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# Synthesis of Acylamino Acid Amides and Acylamino Acids by the Simultaneous Reduction and Hydrolysis of Imidazolinones

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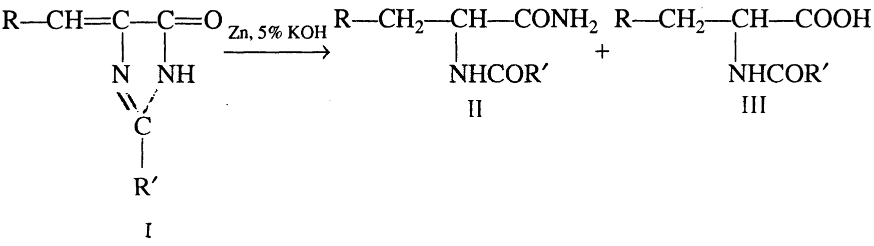
Four acylamino acid amides and four acylamino acids were synthesised by the simultaneous reduction and hydrolysis of 2-aryl-4-arylidene-2-imidazolin-5-ones (I) with a mixture of zinc dust and 5% potassium hydroxide solution.

Only a few of the several methods available for the synthesis of α-amino acids directly afford acylamino acid amides (II)[1–3] and acylamino acids (III)[1–6]. Compounds II are used as O-acylating reagents for serine[7], while III are largely used for resolution of amino acids[8] and the synthesis of peptides[8].

Metallic zinc in presence of KOH solution reduces the double bond exocyclic to the imidazoline ring. This reduced product is hydrolysed by KOH solution to acylamino acid amides and acylamino acids (Scheme 1)



Scheme 1

The yields obtained for the acylamino acid amides were 32–46% and for the acylamino acids were 13–24%. The total conversion of imidazolinones to products ranged from 45–68%.

Imidazolinones required for this work were prepared by condensing aromatic aldehydes with a mixture of glycine ethyl ester hydrochloride and *m*-toluimidic acid ethyl ester hydrochloride in presence of sodium bicarbonate[1].

The imidazolinones were converted into acylamino acid amides and acylamino acids by heating each of them (2 g) with zinc dust (5 g) and 5% potassium hydroxide solution (100 mL) under reflux for 1 h. After cooling to room temperature the precipitated acylamino acid amide along with the zinc dust was filtered off and washed with water. The acylamino acid amide was recovered from zinc by dissolving in ethanol (200 mL). The volume of ethanol solution was

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reduced to 50 mL by distillation. After cooling the precipitated acylamino acid amide was filtered and dried.

TABLE-1
PHYSICAL PROPERTIES OF ACYLAMINO ACID AMIDES AND ACYLAMINO ACIDS*

| Imidazolinone (I) | | Acylamino acid amide (II) | | Acylamino acid (II) | |
|---|---|---|---|---|---|
| R | R′ | m.p.(°C)† | Yield (%) | m.p. (°C)† | Yield (%) |
| Phenyl | *m*-Tolyl | 236 | 46 | 165 | 22 |
| 4-Chlorophenyl | *m*-Tolyl | 262 | 38 | 191 | 24 |
| 4-Methoxyphenyl | *m*-Tolyl | 258 | 42 | 196 | 19 |
| 3,4-Methylenedioxyphenyl | *m*-Tolyl | 289 | 32 | 198 | 13 |

*All the compounds reported as new.
†Melting points are uncorrected.

The aqueous solution after removal of zinc dust and acylamino acid amide was acidified with conc. hydrochloric acid to precipitate the acylamino acid. It was filtered and redissolved in sodium carbonate solution and filtered to remove impurities. The filtrate on acidification yielded pure acylamino acid.

All the new compounds gave satisfactory analytical data for nitrogen. The mass spectra of two typical compounds, *m*-methylbenzoyl-*p*-chlorophenylalanine amide and *m*-methylbenzoyl-*p*-methoxyphenylalanine were recorded. They gave peaks at m/z = 316 ($M^+$), 272, 181, 119, 91, 77, 65 and m/z = 313 ($M^+$), 178, 121, 119, 91, 77, 65 respectively confirming their proposed structures.

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