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INVESTIGATION OF CONVERSION VARIOUS ILIDENMALONONITRILES

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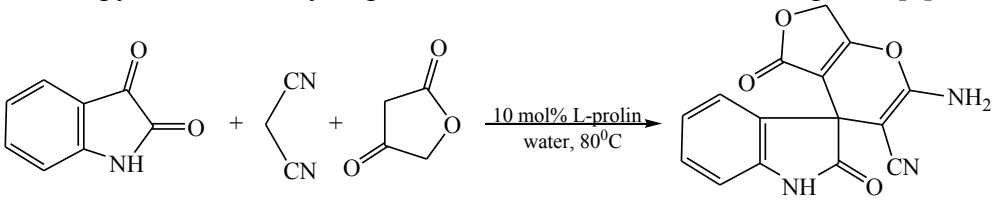
Appropriate derivatives of spiropiridine have first been obtained by means of one-stage condensation of isatilidenmalononitriles, malononitriles and 2-tiophenmethylamine (or furfurilamine). Besides, by interaction of benzylidenemalononitriles with thiosemicarbazide or 2,4-dinitrophenylhydrazines appropriate Schiff-bases obtained. Structures of synthesized compounds obtained confirmed through ^{1}H and ^{13}C NMR spectroscopy methods.
Keywords: *isatilidenemalononitrile, malononitrile, amines, thiosemicarbazide, hydrazine*

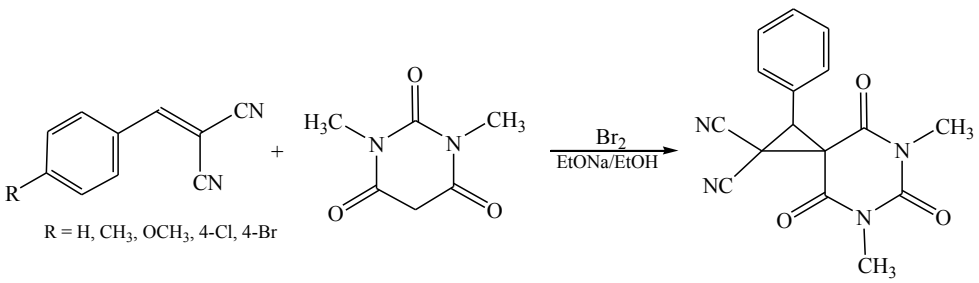
INTRODUCTION

Benzylidenemalononitriles as members of ilidenes class are used as synthones in the synthesis of biologically active compounds, such as 4*H*-pyrane, substituted pyridines, pyrazoles, imidazopyridine derivatives. It has been widely investigated anticoagulant, anticancer, spasmolitic, anti-anafilactic properties of 4*H*-pyranes and dihydropiridines derivatives, which obtained by Michaels addition reactions of benzylidene malononitriles with methylenactive compounds [1-3].

Below-cited is data on effective one-stage synthesis of spirooxindole derivatives by 3-component reaction of isatine, malononitrile and 1,3-dicarbonyl compounds in the aquous media and 10 mol% L-prolin [4].



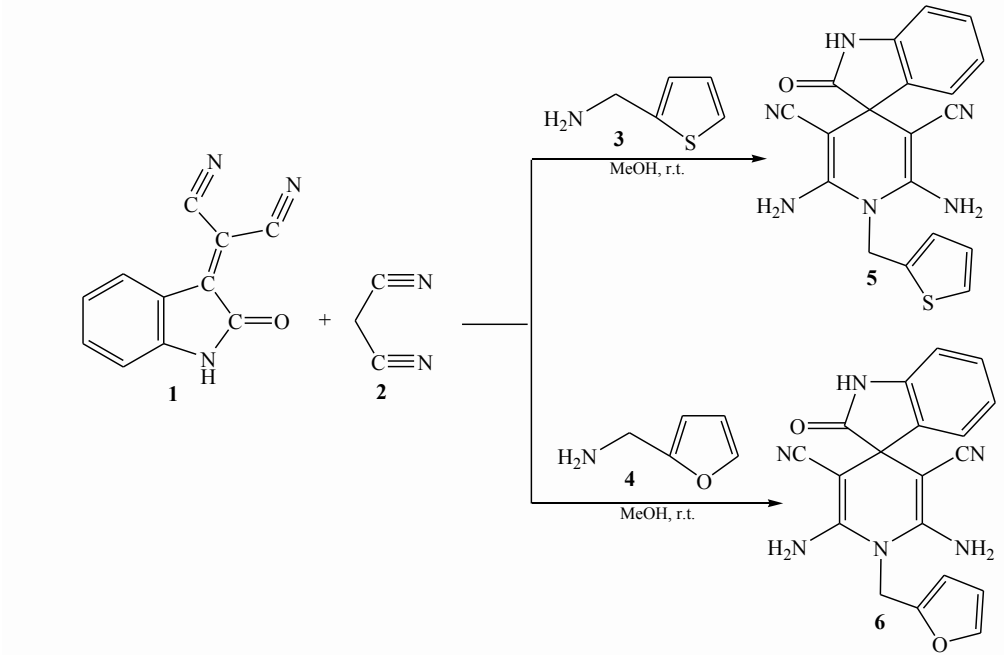
Note that the simple synthesis has been carried out through the Michaels addition reaction of benzylidenemalononitriles and N,N'-dialkylbarbituric acid in the presence of molecular bromine and sodium ethylate by 75-95% yield, 2-aryl-4,6,8-trioxo-5,7-diazaspiro[2.5]octane-1,1-dicarbonitriles [5].



Of interest is data on obtaining corresponding enamines by means of benzylidene malononitriles reaction with primary amines [6].

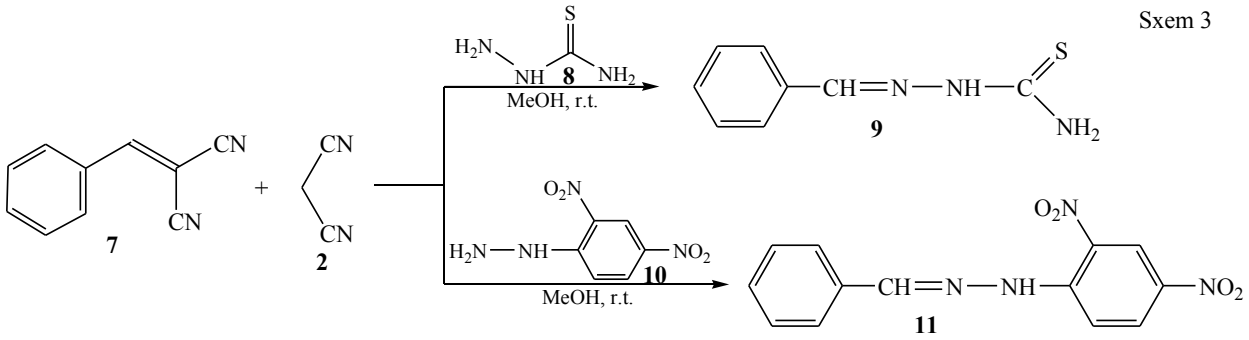
RESULTS AND DISCUSSION

Also, the 3-component one-stage condensation of isatilidenemalononitrile, malononitrile and 2-thiophenmethylamine (or furfurilamine) in methanol and room temperature has first been analyzed.



In terms of identical reaction conditions, the one-stage 3-component condensation reaction between benzylidenemalononitrile, malononitrile and thiosemicarbazide (or 2,4-dinitrophenylhydrazine) has been carried out to reveal that malononitrile takes no part in the process.

Sxem 3



EXPERIMENTAL PART

All reagents were purchased from Merc and Fluca and used without cleaning. The melting points of compounds measured at STUART SPM30. Purity of synthesized compounds was complied with TLC, and structures confirmed on "Bruker300" NMR apparatus (300 and 75 MHz).

The general technique of obtaining spiroindolin-substituted pyridine derivatives is as follows: mixture of isatilidenemalononitrile (4.3 mmol) and

malononitrile (4.4 mmol) dissolved in 30 ml of methanol was stirred up for 5-7 minutes, then 2-thiophenmethylamine (4.4 mmol) (or furfurilamine) added and stirring continued. Reaction progress was tracked by TLC (EtOAc/n-hexane, 2:1) and reaction mixture kept quietly for 48-72 hours. The evaporation of solvent was followed by precipitation of crystals. Also, crystals were separated by filter paper and recrystalliized from ethanol (95%) - water mixture.

2',6'-Diamino-2-oxo-1'-(thiophen-2-ylmethyl)-1'H-spiro[indoline-3,4'-pyridine]-3',5'-dicarbonitrile (5):

^{1}H NMR spektr (DMSO-*d*6), δ, m.h.: 3.37 s (2H, CH_2N), 3.88 s (4H, $2NH_2$), 6.31-8.13 m (7H, $4CH_{arom}$ + 3CH=), 10.55 s (1H, NH). ^{13}C NMR spektr (DMSO-*d*6), δ, m.h.: 43.24 (CH_2N), 54.52 (C_{tert}), 61.30 (=C_{tert}), 76.75 (=C_{tert}), 109.99 (CH_{arom}), 110.20 (CH_{arom}), 116.34 (CN), 116.84 (CN), 122.12 (CH_{arom}), 122.80 (CH_{arom}), 124.16 (C_{ar}), 124.67 (C_{ar}), 126.57 (CH_{arom}), 130.34 (CH_{arom}), 130.66 (CH_{arom}), 159.60 (=C_{tert}), 160.23 (=C_{tert}), 175.10 (=C_{tert}-S), 177.33 (CONH). T_{mp} = 268^{0}C.

Found, %: 60.90 C; 3.68 H. $C_{19}H_{14}N_6OS$. Calculated, %: 60.96 C; 3.74 H.

2',6'-Diamino-1'-(furan-2-ylmethyl)-2-oxo-1'H-spiro[indoline-3,4'-pyridine]-3',5'-dicarbonitrile (6):

^{1}H NMR spektr (DMSO-*d*6), δ, m.h.: 3.36 s (2H, CH_2N), 3.78 s (2H, NH_2), 6.62-7.26 m (7H, $4CH_{arom}$ + 3CH=), 7.69 s (2H, NH_2), 10.56 s (1H, NH). ^{13}C NMR spektr (DMSO-*d*6), δ, m.h.: 54.56 (C_{tert}), 56.63 (CH_2N), 60.71 (=C_{tert}), 76.85 (=C_{tert}), 109.96 (CH_{arom}), 110.18 (CH_{arom}), 116.32 (CN), 116.83 (CN), 122.08 (CH_{arom}), 122.63 (CH_{arom}), 124.17 (C_{ar}), 124.41 (C_{ar}), 126.62 (CH_{arom}), 130.27 (CH_{arom}), 130.65 (CH_{arom}), 159.57 (=C_{tert}), 160.18 (=C_{tert}), 175.07 (=C_{tert}-O), 177.32 (CONH). T_{mp} = 246^{0}C.

Found, %: 63.63 C; 3.87 H. $C_{19}H_{14}N_6O_2$. Calculated, %: 63.69 C; 3.91 H.

General synthesis method of azometin derivatives: Mixture of benzylidenemalononitriles (5.8 mmol) and malononitrile (5.9 mmol) dissolved in 30 ml of methanol and thiosemicarbazide (5.9 mmol) (or 2,4-dinitrophenylhydrazine) was added and stirred for 14 hours. Reaction progress was tracked by TLC (EtOAc/n-hexane, 2:1). Then reaction mixture was kept quitely for 48-72 hours. After solvent evaporating, crystals participated and separated by filter paper. Product was recrystallized in pure form.

2-Benzylidenehydrazine-1-carbothioamide (9):

^{1}H NMR spektr (DMSO-*d*6), δ, m.h.: 7.39 t (3H, $3CH_{arom}$), 7.78 d (2H, $2CH_{arom}$), 8.06 s (2H, NH_2), 8.22 s (1H, CH=), 11.45 s (1H, NH). ^{13}C NMR spektr (DMSO-*d*6), δ, m.h.: 127.76 ($2CH_{arom}$), 129.12 ($2CH_{arom}$), 130.31 (CH_{arom}), 134.62 (C_{ar}), 142.77 (CH=), 178.44 (C=S). T_{mp} = 156^{0}C.

1-Benzylidene-2-(2,4-dinitrophenyl)-hydrazine (11):

^{1}H NMR spektr (DMSO-*d*6), δ, m.h.: 7.49 t (3H, $3CH_{arm}$), 7.80 d (2H, $2CH_{arm}$), 8.10 d (1H, CH_{arm}), 8.37 d (1H, CH_{arm}), 8.70 s (1H, CH=), 8.86 s (1H, CH_{arm}), 11.65 (1H, NH). ^{13}C NMR spektr (DMSO-*d*6), δ, m.h.: 117.32 (CH_{arom}), 123.49 (CH_{arom}), 127.85 (CH_{arom}), 129.45 (CH_{arom}), 129.96 (CH_{arom}), 130.22 (CH_{arom}), 131.03 (C_{ar}), 134.28 (C_{ar}), 137.47 (C_{ar}), 145.05 (*tert*-C=), 149.88 (CH=N). T_{mp} = 241^{0}C.

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BƏZİ İLİDENMALONONİTRİLLƏRİN ÇEVRİLMƏ REAKSİYASININ TƏDQİQİ

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İlk dəfə olaraq izatilidenmalononitrillərin malononitril və 2-tiofenmetilamin (yaxud furfurilamin) ilə birmərhələli üç-komponentli reaksiyası aparılmış və reaksiyadan uyğun spiropiridin törəmələri alınmışdır. Həmçinin benzilidenmalononitrillərin tiosemikarbazid və ya 2,4-dinitrofenilhidrazin ilə qarşılıqlı təsir reaksiyasından uyğun Şiff əsasının alındığı müşahidə edilmişdir. Anınan birləşmələrin quruluşu ^{1}H və ^{13}C NMR spektroskopiyasının köməyilə təsdiq olunmuşdur.
Açar sözlər: *izatilidenmalononitril, malononitril, aminlər, tiosemikarbazid, hidrazin*

ИССЛЕДОВАНИЕ ПРЕВРАЩЕНИЯ НЕКОТОРЫХ ИЛИДЕНМАЛОНОНИТРИЛОВ

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Впервые путем трехкомпонентной одностадийной конденсации изатилиденмалононитрилов, малононитрила и 2-тиофенметиламина (или фурфуриламина) получены соответствующие производные спиропиридина. Кроме того, взаимодействием бензилиденмалононитрилов с тиосемикарбазидом или 2,4-динитрофенилгидразином получаются соответствующие Шиффовы основания. Структуры полученных соединений подтверждены методами ^{1}H и ^{13}C ЯМР спектроскопии.
Ключевые слова: *изатилиденмалононитрил, малононитрил, амины, тиосемикарбазид, гидразин.*

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