

Date: September 12th, 2019

Review report on PhD thesis of Mr. Jamshed Obidov, M.Sc.,

entitled

**“SYNTHESIS OF NEW GLYCEROLTRIETHERS AND STUDY THEIR BIOLOGICAL
PROPERTIES”**

The dissertation was performed at the Department of Organic Chemistry and the Research Laboratory “Glycerol Chemistry” named after Professor B. Kimsanov, Research Institute of the Tajik National University.

The review prepared based on an invitation letter from a Dean of the Chemistry Department of Tajik National University (TNU).

Supervisor: Professor Karimzoda Mahmadvul Bobo, Ph.D. D.Sc. in Chemistry

Supervisor: Professor Rajabov Sirojiddin Ikromovich, Ph.D. D.Sc. in Chemistry

Project background

Mr. Jamshed Obidov, M.Sc., has submitted the doctoral thesis on utilizing of the novel chemical compound based on the modification of triglycerides, which represent the family of complex lipids, and testing of such complex triglycerides to use in the pharmaceutical, agricultural and fine chemical-syntheses. Triglycerides derivatives are readily undergoing hydrolysis in aqueous acid or base to produce small fragments, while the simple lipids do not readily undergo hydrolysis. The complex lipids are so named because the compounds contain one or more ester groups, which can be hydrolyzed to produce a carboxylic acid alcohol. However, all the methods is not straightforward and needs a solid scientific approach of synthesizing of triglycerides based on quantitatively, qualitatively normalizing condition of reaction as well as the theoretical approach of the synthetic method.

In this doctoral dissertation, to obtain an enhanced amount of compound the ester glycerol positions of 1 and 3 were modified in esterification reaction with different chains of alkyl groups (e. g. 1,3-dialkoxsy-2-propanol) where the second carbon remained still attached into a hydroxyl group. In the next step of the reaction, the modified ester (1,3-dialkoxsy-2-propanol) with active nucleophilic functional of hydroxyl group readily attacks the electrophilic carbonyl group of acids (e.g. formic acid, acetic acid, glycolic acid, butyric acid, benzoic acid, 2-hydroxy-2-phenylacetic acid, 3-phenylpropanoic acid) through the acid-catalyzed mechanism of esterification.

The topic represents innovative and very modern directions in science. Therefore, the novelty of the thesis is very high, considering the importance of the research subject, pharmaceutical requirements, biological and agricultural demands.

General description of thesis

The Ph.D. thesis has been submitted by Mr. Jamshed Obidov is excellently structured and correctly presented. It consists of an introduction, chapters (3), conclusion, references (122) and annotations (in Tajik, Russian, and English). The scientific activity of Mr. Jamshed Obidov in forms of papers (6) and conference publications (declaration on the reproduction of pre-published content) (20) has been shown. The thesis was written scientifically very clear (total 123 pages), concise, enriched by numbers of figures (18) and tables (22) and presented in Tajik and Russian languages. At the end of this dissertation, the subsequent parts are annotations also given in Tajik, Russian and English languages. The theoretical principles as well as the research part are validated with valuable references.

The theoretical concept and experimental parts of this thesis evidences that the author has carefully studied the research subject with pinnacle outlook combined with the appropriate number of literature sources. It evidences that Mr. Jamshed Obidov profoundly understood the theoretical basis and discussed problems.

Due to the presence of three hydroxyl groups in glycerol enters into various chemical transformations where the author in the thesis clarified the results with the bibliography sources combination. These obtained derivatives with a wide spectrum of physiological activity are found also pharmaceutical active. Those mono-, di-, and tri- ethers derivatives of glycerol have shown interesting results. The synthesis of such compounds is currently carried out with the use of petrochemical products, and also includes using the epichlorohydrin, mono- and 1,3-dichlorhydrin glycerol.

The glycerol triesters used in wide aspects of applications, so the development of new convenient methods of synthesis with further modification of glycerol derivatives remains one of the main goals of further organic chemistry study. The glycerol derivatives also can inhibit for example growth of malignant tumors, some glycerol drugs that contain phosphorus show anthelmintic, gametocidal properties. Glycerol has three OH groups (hydrophilic) and no hydrophobic tail. It cannot cross the nonpolar environment of the cell membrane. Therefore, modified derivatives are an excellent choice. Glycerol ethers play an essential role in metabolic processes in living organisms and are considered effective substrates and inhibitors of enzyme systems. The glycerol lipids participate in the formation of the structure of biological membranes and the syntheses associated with the transfer of substances and ions through membranes, cell energy supply, as well as protective of biological membrane.

The thesis includes tasks (a) of developing the methodical synthesis of following chemical substances specifically: 1,3-dialkoxy-R, where -R is modified as followings substances: -2-formyloxypropane, -2-acetoxypropane, -2-oxyacetoxypropane, -2-butyryloxypropane, -2-phenylacetoxypropane, -2-phenyloxyacetoxypropane, -2-phenylpropoxypropane.

The tasks (b) specifically includes studying the synthesis and condition of the reaction of glycerol diethers catalyzed in the presence of concentrated sulfuric acid to synthesize derivatives 1,3-dialkoxy-R, where -R is modified as followings substances: -2-oxyacetoxypropane; -2-butyryloxypropane; -2-phenylacetoxypropane; -2-phenyloxyacetoxypropane; -2-phenylpropoxypropane.

Finally, task (c) of this dissertation is to find the areas of practical application of synthesized the glycerol tri-ethers.

Mr. Jamshed Obidov, MSc., studied the temperature, catalytic dependence on the yield of synthesized (task b) conversion.

This thesis is well written and scientific results properly documented. There are some typing errors, however, the text is clear in a concise manner. The figures, schemes, and tables are shown properly as well. The theory, arguments, and experimental results are well formulated with meritorious conclusions which confirms that the postulated objective of the work was successfully reached.

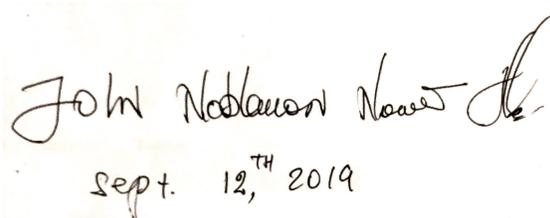
In summary, the dissertation represents a high-level scientific work. The introduction, discussion, conclusion are suitable and focused on the relevant topics. It is an interesting topic for science to discover novel-drugs for the market, and application of novel synthesized substances into the agricultural field for acceleration time of seeds for growth in environmental habitats.

All experiments in this thesis are well arranged, and analytical techniques (chromatography combined with spectroscopies) are correctly applied. Infrared (IR) and Proton Nuclear Magnetic Resonance (¹H-NMR) spectroscopies are analytical chemistry techniques for determining the molecular functional groups and chemical structure determination as well as quality control have been widely used, which made the results and the text of dissertation well presented and very interesting to read.

Final evaluation statement

In my opinion, the reviewed thesis meets all requirements on the thesis presented and the basis for the Ph.D. degree conferment. The following aspect justifies my decision to reward Mr. Jamshed Obidov's doctoral desertion: scientific novelty, a wide range of research, meritorious presentation, and scientific activity confirmed by 6 papers published. This thesis is ready to be defended orally and certainly meets the requirements laid down for the degree of Ph.D. in chemistry by statutes in the Journal of Laws of the Republic of Tajikistan.

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