

HEREDITY VERSUS ENVIRONMENT IN THE PRODUCTION OF ALKALOIDS IN *RAUVOLFIA SERPENTINA*

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Rauvolfia serpentina is indigenous to India. Outside the mainland of India it is reported from the Andamans, Ceylon, Burmah, Thai, Malaya and Java.

The isolation and discovery by Muller and Schlitter in 1952 that the most important alkaloid, reserpine, was the compound responsible for the characteristic activity (Schlitter, 1966) associated with the drug, resulted in spectacular demand for the roots of this plant.

Until recently, all the material was collected from the wild. Intensive exploitation of the wild plant has resulted in scarcity, and large-scale cultivation of *Rauvolfia serpentina* has been taken up both by private and Government Research Organisations in various parts of India. It was found that *R. serpentina* grows under a wide range of climatic and edaphic conditions (Vardarajan, 1963).

Rauvolfia serpentina can be propagated from seeds as well as root and stem cuttings. At the Regional Research Laboratory, Jammu, the first variety introduced came originally from the Forest Research Institute, Dehra Dun. Experiments in cultivation in Jammu showed that this variety produces 1.4% total alkaloid at the age of one year and three months and 1.7% in three years and three months; which is the most economic time to harvest the roots (Dutta *et al.*, 1963).

Bal (1956) examined roots of unknown age from different geographical regions and found that a race from Madhya Pradesh produces 2.99% total alkaloid, Assam 2.5% and Kerala 1.86% (Travancore, Cochin). These results were similar to that reported by Ganguly and Bose (1956). In all these cases the plants analysed were from their native habits. Dhar (1965, 1966) was the first to make a comparative study of different geographical races grown under identical conditions. She found that under Jammu environment three-year-old plant of a clone from Rishikesh gave 2.66% while a variety from Shoranur (Kerala) gave only 1.2%. The Dehra Dun form which is commonly grown in Jammu gave 1.80% total alkaloid which

compares favourably with the 1.70% mentioned by Dutta *et al.* (1963). The variation in the percentage of total alkaloid content under identical conditions was thus found to be a heritable character of the individual race.

Since the variety from Shoranur was found to have the lowest alkaloid content it was decided to grow other geographical races in this part of India.

A plot of land was made available by the senior author in Shoranur as a branch of the R.N.C. Garden of medicinal plants for the continuation of these experiments in Kerala.

The first planting of root cuttings (Dehra Dun variety) was done in June 1963 and continued in 1964 and 1965. The roots were harvested from plants which were 3 years, 2 years and 1 year old, in June 1966. A corresponding set of root cuttings of the same variety was planted in the R.N.C. Garden, Jammu, and the chemical analysis was done by the same method. The mean percentage of alkaloids for three plants in each case selected at random is given in Table I.

TABLE I

Showing percentage of the total alkaloid content of Dehra Dun variety grown at Jammu & Kashmir and Shoranur (Kerala)

Age of the plant	% of alkaloid	
	Jammu	Shoranur (Kerala)
One year	0.84	0.63
Two years	1.10	1.00
Three years	1.80	1.50

It is seen from Table I that the Dehra Dun variety grown in the silty loam of Jammu conditions yields a high percentage of total alkaloids than when grown in Shoranur.

Therefore, it is apparent that the environmental and edaphic conditions of Shoranur are responsible for this decline in the alkaloid content.

The performance of the diploids having been ascertained, a similar study is under progress in the colchicine-induced tetraploids which have already shown promise of higher alkaloid content (Janaki Ammal, 1962),

From these experiments we can conclude that both heredity and environment play important roles in the production of total alkaloids in *R. serpentina*.

The importance of selecting the right variety to be grown in the right place for large-scale cultivation of *R. serpentina* cannot therefore be overlooked.

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