

A NEW AMINO ACID, "PRECATORINE"

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The seeds of *Abrus precatorius* which grow wild in the southern part of Taiwan are claimed to be powerfully poisonous^(1,2). Since 1932 the chemical components of Jequirity seeds have been studied by many authors⁽³⁻⁹⁾. Among the chemical components, two indole positive substances, i.e. abrine (α -N-monomethyl-L-tryptophan) and hypaphorine (the betaine of L-tryptophan), have been identified. Both are the derivatives of an important essential amino acid, L-tryptophan. For the presence of these two L-tryptophan derivatives, we believe that there is an enzyme system which converts abrine to hypaphorine by methylation, or in the reverse by demethylation, and there might be an intermediate substance, i.e. α -N, N-dimethyl-L-tryptophan occurring in Jequirity seed. Since our laboratory is especially interested in the studies of indole derivatives, the purpose of the investigation was to isolate this new amino acid, and to study its physiological functions.

In our laboratory, the new amino acid was crystallized and we named it "precatorine". In this paper, we shall describe the method of investigation of "precatorine" (α -N, N-dimethyl-L-tryptophan) from the alcohol soluble constituents of the seed. The method of identification and some properties of the new amino acid are also described.

EXPERIMENTAL AND RESULTS

After concentrating the alcohol extracts of the seed (ca. 2.5 kg.), crude abrine crystals were obtained and the syrupy mother liquor was diluted with a large amount of water.

Using adsorption-dialysis technique⁽¹⁰⁾, a cellophane bag (No. 4465-A₂ dialyzer tubing cellulose. Arthus H. Thomas Company, Philadelphia 5, U. S. A., 3 cm \times 240 cm) containing an aqueous slurry of Amberlite IR 120 (in the acid form) was immersed into extract. Stirring was continued for 48 hours at room temperature. The cellophane bag was then taken out and washed with distilled water to remove any adhering contaminants. Then the resin in the bag was poured into a column (4 cm. in diameter) and was washed with distilled water (c a. 5 l.) until the eluants were clear. The washing was repeated with 0.5 N ammonia and indole positive yellow eluant was collected. The ammoniacal eluants were concentrated under reduced pressure to dryness and the residue was extracted with methyl alcohol. The methanol extracts were passed through alumina column (2 cm. \times 25 cm. active alumina for absorption chromatography, Wako Pure Chemical Industries, L. T. D.) and eluted with methyl alcohol. After the first indole positive fraction had been collected it was concentrated under reduced pressure to one-third of its original amount. Then acetone was added. A large amount of needle-shaped crystals appeared, which decomposed at 142°C. The crystals gave no depression of m. p. with synthesized authentic trigonelline⁽⁹⁾. Filtration and concentration of the filtrate gave rod-like crystals after standing 2 days in the refrigerator. Recrystallization from ethyl alcohol gave white-rod crystals of m. p. 261-262°C (decompose) which were identified to be α -N, N-dimethyl-L-tryptophan ("precato-

Table 1: Some Physical and Chemical Properties of L-Tryptophan, L-Abrine, L-Precatorine and L-Hypaphorine

Substance	Tryptophan	Abrine	Precatorine	Hypaphorine
m. p.	289°C (decomp.)	295°C (decomp.)	261-2°C (decomp.)	237°C (decomp.)
R _f value on polyamide TLC	0.24	0.52	0.72	
Ninhydrin reaction	positive	slightly positive	slightly positive	slightly positive
FeCl ₃ +K ₃ Fe(CN) ₆ test	+ (blue)	+	+	+
Ehrlich's reagent	+	+	+	+
Dragendorff's reagent	-	-	+	+
Citric acid-acetic anhydride reagent ^{(18)*}	-	-	+	-

* This reagent is specific for tertiary amine.

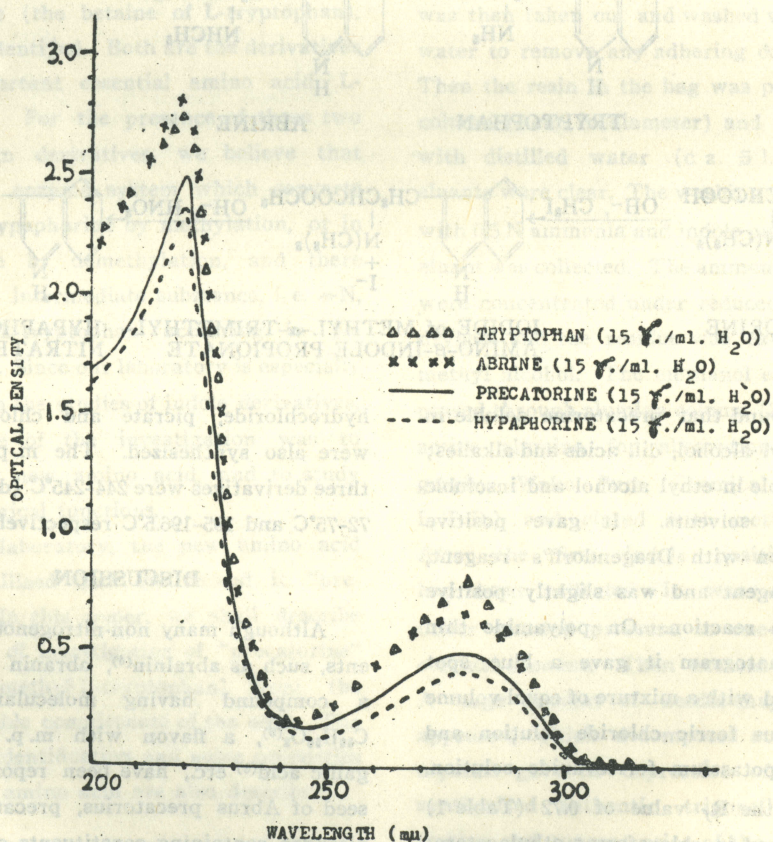


Fig. 1. Ultraviolet absorption spectra

abrine to hypaphorine or in the reverse by demethylation during the growth of the seed.

Abrine has been interested by many investigators for its nutritive value and

enzymatic studies^(14,15). Decarboxylation of abrine produced N-methyltryptamine which is an oxytocic active amine⁽¹⁶⁾ and also possesses many physiological functions^(17,18).

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Hypaphorine has a hyperexcitability on the frog⁽¹⁰⁾. The biochemical studies of precatorine are being undertaken in our laboratory now. The physiological function of the decarboxylation product of precatorine—N, N-dimethyltryptamine are also interested by us.

SUMMARY

From the alcohol extracts of the seeds of *Abrus precatorius*, using adsorption-dialysis technique and alumina chromatography, we can obtain a new amino acid— α -N, N-dimethyl-L-tryptophan. We named it "precatorine". The method of identification and some physicochemical properties of this new amino acid are described in this paper.

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一種新氨基酸 "Precatorine"

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(1971年8月10日受理)

由雞母珠豆之酒精抽出物，利用吸著—透析方法和活性氧化鋁層色分析法，我們可分離出一種新氨基酸— α -N, N-二甲基-L-色氨酸。吾將它命名為 "Precatorine"。

Precatorine 為一白色柱狀結晶，融點為261~262°C (分解)，它之一些物理化學性質及證明於本論文中均述及之。

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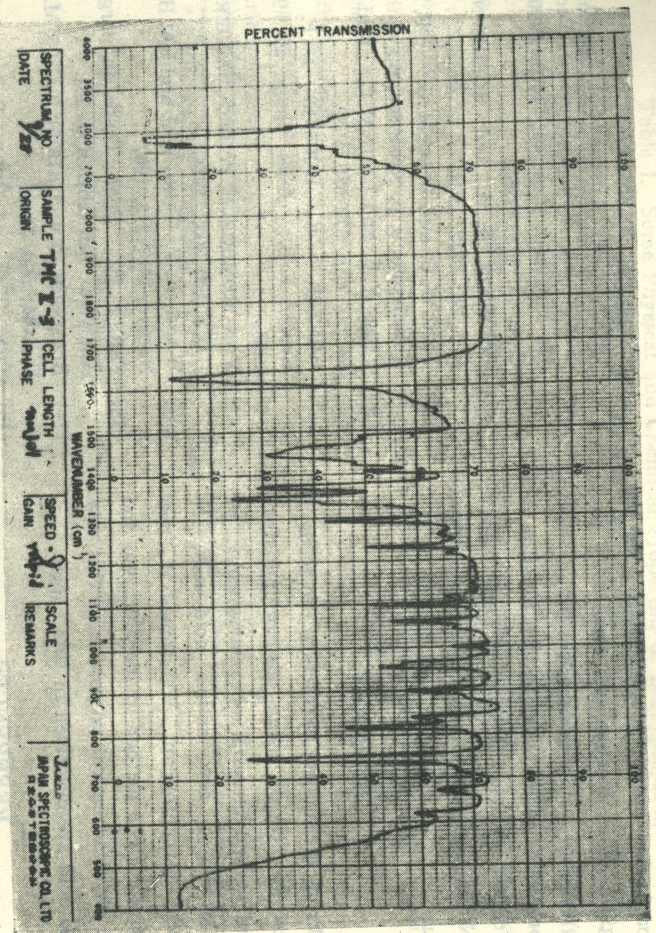


Fig. 2. Infrared absorption spectrum of Precatorine as Nujol mull

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