Delhi on 9 March 1971. The electrical conductivity increases with height as expected till about 18 km, when it falls sharply to about half its value, with the profile showing a series of marked minima. Above 25-28 km, the conductivity again shows a sharp increase with height. Sharp variations had been noticed in the electrical potential gradient profile in the lower stratosphere over Poona (Huddar *et al.*, 1966). These marked variations in electrical conductivity and potential gradient are presumably associated with the existence of dust layers in the lower stratosphere over India. The observed values are much lower than the theoretical values (Israel, 1970). The observations are being continued and extended using an improved conductivity sonde.

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SILVER-SILVER SELENOCYANATE ELECTRODE

SILVER halide electrodes are most commonly used as reference electrodes. The details of their preparation and use are well known.[1] Silver thiocyanate electrodes have been prepared by Parida *et al.*[2] and improved upon by Vanderzee and Smith.[3] We have extensively used this electrode for study of $SeCN^-$ equilibria in solution.[4,5] In continuation of this work we have developed silver selenocyanate electrode to study $SeCN^-$ equilibria. It is found that the thermal-electrolytic method gives the most satisfactory result in terms of reproducibility, stability and convenience of preparation.

Preparation of the Electrode.—Platinum spirals, each 1 cm long, sealed in soft glass were packed with paste of silver oxalate prepared by the method of Ferrell *et al.*[6] They were then dried in an oven for several hours at 160-80° C and then heated in a furnace at 400° C for an hour and allowed to cool slowly. The preliminary drying period prevents sputtering during the decomposition period. Decomposition of silver oxide to spongy silver also gives satisfactory result but it is not preferable to decomposition of silver oxalate because of the tedious process of washing the oxide free from alkali after its preparation by the reaction of silver nitrate with sodium hydroxide. The silver bases were electrolysed as anodes in 0·05 M selenocyanate solution for 3 hours at 0·3 to 0·4 milliampere. Following several washings with water, they were allowed to equilibrate in a portion of cell solution for at least three days before use. These electrodes were prepared in groups of six to eight and always kept dipped in a solution of potassium selenocyanate.

Results.—It was observed that electrodes prepared in this method are reversible with respect to $SeCN^-$ ion and can comfortably be used to estimate the ion potentiometrically. Figure 1 shows a typical potentiometric titration curve and Table I gives the results of different titration curves. Presence of an in-

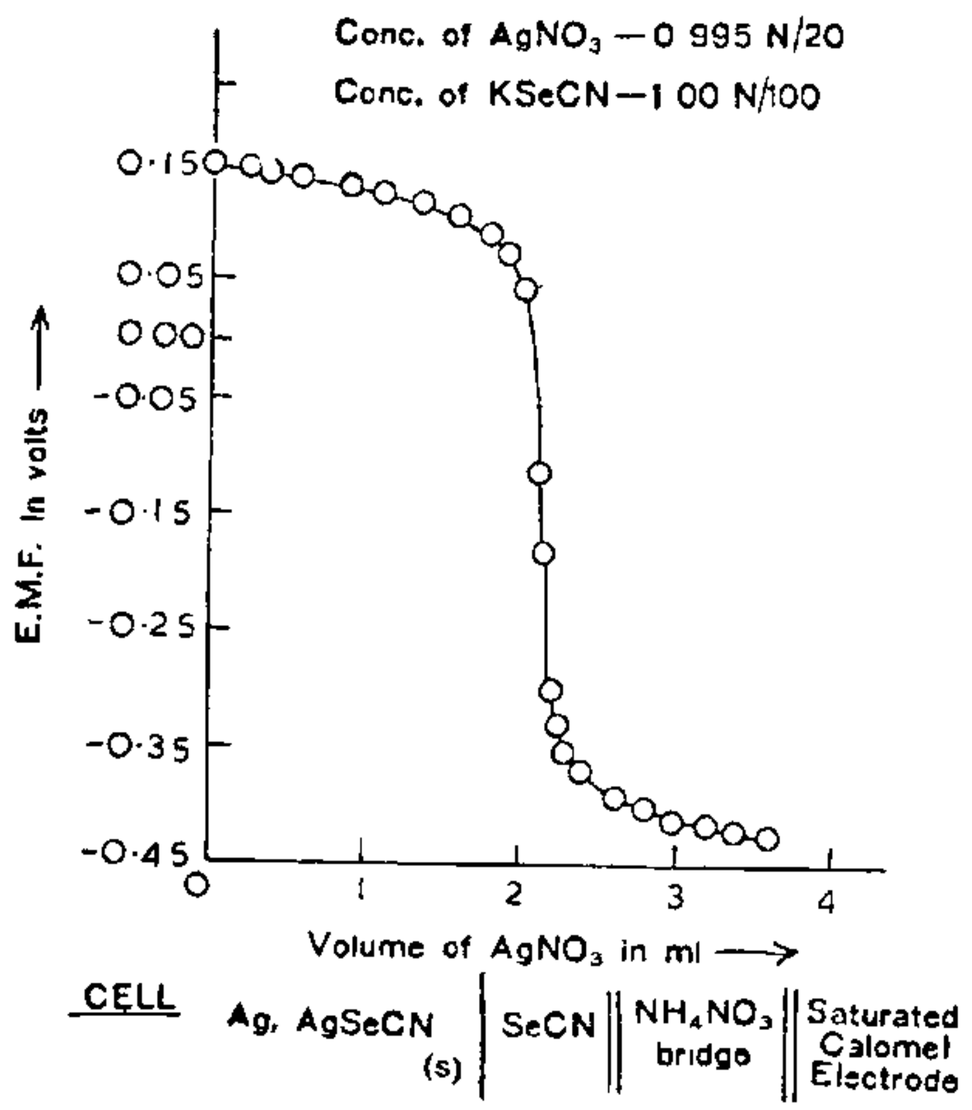

FIG. 1

different electrolyte does not affect the estimation result.

TABLE I

Sl. No.	Amount of KSeCN taken	Amount of KSeCN found	Amount of indifferent electrolyte added
1	14·50 mg	14·69 mg	..
2	29·0 ,,	29·8 ,,	..
3	14·50 ,,	41·69 ,,	6·0 mg of NaCl
4	14·50 ,,	14·83 ,,	50 mg of KNO_3

It was, however, observed that, although electrodes prepared in one set in which electrolysis is done at a particular current strength and for a particular length of time usually matched within 0·3 mv but when compared with those of another set prepared at different conditions of electrolysis, the difference reached as much as 1 mv. However, electrodes prepared in different batches but electrolysed under similar conditions matched within 0·3 mv. Thus, silver selenocyanate electrode can conveniently be used for studying the behaviour of $SeCN^-$ in aqueous solution.

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β-CAROTENE IN LEAF PROTEINS*

THE fibre-free leaf protein extracted from green vegetations has been successfully presented as an adequate protein supplement in human diets.[1] The crude green product is assumed to contain nutritionally important pigments like carotenes and xanthophylls and solvent extraction is therefore considered inadvisable. Estimations for β-carotene were, therefore, done on different leaf proteins to provide experimental support to this assumption.

However, when some of the old dry samples of leaf proteins were soxhlet-extracted, no traces of β-carotene were observed in those from cauliflower (9 months), lucerne (12 months) and dhaincha (14 months), and only 90 and 55 μg of β-carotene/g dry matter in preparations from lucerne (18 days old) and groundnut (12 days old) respectively. This indicated loss in β-carotene during storage.

To standardise the methodology, β-carotene levels were estimated in a number of freshly prepared lucerne leaf protein samples, both in wet materials extracted in soxhlet on a boiling water-bath or in cold and in materials soon after drying in a current of air at 40-60° C. Hot soxhlet extraction was found to give 30% lower values than cold extraction and air-drying caused a loss of 13% in β-carotene of the fresh wet material.

Thereafter, total carotenoid pigments in different leaf proteins were extracted with acetone and taken up in petroleum ether (b.p. 60-80° C) and β-carotene separated on MgO : Supercel (1 : 3) column[2] and estimated colorimetrically, using a Spectronic-20 photoelectric colorimeter.[3] The results are presented in Table I along with computed values for vitamin A. These β-carotene values were lower

TABLE I

β-carotene in leaf proteins

Leaf protein from*	β-carotene (μg) (per g dry matter)	Vitamin A† (IU) (per g dry matter)
Dolichos lablab ..	960	1603
Tapioca (*Manihot utilissima*)	365	610
Lucerne (*Medicago sativa*)‡ ..	380–450	635–750
Carrot (*Daucus carota*) ..	495	826
Radish (*Raphanus sativus*) ..	503	840

* Only fresh wet material used for extraction.
† Conversion factor—β-carotene 1 μg = 1·67 I.U. of vitamin A.
‡ Range of 3 samples from different batches of vegetation.

than those got elsewhere,[4] probably because of the losses during the inefficient batch-extraction,[5] the process used by us for preparing leaf protein. However, it is apparent from the data that green leaf protein even in very small quantities would adequately meet the provitamin A requirements, particularly in India where a quarter of the total nutritional deficiencies are reported to be due to shortage of vitamin A in diets.[6]

In storage studies, a progressive loss occurred with time, greater at room temperature than at low temperature of the refrigerator. Further studies showed practically no losses of β-carotene when leaf protein samples wer-