Chemistry and Standardization of "Bakuchi oil" an Ayurvedic medicinal oil used traditionally in the treatment of vitiligo.

By

Ranamuka Devage Ajantha Rohinie Gunawardena

Thesis submitted to the University of Sri Jayewardenepura for the award of the Degree of Master of Philosophy in chemistry

on 31st December, 2007

ABSTRACT

Chemistry and Standardization of "Bakuchi oil" an Ayurvedic medicinal oil used traditionally in the treatment of Vitiligo.

Ranamuka Devage Ajantha Rohinie Gunawardena

Vitiligo is a disfiguring disease, which is characterized by the appearance of white patches on the skin. Topical application of psoralen based drugs combined with exposure to ultra violet radiation forms the major treatment method in both the modern and Ayurvedic systems of medicine. However, according to available data, any synthetic form of psoralen or extracts from furanocoumarin containing herbs cannot be considered risk free. So their use in the treatment needs specialized medical expertise and standardized products.

"Bakuchi oil", prepared from *Psoralea corylifolia* fruits is widely used in the treatment of vitiligo in the Ayurvedic system of medicine in Sri Lanka. The fruit of *Psoralea corylifolia* contains a considerable amount of psoralen type compounds, the most abundant of which are psoralen and isopsoralen. Given the photo toxicity of psoralens, it is essential that "Bakuchi oil" oil be standardized for its psoralen content.

Towards this end a method was developed for the quantification of psoralen in "Bakuchi oil" by TLC-FD densitometry. The method was of acceptable precision and accuracy with a Coefficient of Variation of a 4.3 % and a recovery rate of 103% when 30 % of psoralen was added.

"Bakuchi oil" samples collected from different manufacturers gave a range of concentrations from 0.038 to 0.226 mg/ml compared with the reference sample which was prepared at the BMARI which gave a concentration of 0.083 mg/ml. This wide variation in the concentration of psoralen indicates the need for standardization and quality control of products used in Sri Lanka. Thin layer chromatographic profiles (finger prints) which would be useful for this purpose were developed for "Bakuchi oil".

The chemical analysis of the oil required the development of a method to separate *Psoralea corylifolia* secondary metabolites from fatty materials in the oil. A successful method which involved selective solubility in a mixture of acetone and methanol at low temperatures was developed.

Six of the compounds present in *Psoralea corylifolia* that were incorporated in "Bakuchi oil" were identified by detailed comparative chromatographic analysis of the plant extract and the medicinal oil. The six compounds are psoralen, isopsoralen, dehydroisopsoralidin, corylin, isobavachalcone, and psoralidin. Of these, dehydroisopsoralidin is a new natural product. Structures of the isolated compounds were determined by UV, IR, Mass, ^{1}H NMR, DEPT, HSQC, HMBC, and ^{13}C NMR spectroscopic data.

A surprising finding was the fact that bakuchiol which is a major secondary metabolite found in the fruits of *Psoralea corylifolia* is not incorporated in "Bakuchi oil"even though it is quite soluble in sesame oil and is stable at 140° C, the highest temperature reached during processing.

The rates of incorporation of psoralen in "Bakuchi oil" during the different stages of manufacture were studied. It was found that the preparation process currently used for "Bakuchi oil" at BMARI is wasteful in terms of both psoralen and energy, and that about 90% of psoralen found in the fruit is thrown away. A modification of the drug preparation process to eliminate the water extraction stage and to directly extract the fruits with sesame oil is suggested as being worthy of further study.

CONTENTS