubator at a temperature of 13° C. The ratio between pulp to skin weight was determined to assess the maturity of the fruits. In our previous experiment, 13° C was found to be more favourable temperature for ripening, and storage of bananas. Therefore the enzyme activity was carried out at this temperature. All the observations were made on detached banana fingers. Three fingers from each of the five banana hands were removed at a time and the average values are reported.

In order to find out the solubility of ascorbic acid oxidase, water, 3% sodium chloride, 30% alcohol and phosphate buffer (pH 7·0, 0·1 M) were tried and the enzyme activity was carried out by following the titrimetric method of Birch, Harris and Ray[2]. It was found that 3% sodium chloride was the best extracting solvent for ascorbic acid oxidase of the banana fruit pulp (Table I).

TABLE I

Extraction of ascorbic acid oxidase with different solvents

Solvent	Mg of ascorbic acid oxidised per 100 g wet weight basis in pulp	Ascorbic acid oxidase (units)
Water	0·481	19
30% alcohol	0·672	27
3% NaCl	1·008	40
Phosphate buffer pH 7·0, 0·1 M	Nil	Nil

10 g of banana pulp were homogenised in a Waring blender with 50 ml of 3% sodium chloride for 3–4 minutes. The homogenate was filtered through a double layer of muslin cloth and the residue was again re-extracted with 30 ml of the same solvent to ensure the complete extraction of the enzyme. The combined extracts were kept at 5° C for one hour and then centrifuged at 2.000 r.p.m. for 20 minutes and supernatant layer was made to volume, and used as an enzyme source for the determination of ascorbic acid oxidase. Unit activity is defined as the percentage of oxidation of added ascorbic acid and taken to be the criteria of the amount of ascorbic acid oxidase present in tissues and each percentage oxidation represents one unit of the enzyme activity.

It can be seen from Table II that ascorbic acid oxidase activity during storage and ripening at 13° C increased upto yellow stage and then remained steady in the advanced progress of ripening. Fifty per cent ascorbic acid oxidase was observed to be left in an unoxidised form in green unripe stage, whereas in full ripe stage it varied from 35–40%. Babber[3] reported 50% units of ascorbic acid oxidase in bananas. In the present investigation ascorbic acid oxidase ranged in between 38–48% units on fresh weight basis. The highest activity was found in Harichal, Lalkel (48% units) bananas while lowest in Safed velchi banana (45% units). Basrai banana contained 40% units activity and was found to be higher than the other varieties at the initial green stage. There was not much difference in the per cent units activity of Basrai and Rajeli bananas at full stage.

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TABLE II

Enzymatic changes in ascorbic acid oxidase during the ripening of bananas

	Storage period in days after harvesting		0 (initial stage)	8	16	24	32
Basrai	Ascorbic acid oxidised mg		1·01	1·09	1·13	1·18	1·19
	do.	oxidase (units)	40·32	43·37	45·37	47·33	47·76
Harichal	do.	oxidised mg	1·02	1·10	1·15	1·19	1·20
	do.	oxidase (units)	40·32	44·28	46·30	47·76	48·23
Lalkel	do.	oxidised mg	0·87	0·97	1·01	1·14	1·20
	do.	oxidase (units)	35·00	39·04	40·34	45·84	48·23
Rajeli	do.	oxidised mg	0·96	1·05	1·10	1·15	1·18
	do.	oxidase (units)	38·34	42·08	44·28	46·30	47·33
Safed velchi	do.	oxidised mg	0·97	1·03	1·09	1·13	Overripe
	do.	oxidase (units)	39·04	41·53	43·63	45·31	

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1. Thornton, N. C., *Contrib. Boyce. Food Research*, 1937, 2, 311.
2. Birch, T. W., Harris, L. J. and Ray, S. W., *Biochem. J.*, 1933, 27, 590.
3. Babber, I. J., *Indian J. Med. Res.*, 1950, **38**, 263.