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FUNCTIONALIZED ENAMINES IN THE SYNTHESIS OF SOME HETEROCYCLIC COMPOUNDS

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Abstract - Esters of 3-amino-2-cyanoacrylate and analogous compounds were used as starting material for pyridines which were obtained via the corresponding amidines. On the other hand, from ethyl 5-aminoisoxazole-4-carboxylate or 5-amino-4-cyanoisoxazole in a similar reaction sequence a pyrimidine derivative could be prepared.

The principal synthesis of pyrimidines from acylic precursors is the condensation of an N-C-N and a C_3 fragment.[1,2] The synthesis of a pyrimidine ring from C_3-N and C-N fragments has been used less frequently and in most cases alkyl or aryl imidates have been used as synthons and representing the C-N fragment. By this approach, pyrimidines were synthesized from derivatives of 3-aminoacrylic acid and isocyanates or isothiocyanates,[3-9] imidates[10,11] and imidoyl chlorides.[12] Related are syntheses from crotonamides or crotonothioamides.[13-18]

As a continuation of previous investigations, designed to prepare some functionalized pyrimidines,[13] we like to report here on some new transformations of functionalized enamines. Ethyl 3-amino-2-cyanoacrylate (1) was treated with N,N-dimethylformamide dimethyl acetal (DMF-DMA) in order to obtain the corresponding amidine (2). This was obtained in low yield, and accompanied with the dimethylamino compound (3) as the main product, indicating a ready displacement of either the amino or amidine group. Ethyl 3-amino-3-ethoxyacrylate (4) when treated with N,N-dimethylacetamide dimethyl acetal (DMA-DMA) did not afford the anticipated amidine since this, when formed in situ, is readily cyclized into the pyridone

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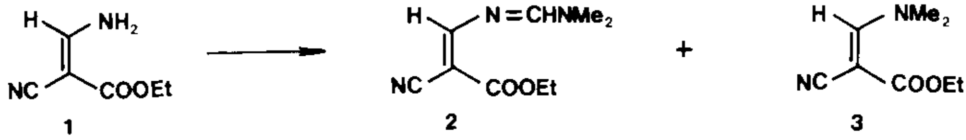
*Dedicated to Professor G.Stork at the occasion of his 65th birthday.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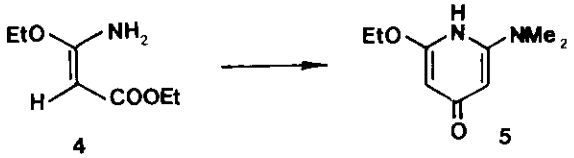
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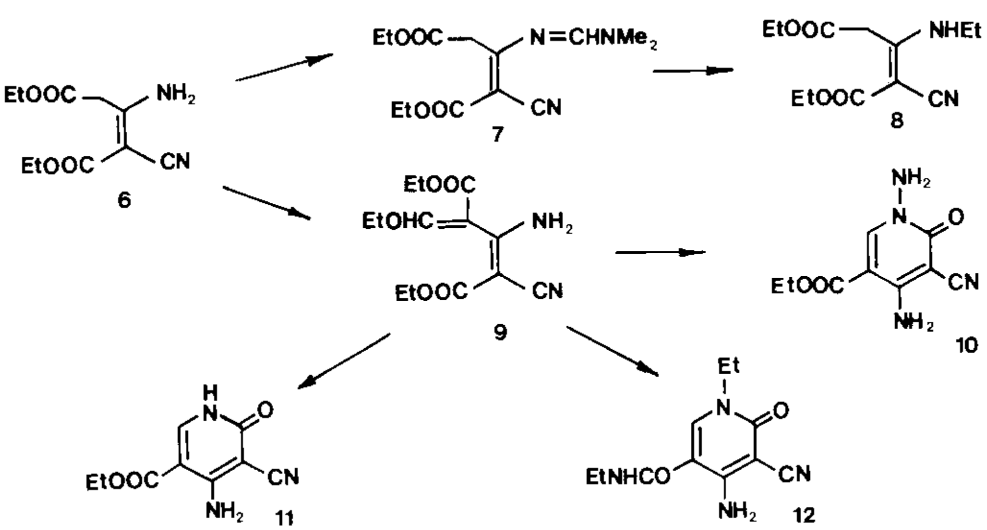
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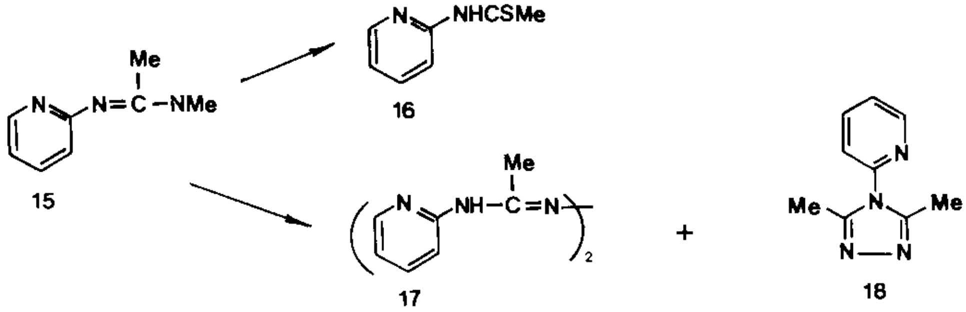
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derivative 5. The structure of this product implicates that in the intermediate amidine the methyl and carbethoxy groups reacted to form a new carbon-carbon bond. To the best of our knowledge, this is the first case of such participation in ring formation. The structure of compound 5 has been confirmed by an X-ray analysis and the perspective view and bond distances are given in Fig.1. It is interesring and the perspective view bond distances are given in Gig. 1. It is interesting to note that in the crystal structure the hydroxy form rather than the lactam form is present, this being an exception for such compounds for which in solution the lactam form prevails.[19] The hydrogen atom at the 4-hydroxy group is by 0.74 Å distant from the oxygen and by 2.07 Å apart from the endocyclic nitrogen atom of a neighbouring pyridine ring. Also the C-O bond distance (1.348 Å) is between that of a typical single and double bond.

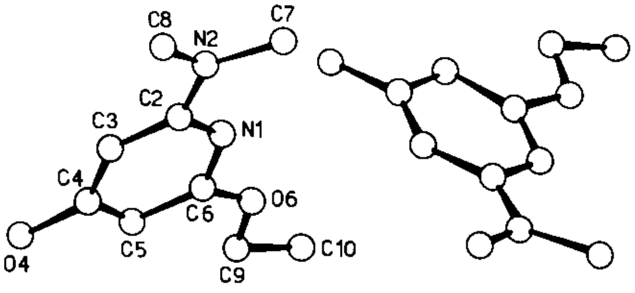
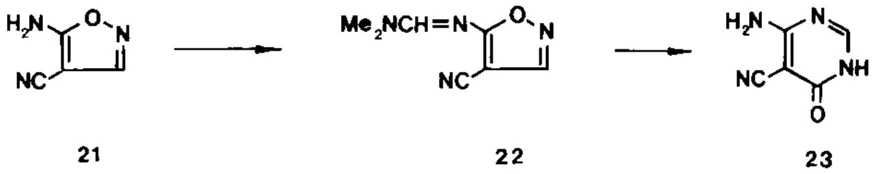


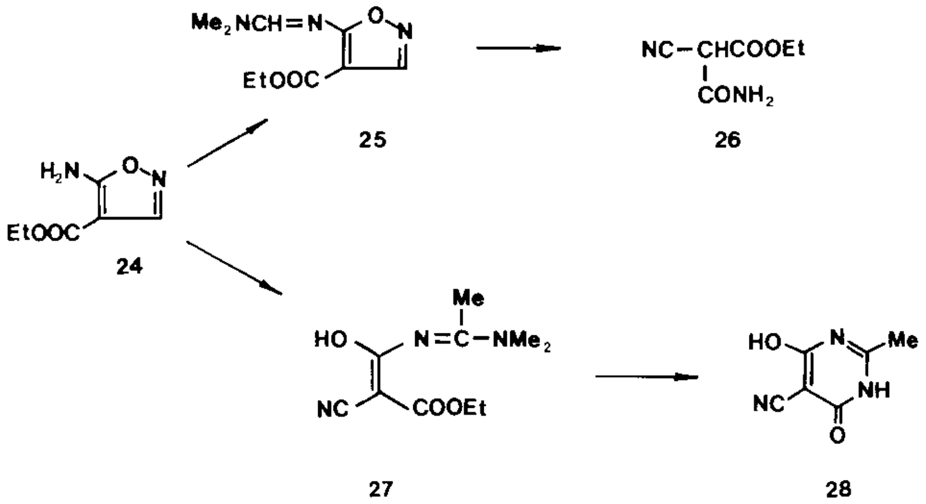
Figure 1. Molecular structure of (5). Bond lengths: N(1)-C(2)1.352(4), C(2)-C(3)1.404(3), C(3)-C(4)1.380(3), C(4)-C(5)1.398(4), C(5)-C(6)1.378(3), C(6)-N(1)1.333(3), C(2)-N(2)1.363(3), N(2)-C(7)1.449(4), N(2)-C(8)1.460(5), C(4)-O(4)1.348(3), C(6)-O(6)1.360(4), O(6)-C(9)1.417(4), C(9)-C(10)1.505(7) Å.

Diethyl 3-amino-2-cyanopent-2-ene-1,5-dicarboxylate (6) reacted with the amino group in the usual manner to give the amidine 7. In this connection, it should be mentioned that 2-aminopropene-1,1,3-tricarbonitrile (dimeric malononitrile) or 3-amino-2-cyanocrotononitrile react with DMF-DMA to give a bis-condensation product.[20] The amidine 7 was unfortunately not suitable for further transformations since with amines no cyclic products were obtained. For example, ethylamine transformed it into the ethylamino derivative (8). Similar results were observed with the starting diester which afforded only the corresponding amides after treatment with either amines or hydrazine. Therefore, we have converted the diester into the ethoxymethylene derivative (9). This, when treated with hydrazine hydrate afforded an N-aminopyridine derivative (10). On the other hand, the ethoxymethylene derivative (9) reacted with ethanolic ammonia to give the pyridone derivative (11) in good yield. In a similar manner, reaction with ehtylamine afforded the 1-ethyl derivative (12) with simultaneous formation of the ethylamide side chain.

When compared to alipahtic α,β-unsaturated nitriles which absorb at about 2225 cm^{-1}, enaminonitriles exhibit their nitrile stretching frequency at 2165-2190 cm^{-1}. This lowering is postulated to result from the conjugation of the amino and cyano group through the carbon-carbon double bond. In addition, high dipole moments of enamino esters also indicate a high contribution of the dipolar structure.[21-23] Also an easy cis-trans isomerization of enamino esters has been established and esters of alkylaminoacrylic acid exist in the equilibrium with the cis-isomer prevailing.[22,23] This has been established also for the related alkylamino crotonates, whereas the arylamino derivatives exist nearly exclusively in the cis-form.[24,25] In accord with these earlier observations we could establish that all our investigated aminonitriles revealed in the ir spectra the presence of the cyano group with a peak at 2205-2210 cm^{-1}, whereas o-cyanoaminopyridines showed a signal in the 2215-2230 cm^{-1} region.

The amidine 13, prepared from methyl 3-aminocrotonate, was transformed in the presence of hydrogen sulfide into a mixture of the thioformylamino (14,X = S) and formylamino (14, X = O) derivatives. In a similar manner afforded the amidine 15, prepared from 2-aminopyridine and DMA-DMA, the corresponding pyridyl-2-N-thioacetamide (16). On the other hand, the amidine (15) when treated with hydrazine hydrate at room temperature afforded as the main product the bis-hydrazone (17) together with the triazole derivative (18). The latter is formed apparently by the nucleophilic addition of the secondary amino group on the imine bond with subsequent elimination of 2-aminopyridine. The related 2-thioformylaminopyridine (19) when treated with hydroxylamine was converted into 2-hydroxyiminomethyleneaminopyridine[26] and this, without purification, was thermally cyclized into s-triazolo [1,5-a] pyridine (20). This conversion represents thus a new approach for this heterocyclic system.[27-29]





An interesting masked enamine system is represented by a heterocyclic system, 5-aminoisoxazoles.[30] We have tried to use this system to prepare the corresponding substituted pyrimidines. For example, 5-amino-4-cyanoisoxazole (21) readily formed the amidine (22) which was transformed with hot aqueous ammonia into 6-amino-5-cyanopyrimidin-4(3H)-one (23) in moderate yield. In a similar manner, the corresponding amidine (25) was obtained from ethyl 5-aminoisoxazole-4-carboxylate (24). With hydrazine hydrate only an acyclic product (26) was obtained and also with amines the desired pyrimidines were not obtained. In an attempt to prepare the related amidine from 24 and DMA-DMA an open chain product (27) was obtained and this when treated with hot aqueous ammonia afforded the corresponding pyrimidinone derivative (28) in good yield. As anticipated and shown by the ring opened product (27) a mechanism involving the N-O bond fission of the isoxazole ring must proceed the formation of the pyrimidine ring in the above mentioned examples.

All these transformations are new additions to the already described utility of heterocyclic amidines in organic synthesis.[31]

EXPERIMENTAL

Melting points were determined on a Kofler micro hot stage apparatus and are *uncorrected. Mass spectra were recorded on* a Hitachi-Perkin-Elmer RMU-6L spectrometer and ir spectra were obtained on a Perkin-Elmer 727B spectrophotometer. ^{1}H nmr spectra were recorded on a JEOL JNM C-60HL nuclear magnetic resonance spectrometer with tetramethylsilane as an internal standard. Elemental analyses for C, H, and N were run on a Perkin-Elmer CHN Analyzer 240C.

Ethyl 2-Cyano-3-N,N-dimethylaminomethyleneaminoacrylate (2) and Ethyl 2-Cyano-3-N,N-dimethylaminoacrylate (3).

A mixture of ethyl 3-amino-2-cyanoacrylate[32,33] (1) (178 mg) and N,N-dimethylformamide dimethyl acetal (0.55 ml) was heated under reflux for 1 h. The reaction mixture was evaporated in vacuo and the residue was left to crystallize in a refrigerator for 24 h. The separated product was crystallized from ethyl acetate to give 2 (97 mg, 39%), mp 134-136°C. ^{1}H NMR (DMSO-d_6) δ: 8.35 and 8.42 (two s, H_3 and =$\underline{CH}$-NMe_2), 4.14 (q, $OC\underline{H}_2Me$), 3.13 (d, NMe_2), 1.22 (t, $OCH_2\underline{Me}$). J_{Et} = 7.2 Hz. IR: 2210 cm^{-1} (CN). MS: m/z 195 (M^+). Anal. calcd. for $C_9H_{13}N_3O_2$ C, 55.37; H, 6.71; *N, 21.53. Found: C, 55.42; H, 6.89; N, 21.57.*

The filtrate from the above crystallization was treated with cyclohexane and the separated 3 was filtered and crystallized from ethyl acetate and cyclohexane, mp 70-72°C (96 mg, 45%). ^{1}H NMR ($CDCl_3$) δ: 7.68 (s, H_3), 4.20 (q, $OC\underline{H}_2Me$), 1.30 (t, $OCH_2\underline{Me}$), 3.29 (d, NMe_2), J_{Et} = 7.3 Hz. IR: 2205 cm^{-1} (CN). MS: m/z 168 (M^+). Anal. calcd. for $C_8H_{12}N_2O_2$ C, 57.13; H, 7.19; N, 16.66. Found C, 56.88; H, 7.27; N, 17.14.

2-N,N-Dimethylamino-6-ethoxypyridin-4(1H)-one (5).

A mixture of ethyl 3-amino-3-ethoxyacrylate[34] (4) (0.8 g) and DMA-DMA (0.85 ml) was heated under reflux for 1 h and evaporated in vacuo. The residual oil crystallized upon standing on ice. The product (719 mg, 78% yield) was crystallized from ethyl acetate, mp 144-145°C. ^{1}H NMR (DMSO-d_6) δ: 5.44 (d, H_3 or H_5), 5.32 (d, H_3 or H_5), 2.85 (s, NMe_2), 4.12 (q, $OC\underline{H}_2Me$), 1.25 (t, $OCH_2C\underline{H}_3$), $J_{3,5}$ = 1.5, J_{Et} = 7.3 Hz. MS : m/z 182 (M^+). Anal. calcd. for $C_9H_{14}N_2O_2$ C, 59.32; H, 7.74; N, 15.37. *Found: C, 59.33; H, 7.74; N, 15.34.*

Diethyl 2-Cyano-3-N,N-dimethylaminomethyleneaminopent-2-ene-1,5-dicarboxylate (7).

A mixture of diethyl 3-amino-2-cyanopent-2-ene-1,5-dicarboxylate (6) (0.25 g) and DMF-DMA (0.2 ml) was stirred at room temperature for 20 h (the reaction with equivalent of N,N-dimethylformamide dineopentyl acetal took place in 7 h, but the yield was lower, 31%). The product was filtered (0.156 g, 50%) and crystallized from ethyl acetate, mp 115°C. ^{1}H NMR CDCl$_3$) δ: 7.79 (s, =C$\underline{H}$-NMe$_2$), 3.92 and 4.37 (m, two OC$\underline{H}_2$Me), 3.94 (s, C$\underline{H}_2$COOEt), 1.10-1.43 (m, two OCH$_2\underline{Me}$), 3.08 (d, NMe$_2$), J_{Et} = 7.2 Hz. IR: 2210 cm^{-1} (CN). MS: m/z 281 (M$^+$). Anal. calcd. for $C_{13}H_{19}N_3O_4$ C, 55.50: H, 6.81; N, 14.97. Found: C, 55.08; H, 6.90; N, 14.97.

Diethyl 2-Cyano-3-ethylaminopent-2-ene-1,5-dicarboxylate (8).

Into a suspension of the above diester (7) (0.204 g) in EtOH (50 ml) anhydrous ethylamine was intoduced during 1 h. The yellow solution was evaporated in vacuo and the residual oil solidified upon standing in refrigerator. The product was extracted several times with hot cyclohexane to give the product (87 mg, 47%) which was for analysis crystallized from cyclohexane, mp 72-74°C with sublimation. IR: 2205 cm^{-1} (CN). ^{1}H NMR (CDCl$_3$) δ: 6.46 (s, CH$_2$), 8.70 and 8.71 (t, 9H of CH$_2\underline{CH_3}$) 5.86, 5.87 and 6.40 (q, 6H of $\underline{CH_2}$Me), J_{Et} = 7.2 Hz. High resolution MS: m/z 254.1267 (calcd. 254.1266). Anal. calcd. for $C_{12}H_{18}N_4O_2$ C, 56.68; H, 7.13; N, 11.02. Found: C, 56.16; H, 7.22; N, 11.06.

Diethyl 3-amino-2-cyano-4-ethoxymethylenepent-2-ene-1,5-dicarboxylate (9).

A mixture of the diester (6) (0.7 g) and triethyl orthoformate (5.7 ml) was heated at 145°C for 5 h. Excess triethyl orthoformate was evaporated in vacuo, the residue was treated with EtOH (1 ml) and the solution was left in refrigerator for several days. The separated product was filtered (0.29 g, 33%) and crystallized from ethyl acetate, mp 147-149°C (from the residue 0.27 g of the starting diester could be recovered). IR: 2220 cm^{-1} (CN). ^{1}H NMR (CDCl$_3$) δ: 7.47 (s, C$\underline{H}$OEt), 4.13 (q, three C$\underline{H}_2$Me), 1.33 (m, three CH$_2\underline{Me}$). MS: m/z 282 (M$^+$). Anal. calcd. for $C_{13}H_{18}N_2O_5$ C, 55.31; H, 6.43; N, 9.92. Found: C, 55.24; H, 6.60; N, 9.60.

Ethyl 3-Cyano-1,4-diaminopyrid-2(1H)-one-5-carboxylate (10).

The above ester (9) (534 mg) was dissolved in ethanol (50 ml) and under stirring hydrazine hydrate (0.1 ml of 100%) was added dropwise. The separated product was crystallized from aqueous ethanol (50%) (418 mg, 98% yield). mp 240°C (with sublimation). ^{1}H NMR (DMSO-d$_6$) δ: 8.29 (s, H$_6$), 4.20 (q, OC$\underline{H}_2$Me), 1.28 (t, OCH$_2$C$\underline{H}_3$), 5.87 and 7.70 (s, two NH$_2$), J_{Et} = 7.1 Hz. IR: 2230 cm^{-1} (CN). MS: m/z 222 (M$^+$).

Anal. calcd. for $C_9N_{10}N_4O_3$ C, 48.05; H, 4.54; N, 25.22. Found: C, 48.03; H, 4.58; N, 24.74.

The compound formed a monobenzylidene derivative upon treatment with hot benzaldehyde, mp 222°C. IR: 2230 cm^{-1} (CN). MS: m/z 310 (M^+). Anal. calcd. for $C_{16}H_{14}N_4O_3$ C, 61.93; H, 4.55 ; N, 18.06. Found: C, 61.45; H, 4.47; N, 17.98.

Ethyl 4-Amino-3 -cyano pyrid-2(1H)-one-5-carboxylate (11).

The diester (9) (240 mg), ethanol (20 ml) and conc. aqueous ammonia (30 ml) was stirred at room temperature for 3 days. Upon evaporation *in vacuo* the solid was crystallized from 50% ethanol, mp 303-307°C (451 mg, 98% yield). The same product was obtained if anhydrous ammonia was bubbled into an ethanolic solution of the starting compound and the mixture left for 20 h, ^1H NMR (DMSO-d_6) δ: 9.06 (s, H_6), 7.57-8.01 (broad s, NH_2), 4.20 (q, $C\underline{H}_2Me$), 1.27 (t, $CH_2C\underline{H}_3$), J_{Et} = 7.1 Hz. MS: m/z 207 (M^+). IR: 2215 cm^{-1} (CN). Anal. calcd. for $C_9H_9N_3O_3$ C, 52.17; H, 4.38; N, 20.28. Found: C, 52.09; H, 4.42; N, 20.11.

4-Amino-3-cyano-1-ethylpyrid-2(1H)-one-5-carboxylic Acid Ethylamide (12).

A mixture of the diester (9) (555 mg) and aqueous ethylamine (30 ml of 70%) was stirred at room temperature for 20 h. Excess of the reagent was distilled off in vacuo and the residue was crystallized from ethanol, mp 215°C (451 mg, 98% yield). ^1H NMR (DMSO-d_6) δ 8.23 (s, H_6), 3.15 and 3.81 (q, two $C\underline{H}_2Me$), 1.13 (m, two $CH_2C\underline{H}_3$), J_{Et} = 7.2. MS: m/z 234 (M^+), IR: 2215 cm^{-1} (CN). Anal. calcd. for $C_{11}H_{14}N_4O_2$ C, 56.40; H, 6.02; N, 23.92. Found: C, 56.23; H, 6.08; N, 23.51.

Methyl 3-Thioformylaminocrotonate (14, X = S).

Into a solution of the formamidine (13) (885 mg) in methanol (3.5 ml) three drops of 30% aqueous NaOH was added and hydrogen sulfide was bubbled into the mixture. After short time crystals separated, they were collected and crystallized from a mixture of petroleum ether and chloroform or petroleum ether and benzene, mp 72-74°C (237 mg, 29%). ^1H NMR ($CDCl_3$) δ: 9.57 (d, CHS), 5.11 (s, H_2), 3.70 (s, OMe), 2.15 (s, 3-Me), J_{CH-NH} = 10.5 Hz. MS: m/z 159 (M^+). Anal. calcd. for $C_6H_9NO_2S$ C, 45.28; H, 5.70; N, 8.80. Found: C, 45.04; H, 5.72; N, 8.81.

The same procedure in aqueous methanol afforded in addition to the above compound also methyl 3-formylaminocrotonate (14, X=O) in 21% yield.

N_1,N_1-Dimethyl-N_2-pyridyl-2'-acetamidine (15) and N-Pyridyl-2'-thioacetamide (16).

A mixture of 2-aminopyridine (1.515 g) and DMA-DMA (2.6 ml) was heated under reflux for 3 h, excess of the reagent was evaporated in vacuo and the residual oil was distilled in vacuo at 109-111°C/200 Pa (2.24 g, 85% yield). ^1H NMR ($CDCl_3$) δ: 8.38 (ddd, $H_{6'}$), 7.57 (m, $H_{4'}$), 6.65-6.95 (m, $H_{3'}$ and $H_{5'}$), 3.05 (s, NMe_2), 1.96 (s, Me). The crude amidine (15) (231 mg) was dissolved in methanol (4 ml), a drop of conc. aqueous NaOH solution was added and into the solution hydrogen sulfide was introduced. After some time pale yellow crystals separated and they were crystallized from methanol, mp 107°C (131 mg, 61% yield). ^1H NMR ($CDCl_3$) δ: 8.95 (d, $H_{3'}$), 8.29 (m, $H_{6'}$), 7.70 (m, $H_{4'}$), 7.08 (m, $H_{5'}$) 2.74 (s, Me). MS: m/e 152 (M^+). Anal. calcd. for $C_7H_8N_2S$ C, 55.25; H, 5.03; N, 18.41. Found: C, 55.02; H, 5.41; N, 18.54.

Reaction of Pyridyl-2-N,N-dimethylaminoacetamidine with Hydrazine Hydrate.

A mixture of the acetamidine (15) (0.415 g) and hydrazine hydrate (0.075 ml of 98%) was stirred at room temperature for 20 h. The resulting product was crystallized from chloroform to give the bis-amidine (17) (0.184 g, 54% yield), mp 132°C. MS: m/z 268 (M^+). Anal. calcd. for $C_{14}H_{16}N_6$ C, 62.67; H, 6.01; N, 31.32. Found: C, 62.13; H, 6.08; N, 31.43.

From the filtrate upon evaporation another compound was obtained, as crystals, mp 131°C. High resultion MS: m/z 174.0910 (calcd. 174.0905). ^1H NMR ($CDCl_3$) δ: 8.64 (ddd, H_6), 7.97 (dt, H_3), 7.18-7.57 (m, H_4, H_5), 2.37 (s, two Me). Anal. calcd. for $C_9H_{10}N_4$ C, 62.05; 5.79; N, 32.17. Found: C, 62.07; H, 5.96; N, 32.06. These data are consistent with the structure of 2,5-dimethyl-1-(pyridyl-2')-1,3,4-triazole (18).

s-Triazolo[1,5-a]pyridine (20).

N-Pyridyl-2'-thioformamide[26] (315 mg) was suspended in methanol (4 ml) and treated with a saturated aqueous solution of hydroxylamine hydrochloride (containing 160 mg of the salt). After stirring the mixture at room temperature for 20 h, the volatile part was evaporated in vacuo and the residue was sublimed at 110°C/20.10^2 Pa (yield 25 mg, 9%) to give 20, mp 99°C. Mixed mp and IR spectrum of an authentic specimen[27] revealed identity.

4-Cyano-5-N,N-dimethylaminomethyleneaminoisoxazole (22).

5-Amino-4-cyanoisoxazole[35] (21) (311 mg) and DMF-DMA (0.4 ml) were stirred at room temperature for 15 min. The product was separated and crystallized from ethanol, mp 120-122°C (412 mg, 88% yield). Alternatively, a methanolic solution was heated under reflux for 30 min. and the compound was obtained in 79% yield. ^1H NMR ($CDCl_3$)

δ: 8.08 and 8.14 (two s, H_3 and CH), 3.15 (s, NMe_2). IR: 2225 cm^{-1} (CN). Anal. calcd. for $C_7H_8N_4O$ C, 51.21; H, 4.91; N, 34.13. Found: C, 50.83; H, 4.94; N, 33.85.

6-Amino-5-cyanopyrimidin-4(3H)-one (23).

A suspension of the above amidine (22) (217 mg) in water (5 ml) and conc. aqueous ammonia (0.9 ml) was stirred and heated to 70°C for 15 min. The obtained solution was evaporated *in vacuo* and the residue crystallized from aqueous ethanol, mp >300°C (97 mg, 54%). High resolution MS: m/z 136.038 (M^+) (calc. 136.038). IR: 2225 cm^{-1} (CN). Anal. calcd. for $C_5H_4N_4O$ C, 44.12; H, 2.96; N, 41.17. Found: C, 43.96; H, 3.24; N, 41.29.

Ethyl 5-N,N-Dimethylaminomethyleneaminoisoxazole-4-carboxylate (25).

Ethyl 5-amino-isoxazole-4-carboxylate[35] (24) (306 mg) was treated under stirring with DMF-DMA (0.41 ml). From the resulting solution after short time crystals separated and after additional stirring for 15 min the product was separated and crystallized from ethyl acetate, mp 65-67°C (385 mg, 93%). ^1H NMR ($CDCl_3$) δ: 8.27 and 8.42 (two s, H_3 and CH), 3.15 (d, NMe_2), 4.20 (q, $C\underline{H}_2Me$), 1.32 (t, $CH_2C\underline{H}_3$), J_{Et} = 6.9 Hz. MS: m/z 211 (M^+). Anal. calcd. for $C_9H_{13}N_3O_3$ C, 51.18; H, 6.20; N, 19.89. Found: C, 50.71; H, 6.30; N, 19.76.

If this amidine (25) (0.525 g) was dissolved in ethanol (6 ml) and treated dropwise under stirring with hydrazine hydrate (0.14 ml of 100%) and left at room temperature for 1 h, upon evaporation of the mixture an oily residue was obtained. After some time crystals separated and were identified as α-carbethoxy cyanoacetamide (26), mp 165°C (Lit.[35] gives mp 162-163°C) (0.187 g, 48% yield). MS: m/z 156 (M^+). IR: 2220 cm^{-1} (CN). Anal. calcd. for $C_6H_8N_2O_3$: C, 46.15; H, 5.16; N, 17.94. Found: C, 46.22; H, 5.14; N, 18.02.

Transformation of Ethyl 5-Aminoisoxazole-4-carboxylate into 5-Cyano-6-hydroxy-2-methylpyrimidin-4(3H)-one (28).

To ice-cooled ethyl 5-amino-isoxazole-4-carboxylate (1.364 g) under stirring DMA-DMA (2.33 ml) was added. The resulting suspension was stirred at 0°C for 10 min and left to stand at room temperature for 1 h. The resulting solution was evaporated in vacuo and the residual oil was left on ice for crystallization. The separated crystals of the amidine (27) were crystallized from ethanol, mp 195-196 °C (0.612 g, 31% yield). ^1H NMR $CDCl_3$ δ: 2.85 (s, Me), 3.37 (d, NMe_2), 4.09 (q, $C\underline{H}_2Me$), 1.26 (t, $CH_2C\underline{H}_3$), J_{Et} = 6.9 Hz. IR: 2205 cm^{-1} (CN). MS: m/z 225 (M^+).

Anal. calcd. for $C_{10}H_{15}N_3O_3$ C, 53.32; H, 6.71; N, 18.65. Found: C, 53.33; H, 6.91; N, 18.69.

The obtained amidine (27) (150 mg), water (4 ml) and conc. aqueous ammonia (0.4 ml) were stirred and heated at 80°C for 10 min until the starting suspension disappeared. The solution was evaporated in vacuo and the residue crystallized from methanol with a small amount of water added. The pyrimidine derivative (28) had mp over 335°C (81 mg, 81% yield). IR: 2220 cm^{-1} (CN). MS: m/z 151 (M^+). Anal. calcd. for $C_6H_5N_3O_2$ C, 47.68; H, 3.34; N, 29.84. Found: C, 47.44; H, 3.12; N, 29.81.

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REFERENCES

1. D.J.Brown, "Pyrimidines and their Benzo Derivatives", "Comprehensive Heterocyclic Chemistry", Vol. 3, Pergamon, Oxford 1984, p. 57.
2. D.J.Brown, "The Pyrimidines", Wiley-Interscience, New York, 1962.
3. O.Behrend, A.Meyer, and B.Buckholz, Ann., 1901, 314, 200.
4. J.Goerdeler and H.Pohland, Chem.Ber., 1963, 96, 526
5. G.de Stevens, B.Smolinsky, and C.Dorfman, J. Org.Chem., 1964, 29, 1115.
6. J.Goerdeler and U.Keuser, Chem.Ber., 1964, 97, 3106.
7. J.Goerdeler and J.Gnad, Chem.Ber., 1965, 98, 1531.
8. J.Goerdeler and D.Wieland, Chem.Ber., 1967, 100, 47.
9. L.R.Buerger and T.B.Johnson, J.Am.Chem.Soc., 1934, 56, 2754.
10. W.Ried and P.Stock, Ann., 1966, 700, 87.
11. A.Dornow and E.Neuse, Chem.Ber., 1951, 84, 296.
12. B.Staskun and H.Stephen, J.Chem.Soc., 1956, 4708.
13. Č.Stropnik, M.Tišler, and B.Stanovnik, Vestn.Slov.Kem.Drus., 1984, 31, 229.
14. T.Kato, H.Yamanaka, and T.Shibata, Chem.Pharm.Bull., 1967, 15, 921.
15. T.Kato, H.Yamanaka, and T.Shibata, Tetrahedron, 1967, 23, 2965.
16. S.M.Fahmy, N.Abed, and R.M.Mohareb, Synthesis, 1982, 490.
17. N.Katagiri, A.Koshihara, S.Atsumi, and T.Kato, J.Org.Chem., 1982, 47, 167.
18. T.Kato, T.Chiba, and M.Sasaki, Heterocycles, 1981, 16, 577.

19. J.Elguero, C.Marzin, A.R.Katritzky, and P.Linda, "The Tautomerism of Heterocycles", Adv.Heterocycl.Chem., Suppl. 1., Academic Press, New York, 1976.
20. M.Mittelbach, H.Junek, and C.Kratky, Ann., 1983, 1107.
21. S.Baldwin, J.Org.Chem., 1961, 26, 3288.
22. R.Huisgen, K.Herbig, A.Sigl , and H.Huber, Chem.Ber., 1966, 99, 2526.
23. K.Herbig, R.Huisgen, and H.Huber, Chem.Ber., 1966, 99, 2546.
24. W.Werner, Tetrahedron, 1971, 27, 1755.
25. A.Gomez-Sanchez, A.M.Valle, and J.Bellanato, J.Chem.Soc. (B), 1971, 2330.
26. M.Tišler, B.Stanovnik, Z.Zrimšek, and Č.Stropnik, Synthesis, 1981, 299.
27. B.Verček, B.Ogorevc, B.Stanovnik, and M.Tišler, Vestn.Slov.Kem.Drus., 1983, 30, 51.
28. K.T.Potts, H.R.Burton, and J.Bhattacharyya, J.Org.Chem., 1966, 31, 260.
29. K.T.Potts, H.R.Burton, and S.K.Roy, J.Org.Chem., 1966, 31, 265.
30. H.Wamhoff, Adv.Heterocycl.Chem., 1985, 38, 299.
31. M.Tišler, Heterocycles, 1983, 20, 1591.
32. G.W.Kenner, B.Lythgoe, A.R.Todd, and A.Topham, J.Chem.Soc., 1943, 388.
33. E.C.Taylor and W.A.Ehrhart, J.Am.Chem.Soc., 1960, 82, 3138.
34. S.A.Glickman and A.C.Cope, J.Am.Chem.Soc., 1945, 67, 1017.
35. H.Kano, Y.Makisumi, and K.Ogata, Chem.Pharm.Bull., 1958, 6, 105.

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