As we do not however have an idea of the geological formation underneath these deserts, we are unable to state how much of the accumulated ground water would have flowed away. Nevertheless, one could broadly expect from our line of reasoning that the pre-historic ground water is still underneath these deserts and that consequently, the water table is high as we see it today[6].

On the basis of the above facts and arguments the author would put forward a tentative hypothesis *that Central Asia was not a desert region between 6500 B.C. and 500 B.C. and that deserts began to develop only after 500 B.C.* Thereafter, they gradually extended eastwards. This eastward extension would have continued at least upto the end of the T'ang Dynasty. The water table must therefore have risen nearly to its present height by the end of the T'ang Dynasty. The subsequent accumulation of ground water must have been small. The correctness of this statement about the age of the ground water can be checked by C_{14} tests as in the case of the ground water reserves underneath the Thar Desert[12] in India. It is relevant to add that the age of the ground water determined by C_{14} tests may be out by about one thousand† years, but even then, the upper limit of the age of the ground water underneath the Central Asian deserts would be at least six thousand years.

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† Recent communication to the writer from the National Centre of the Government of India for Nuclear Sciences and Mathematics (TIFR), Bombay.

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STUDIES ON THE RELATIONSHIP OF CINEOLE CONTENT AND REFRACTIVE INDEX OF *EUCALYPTUS* HYBRID OIL

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ABSTRACT

An attempt to establish a relationship between refractive index and cineole content of the essential oil of *Eucalyptus* hybrid (Mysore gum; mainly *E. tereticornis*) was made. It was observed that oil samples having refractive indices less than 1·4700 were rich in cineole.

INTRODUCTION

LARGE scale plantations of *Eucalyptus* hybrid (Mysore gum; mainly *E. tereticornis*) have been undertaken in Karnataka and other States as a raw material for pulp industry. The leaves go to waste when the tree is extracted. Some of the *Eucalyptus* hybrid trees yield oil comparable in cineole content to the oil obtained from *Eucalyptus globulus* (Blue gum) and the significance of *Eucalyptus* hybrid as an alternative source of cineole was suggested earlier[1]. A screening of these trees was taken up with a view to identifying cineole-rich trees, which are morphologically

indistinguishable. Though for the rapid initial identification of such trees the olfactory test could be used, yet for the actual identification the oil obtained from the leaves needs a quantitative examination for cineole content by chemical method.

Since the chemical method is time-consuming and requires 3 g of oil for each estimation, large amount of leaf material has to be obtained. It also involves the use of O-cresol which is hygroscopic and the presence of moisture affects the results. With a view to finding a simpler technique, the percentage of cineole in the oil and its specific gravity, optical rotation and refractive index were determined for establishing possible correlation.

Materials and Method

Leaf samples were collected using olfactory test from 315 trees apparently rich in cineole. The essential oil was obtained from the leaf samples by steam distillation and the physical constants, *viz.*, specific gravity, optical rotation and refractive index were determined after the oil was dried with anhydrous sodium sulphate overnight. The Abbe's refractometer was used to determine the refractive index. The cineole content of each sample was estimated by O-cresol method[3]. From the population of these data, 15 samples were selected by random sampling method and correlation studies were made between the cineole content and physical constants.

Results and Discussion

The data pertaining to the 15 samples selected are presented in Table I. The correlation coefficient obtained between cineole content and various physical constants of the *Eucalyptus* hybrid oil are given in Table II.

From Table II, it is clear that there is a significant correlation between cineole content and refractive index indicating an association between the two variables. It was observed that all the samples with refractive index below 1·4700 were cineole rich.

Due to the high degree of association between cineole content and refractive index an attempt to fit a linear regression line was made. The best equation was found to be

$$Y = 2640{\cdot}9025 - 1760{\cdot}25\,X \quad \ldots \quad (A)$$

Standard error of the regression coefficient (Sb) = 600·7 and this has been shown in Fig. 1.

For any given refractive index (X) its experimentally determined value of cineole content (Y) are scattered above and below the regression line given by equation A. In practice, it is of interest to know how closely the regression could predict the individual value of cineole content rather than the mean value obtained by the use of equation A. Hence the range of variation was determined using 95% prediction interval[3]. The prediction interval is given by the equation

$$Y' = 2640{\cdot}9025 - 1760{\cdot}25\,X \pm 10{\cdot}54\,[1{\cdot}07 + 5000\,(X - 1{\cdot}4661)^2]^{\frac{1}{2}} \ldots (B)$$

where X is the known refractive index. Estimated prediction interval is shown by the dotted lines in Fig. 1.

The reliability of the estimates obtained by the use of equation (B) was tested on samples obtained from a different plantation. The estimates obtained by the equation and also by the experimental method were well within the 95% prediction interval, indicating a good reliability of the estimate by the equation.

TABLE I

Data of 15 *random samples considered for correlation studies*

Cineole content %	Physical constants (at 27° C)		
	Refractive index	Specific gravity	Optical rotation
71·8	1·4605	0·9181	3·90°
69·9	1·4620	0·9103	2·30°
68·8	1·4640	0·9279	2·7°
63·8	1·4655	0·9122	1·2°
62·5	1·4670	0·9122	−22·7°
59·9	1·4635	0·9189	7·8°
59·5	1·4650	0·9088	−23·2°
57·6	1·4660	0·9279	3·00°
56·9	1·4690	0·9217	−26·55°
56·3	1·4650	0·9103	−26°
56·1	1·4705	0·9181	− 1·8°
52·8	1·4690	0·9189	− 2·00°
51·8	1·4700	0·9088	− 7·9°
51·5	1·4700	0·9103	−12·1°

TABLE II

Correlation coefficient between cineole content and its physical constants of Eucalyptus *hybrid oil*

	Physical constants		
	Refractive index	Specific gravity	Optical rotation
Cineole content	−0·840*	0·181	0·286

* Significant at 1% level.

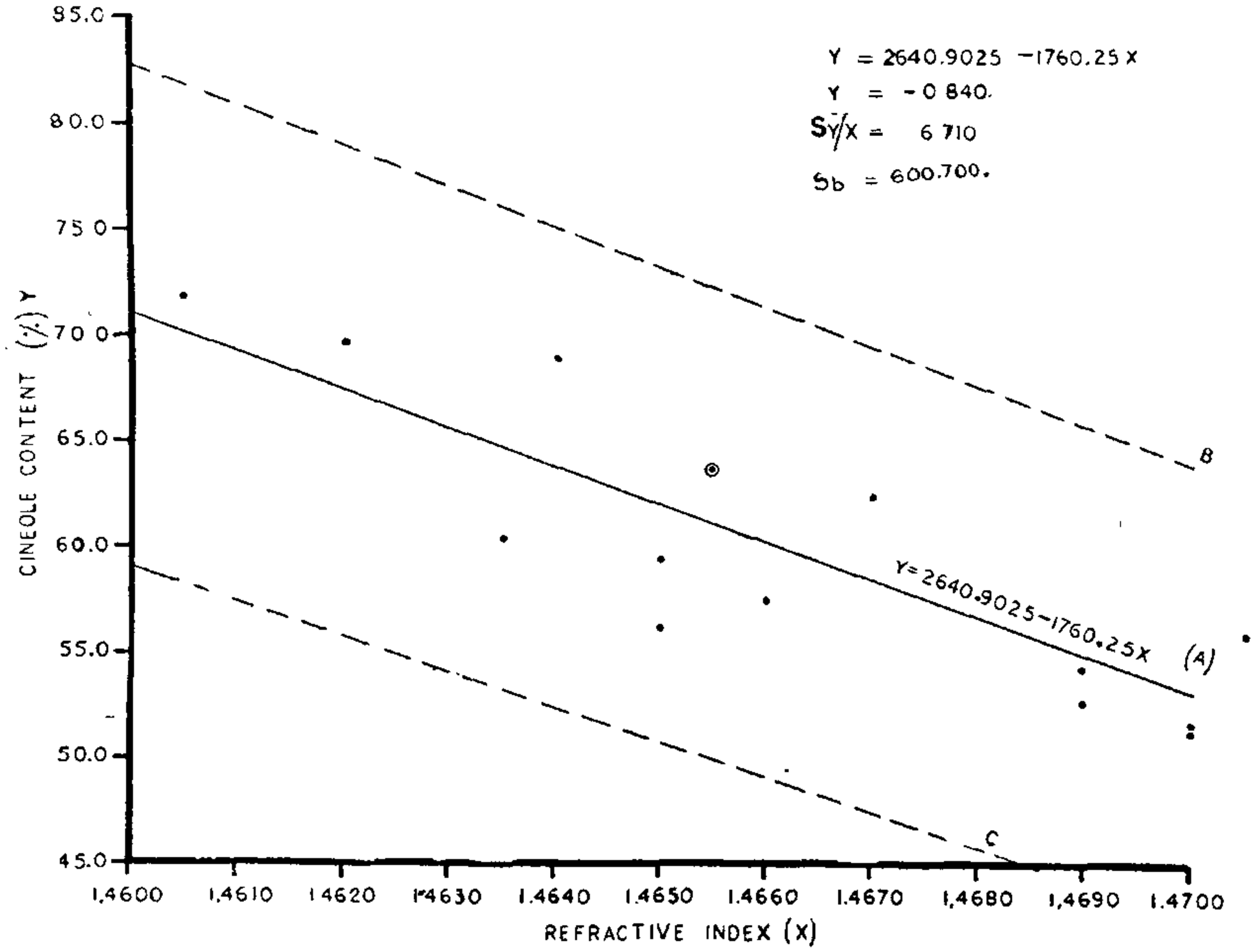

FIG. 1. Relationship of refractive index to cineole content (Dashed lines B & C show 95% prediction intervals).

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INTERNATIONAL ORGANIZATION OF OLIGOCHAETE TAXONOMISTS

At an international meeting of oligochaetologists held in Braunschweig 28–30 June, 1976, it was agreed to found the International Organization of Oligochaete Taxonomists under the presidentship of Dr. A. Zicsi (Budapest) to promote co-operation and the exchange of information among research workers on all aspects of oligochaetology and to initiate the preparation of any checklists deemed to be required. Membership is open to all interested workers ; for details apply to : Mr. B. W. Sims, Department of Zoology, British Museum (Natural History), Cromwell Road, London, SW 7, 5 BD.