Communications to the Editor

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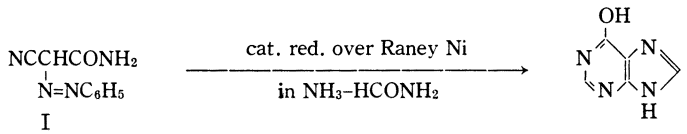
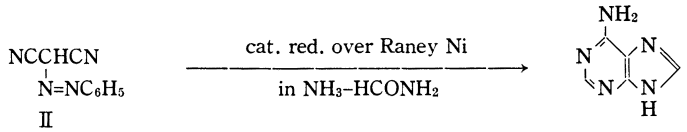
Facile Syntheses of Hypoxanthine and Adenine

Although abundance of papers have reported the syntheses of hypoxanthine and adenine, we have now found new facile one step syntheses of hypoxanthine and adenine from 2-cyano-2-phenylazo-acetamide (I) and 2-phenylazomalononitrile (II), respectively, as shown in the following.



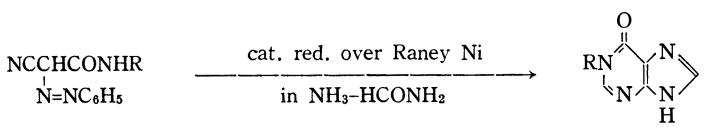


Both the reactions proceeded successfully by means of catalytic hydrogenation of the compounds, I and II, in ammoniacal formamide over Raney nickel catalyst under high hydrogen pressure. Representative conditions are shown in the following: 150—155°, 4 hr, 80 kg/cm^2 of initial hydrogen pressure, and content of ammonia in formamide is about 7%. Under these conditions 60—70% yields of practically pure crystals of hypoxanthine and adenine, which were calculated from the starting I and II, were obtained. Because of ease of preparations of the compounds I and II, the above reactions appeared to provide convenient synthetic methods for preparations of hypoxanthine and adenine which may find an increasing demand in chemical industry.

Instead of the compound, I, ethyl 2-cyano-2-phenylazo-acetate and 2-cyano-2-nitroso-acetamide can be also applied to the above method giving hypoxanthine, but the yields were lower.

On survey of other chemical reduction method sodium dithionite and sodium sulfite were also effective for the conversion of I into hypoxanthine by means of adding these reagents to formamide solution containing I and ammonium chloride at the elevated temperature. However, yields of hypoxanthine were much lower than that in the above method.

When N-alkyl substituted compound, *i.e.* N-alkyl-2-cyano-2-phenylazo-acetamide, was used instead of I, there was obtained 1-alkyl-substituted hypoxanthine. This was exemplified in the formations of 1-methyl- and 1-benzylhypoxanthine, which were obtained in 64% and 62% yield, respectively, and exhibited ultraviolet (UV) absorptions characteristic of 1-alkyl-substituted hypoxanthine.



R: CH_3, $C_6H_5CH_2$

1-Methylhypoxanthine: mp>300°, UV λ_{max}^{pH1}: 250 mμ (ε=8700), λ_{max}^{pH7}: 251 mμ (ε=8400), λ_{max}^{pH11}: 261 mμ (ε=8900) (lit.,[1] UV λ_{max}^{pH1}: 249 mμ, $\lambda_{max}^{pH5.12}$: 251 mμ, λ_{max}^{pH11}: 260 mμ). 1-Benzylhypoxanthine: mp 268—269° (lit.,[2] mp 268—270°). UV λ_{max}^{pH1}: 251 mμ (ε=10300), λ_{max}^{pH7}: 252 mμ (ε=9500), λ_{max}^{pH11}: 262 mμ (ε=10200) (lit.,[3] UV $\lambda_{max}^{neutral\ molecular}$: 251 mμ, λ_{max}^{anion}: 261 mμ).

Thus a convenient synthetic method for preparation of 1-alkyl-substituted hypoxanthine is also provided.

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1) G.B. Elion, *J. Org. Chem.*, **27**, 2478 (1962).
2) E. Shaw, *J. Am. Chem. Soc.*, **80**, 3899 (1958).
3) J.A. Montgomery and H.J. Thomas, *J. Org. Chem.*, **31**, 1411 (1966).

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Structure of Pteroside A and C, Glycosides of *Pteridium aquilinum* var. *latiusculum*

We have previously isolated a new glycoside pteroside B from the Japanese bracken, *Pteridium aquilinum* KUHN var. *latiusculum* UNDERWOOD (Pteridaceae).[1] Further survey has resulted in the isolation of other new glycosides pteroside A and C whose stereostructures I and II, respectively, are reported in this communication.

Pteroside A on acetylation gave the pentaacetate (III). Enzymatic hydrolysis of pteroside A yielded glucose and the aglycone (IV), $C_{15}H_{20}O_3$, mp 129—130°, whose ultraviolet (UV) and infrared (IR) spectra showed that it is a 1-indanone derivative (λ_{max}^{MeOH}: 219, 261, 300 sh, 306 nm, ν_{max}^{KBr}: 1700, 1603 cm^{-1}). The nuclear magnetic resonance (NMR) spectrum of the aglycone (IV) indicated the presence of a tertiary methyl (δ 1.26 ppm), two aromatic methyls (δ 2.38, 2.80 ppm, the location of the latter at C-7 being concluded from the deshielded position), an isolated methylene (δ 2.75, 3.57 ppm in an AB system), a hydroxyethyl on the benzene ring (δ 3.08, 3.91 ppm in an A_2X_2 system, the latter signal being displaced to δ 4.12 ppm in the spectrum of its diacetate (V)), a hydroxymethyl (δ 3.78, 4.17 ppm in an AB system), and an aromatic hydrogen (δ 7.04 ppm). Analysis of the spectrum revealed that although the aromatic hydrogen is long range coupled to both the aromatic methyls, an intramolecular nuclear overhauser effect (NOE) was observed only between the aromatic hydrogen and one of the aromatic methyls (δ 2.38 ppm) but not between the aromatic hydrogen and the other aromatic methyl (δ 2.80 ppm). Further, long range couplings were found between the aromatic hydrogen and the isolated methylene hydrogens. The accumulated data point to the gross structure of the aglycone (IV). This assumption was confirmed by the transformation of the aglycone (IV) to the aglycone (VI) of pteroside B by alkali treatment.[2] The IR spectrum of the monoacetate (VII), obtained by partial hydrolysis of the

1) H. Hikino, T. Takahashi, S. Arihara, and T. Takemoto, *Chem. Pharm. Bull.* (Tokyo), **18**, 1488 (1970).
2) In this connection, the structure of the aglycone of pteroside B, whose substitutions in the benzene ring has been previously allotted by the presence of long-range couplings between the aromatic hydrogen and the two aromatic methyls in its NMR spectrum,[1] should be revised.