

products are formed during the reaction, which indicates the *trans*-addition of an aryl radical and a halogen atom to a carbon-carbon double bond. In the case of maleic acid, the transformation of the substrate structure occurs at the stage of the arylalkyl radical, which is an intermediate intermediate of Meerwein and anionarylation reactions.

Our research has shown that 3-aryl-2-chloro(bromo)butanedioic acids are effective stimulators of seed germination and plant growth regulators. Now these compounds are used as a component of the complex organo-mineral fertilizer "Fulvohumin".

References:

1. Grishchuk B. D., Gorbovyi P. M., Baranovskyi V. S., Ganushak N. I. Catalytic and non-catalytic reactions of diazonium aromatic salts with alkenes in the presence of nucleophiles. *Journal of Organic and Pharmaceutical Chemistry*. 2008. Vol. 6 (3). P. 16–32.
2. Hari D.P., Koenig B. The Photocatalyzed Meerwein Arylation: Classic Reaction of Aryl Diazonium Salts in a New Light. *Angewandte Chemie International Edition (English)*. 2013. Vol. 52(18). P. 4734-4743.

UDC 547.638 + 547.789

SYNTHESIS AND BIOLOGICAL ACTIVITY OF 1,4-PHENYLENEBIS[2-O-ETHYLDITHIOCARBONATO-(2-METHYL)PROPANONITRILES]

¹ Mykolyshyn U. T., ¹ Pylpchuk N. A.,

¹ Symchak R. V., ² Yatsiuk V. M., ¹ Baranovskyi V. S.

¹ Ternopil Volodymyr Hnatiuk National Pedagogical University

² Ternopil Scientific Research Forensic Center of the Ministry of Internal Affairs of Ukraine

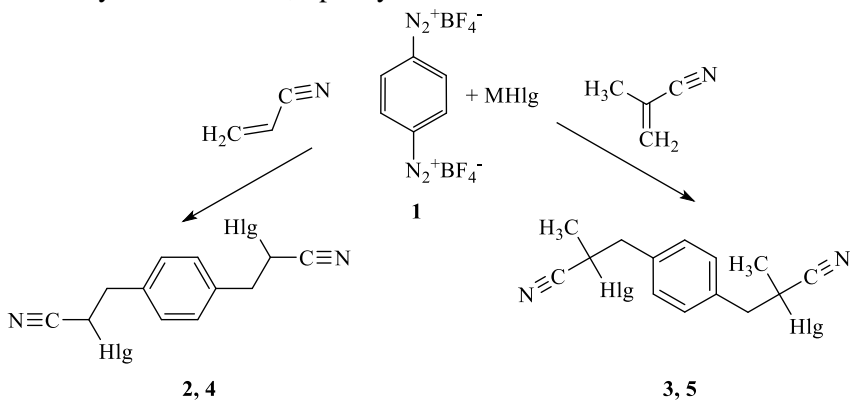
E-mail: baranovsky@tnpu.edu.ua

Nitriles of acrylic and methacrylic acids are among the first

Екологія та охорона навколишнього середовища. Прикладні аспекти адаптації та хімічні основи життєдіяльності організмів

unsaturated substrates investigated in Meyerwein and anionarylation reactions. The presence in the structure of α,β -unsaturated nitriles molecules of two reaction centers – a double bond and a nitrile group determines the sufficiently high reactivity of such monomers in addition reactions [1, 2].

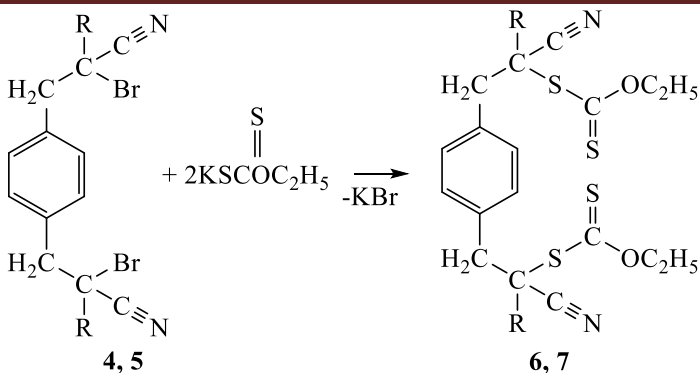
Taking into account the significant electron-accepting influence of the nitrile group on the activation of multiple carbon-carbon bonds of unsaturated compounds and with the aim of comparing the reactivity of nitriles of unsaturated carboxylic acids in anionarylation reactions, we investigated the halogenarylation of acrylonitrile and methacrylonitrile with 1,4-phenylenebisdiazonium salts.



2-5: Hlg = Cl (**2, 3**), Br (**4, 5**), M = K, Na

Bromoarylation products of nitriles of acrylic and methacrylic acids can also be used as substances for obtaining functionalized nitriles of carboxylic acids. In order to confirm the possibilities of synthetic use of these compounds, we implemented nucleophilic substitution of bromine atoms in 1,4-phenylenebis(2-bromo)-(2-methyl)propanonitriles **4, 5** on the O-ethyldithiocarbonate group. The synthesis of 1,4-phenylenebis[2-O-ethyldithiocarbonato-(2-methyl)propanonitriles] **6, 7** was carried out according to the following scheme:

Екологія та охорона навколишнього середовища. Прикладні аспекти адаптації та хімічні основи життєдіяльності організмів



4-7: R = H (**4, 6**), CH₃ (**5, 7**)

Nucleophilic substitution of the bromine atom in compounds **4**, **5** by an O-ethylthiocarbonate group occurs at 30°C in dimethylformamide. The yields of 1,4-phenylenebis[2-O-ethylthiocarbonato-(2-methyl)propanonitriles] **6**, **7** under the specified conditions are close to quantitative and amount to 92-97%.

We also conducted a study of 1,4-phenylenebis(2-chloro)-(2-methyl)propanonitriles) **2**, **3** under the conditions of the reaction of nucleophilic substitution of chlorine atoms on the ethyl xanthogenate group. However, as evidenced by the data of ¹H NMR spectra, the target O-ethylthiocarbonatonitriles are formed with insignificant (up to 30%) yields, which is due to the greater strength of the C-Cl bond compared to C-Br in chloronitrile molecules.

Thus, reactions of bromoarylation of unsaturated acids nitriles make it possible to obtain arylalkylic bromonitrile, which are convenient synthons for transformations in terms of the synthesis of other functionalized derivatives with highly reactive groups, in particular O-alkylthiocarbonate group. Therefore the possibilities of molecular design based on these compounds are quite diverse.

The antimicrobial properties of the synthesized compounds were studied, and the relationship between their structure and the degree of antibacterial and antifungal activity was established. It was found that 1,4-phenylenebis[2-O-ethylthiocarbonato-(2-methyl)propanonitriles] are characterized by effective antifungal

properties.

References:

1. Fleming F. F., Wang Q. Unsaturated nitriles: conjugate additions of carbon nucleophiles to a recalcitrant class of acceptors. *Chemical reviews*. 2003. Vol. 103(5). P. 2035-2078.
2. Grishchuk B. D., Gorbovyi P. M., Baranovskyi V. S., Ganushak M. I. Catalytic and non-catalytic reactions of diazonium aromatic salts with alkenes in the presence of nucleophiles. *Journal of Organic and Pharmaceutical Chemistry*. 2008. Vol. 6 (3). P. 16–32.
3. Duez S., Bernhardt S., Heppekausen J., Fleming F. F., Knochel P. Pd-Catalyzed α -Arylation of nitriles and esters and γ -Arylation of unsaturated nitriles with $\text{TMPZnCl} \cdot \text{LiCl}$. *Organic Letters*. 2011. V. 13(7). P. 1690-1693.