

SYNTHESIS OF COMPOUNDS ANALOGOUS TO ATOPHANE AND CONTAINING
 A PYRROLE NUCLEUS

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In a search for new plant-growth-promoting substances, 2-(2-pyrrolyl)-cinchoninic acid and its derivatives with methyl groups in positions 6, 7, and 8 were synthesized.

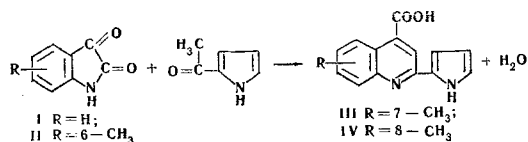
Heterocyclic compounds find extensive use as plant-growth-promoting substances [1]. We obtained

Table 1

Properties of the Compounds Synthesized

Com- pound	Mp, °C	Sublima- tion tem- perature	Empirical formula	Found, %		Calculated, %		Yield, %
				C	H	C	H	
I	305	260	C ₁₄ H ₁₀ N ₂ O ₂	70.36	4.18	70.6	4.2	27
II	315	270	C ₁₅ H ₁₂ N ₂ O ₂	71.21	4.71	71.4	4.8	34
III	240	200	C ₁₅ H ₁₂ N ₂ O ₂	71.28	4.76	71.4	4.8	20
IV	285	235	C ₁₅ H ₁₂ N ₂ O ₂	71.60	4.83	71.4	4.8	14

for the first time compounds analogous to atophane and containing a pyrrole nucleus by condensing isatin and its 5-6- and 7-methyl derivatives with 2-acetylpyrrole.



In Table 1 are listed the compounds synthesized. The products obtained were solids of yellowish-red color, which on standing changed to dark greenish-yellow. This change may be due to the influence of the pyrrole nucleus entering into the molecular composition of these products. They are readily soluble in dilute ethanol and in hot water, but slightly soluble in acetone. Some of them are plant-growth-promoting substances. The effect of these synthetic compounds on the growth of peas of the Ramonskii variety was investigated. The experiments were conducted under greenhouse conditions. Table 2 summarizes the results obtained.

EXPERIMENTAL

2-Acetylpyrrole was obtained by Schiff's procedure [2] with some modifications. Equimolecular quantities of pyrrole [3] and acetic anhydride were heated for 4 hr, and then mixed with an equal quantity of water and neutralized with sodium carbonate crystals. The 2-acetylpyrrole thus obtained was extracted with benzene and, after elimination of the benzene, was steam-distilled. The distillate was again extracted with benzene and, after distilling off the benzene, crystalline 2-acetylpyrrole was obtained. Yield 32%, mp 90°. Acetylation of pyrrole proceeds more easily in the presence of magnesium perchlorate [4].

Methylisatin was obtained from o-, p-, and m-toluidines by their interaction with hydroxylamine and chloral hydrate [5].

2-(2-Pyrrolyl)cinchoninic acid. 0.7 g (0.0064 mole) of 2-acetylpyrrole, 0.46 g (0.0035 mole) of isatin, 4.1 ml of ethanol, and 2 ml of a 33%-KOH solution were heated for 6 hr on a water-bath. The mixture was diluted with water, filtered, and the filtrate was acidified to pH 4.0 with dilute HCl. After 12 hr, the precipitate was washed with water and dissolved in sodium carbonate. About 1.5 g of sodium chloride was added, and the solution was allowed to stand for 36 hr. The solution was filtered and the filtrate was carefully acidified to pH 4.0 with dilute HCl. Compound I separated out and was recrystallized from dilute ethanol [6].

Compounds II-IV are obtained by a similar procedure from homologs of isatin.

The biological activity of these compounds was tested under the direction of P. F. Stadniichuk, professor of botany at the Novocherkassk Engineering-Meliorative Institute.

Table 2

Influence of the Applied Growth-Promoting-Substances on the Height of the Plant

Name of compound	Plant height, cm
2-(2-pyrrolyl)cinchoninic acid	57
2-(2-pyrrolyl)-6-methyl-cinchoninic acid	74
2-(2-pyrrolyl)-8-methyl-cinchoninic acid	70
Control	56

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