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A NEW AMINO ACID, (-)-1-METHYL-3-CARBOXY-6,7-DIHYDROXY-1,2,3,4-TETRAHYDROISOQUINOLINE, FROM VELVET BEANS

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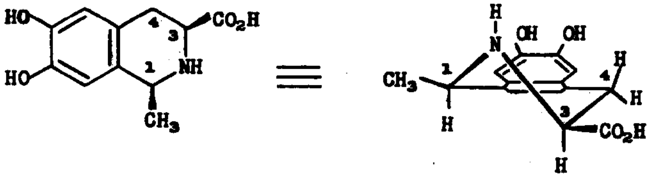
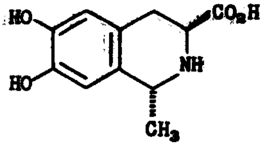
During extraction and isolation of L-dopa from seed of the genus *Mucuna* (Leguminosae)[1], we isolated a previously unknown amino acid from the 90-Day Speckle variety of velvet bean [*M. deeringiana* (Bort.) Merr.]. The acid was characterized as (-)-1-methyl-3-carboxy-6,7-dihydroxy-1,2,3,4-tetrahydroisoquinoline (I).



I (1S,3S)



II (1R,3S)

This compound differs by only a methyl group from the one isolated by Bell, Nulu, and Cone from seed of *Mucuna mutisiana*[2].

A 100-g sample of the beans was ground and extracted with hot water. After the meal was separated by centrifugation, the extract was passed through an anion exchange column (Bio-Rad AG1X2, ⁻OH form; Bio-Rad Laboratories, Richmond, California)[3]. Elution of L-dopa with 10% v/v acetic acid solution carried with it the "unknown" as a minor constituent and some other unidentified materials. Most of the L-dopa readily crystallized from the eluate on concentration and cooling. The mother liquor was then applied to a 5 X 100 cm column of Sephadex G-10 (Pharmacia, Uppsala, Sweden) and chromatographed with water as the developing solvent. Compound I emerged directly after, but completely separated from, the remaining L-dopa.

As estimated by UV, compound I represented about 0.4% of the original seed. After decolorization, crystallization from 20% HOAc gave pure I with elemental analysis of $C_{11}H_{13}O_4N$. On a Silica Gel G TLC plate developed with i-PrOH-EtOAc-H_2O-HOAc (20:19:10:1), I migrated at

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a rate similar to that of L-dopa and, consistent with its **cyclic amino structure, gave a yellow** color with ninhydrin. Maximum UV absorption was at 286 nm in water and 282 nm in 6N HCl. $[\alpha]_D^{26}$ -142.8° (C = 0.7; 6N HCl). Mass spectrometry gave a parent ion at m/e 223 and an abundant ion at m/e 162. The NMR spectrum[4] of I contained resonances centered at: δ 1.70 (d, J = 7, methyl), δ 3.20 (C-4 benzylic methylene, AB portion of an ABX system, $J_{4,4'}$ = 16), δ 4.26 (q, H-3 methine, X portion of the ABX system, $J_{3,4}$ = 7, $J_{3,4'}$ = 11), δ 4.52 (q, J = 7, H-1 methine), δ 6.68 (s, aromatic), δ 6.75 (s, aromatic). The absence of coupling in the aromatic absorptions is evidence of their *para* relationship.

Structure I, tentatively assigned on the basis of these data, was confirmed by synthesis of the compound (57% yield) by condensation of L-dopa with acetaldehyde in a manner similar to that described by Bell and coworkers[2] for condensation of L-dopa with formaldehyde. The condensation product, after two recrystallizations from 20% HOAc, had $[\alpha]_D^{26}$ -143.4° (c = 0.5, 6N HCl) and was identical in all respects with the compound isolated from velvet beans. The sharply defined ABX pattern and other features of the NMR spectrum are consistent with the more stable (I) of the two possible diastereomers. The conformer equilibrium expected for the less stable diastereomer (II) should result in a significantly different ABX pattern with smaller average couplings, $J_{3,4}$ and $J_{3,4'}$. It appears that the condensation reaction was stereoselective, and I was formed predominantly.

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REFERENCES AND FOOTNOTES

1. Manuscript in preparation.
2. E. A. Bell, J. R. Nulu, and C. Cone, *Phytochemistry*, 10, 2191 (1971).
3. Reference to a company or a product name does not constitute endorsement by the U.S. Department of Agriculture over others that may be suitable.
4. NMR spectra were obtained with a Varian HA-100 spectrometer in D_2O with a drop of trifluoroacetic acid added to increase solubility. The internal reference was 2,2,3,3-tetradeutero-3-(trimethylsilyl)-propionic acid sodium salt.