

OPPONENT'S REVIEW OF THE DOCTORAL THESIS

Author: Anton Korban, M.Sc.

Title: Development and metrological evaluation of gas chromatographic methods for quality and safety control of alcoholic products

Supervisor: Assoc. Prof. Radomír Čabala, Ph.D.

Doctoral thesis of Anton Korban deals with the development of quality control methods for alcoholic products, especially the quantification of volatile congeners. Attention was focused on the investigation of the "Ethanol as an internal standard (IS)" method, which was compared in the work with existing analytical methods of internal and external standardization. An algorithm for using the method on GC-MS instruments was also designed and developed. According to the obtained results, the proposed methodology made it possible to use the "Ethanol as IS" method on GC-MS instruments with metrological properties better or similar to those of the traditional IS method.

The assessed work has a total of 25 pages, without appendices and a list of publications, divided into chapters and 24 cited literary references, which is sufficient for this type of work. The division of the work into individual chapters is standard and logical.

The objectives of the dissertation are clearly formulated and the processing methods necessary for their fulfillment are correctly chosen. I conclude that the planned objectives of the work have been met.

The work consists of an introductory overview of the methods of analysis of alcoholic products used so far, a description of the obtained results and their critical evaluation. The division and especially the scope of this part of the work is given by documenting the relevant data in the form of appendices of published works.

Anton Korban obtained a large amount of experimental data that was published in nine papers. Published works where Anton Korban is a co-author and which are part of the submitted Doctoral thesis have already been opposed in the review process of individual editors. I

especially appreciate that the doctoral student is listed as the first author on four published original scientific works. Nevertheless, I have the following comments and questions about the dissertation:

- I consider typos and some grammatical errors to be only formal deficiencies that do not reduce the level of this doctoral thesis.
- On page 10, you write about the advantages of using the internal standard method. Is this method applicable even if unidentified components are present in the actual sample?
- Among the main components in the analyzed samples is water, which can coelute with some analyzed analytes. When calculating the RRF factors for the FID and especially the MS detector, did you observe their correlation with the water content in the sample?
- When using an MS detector, you observed a change in RRF values when the volume of the dispensed sample changed. Would you be able to quantify this change?
- In conclusion, you claim that the method developed by you does not require the preparation and addition of a solution of the IS compound to the tested sample, the measurement of the ABV value of the tested sample or its density. It also applies to the use of the "Ethanol as IS" method on GC-MS for samples where the alcohol content is unknown, such as domestic products (slivovica, jablkovica, drienkovica etc.)?

Doctoral thesis of Anton Korban content and results correspond to the conditions set for the dissertation. The fulfilled goals of the work, which, in addition to practical results, are also beneficial for the development of the given scientific discipline, document the ability of the doctoral student to do creative scientific work. I recommend the submitted dissertation for defense and, based on a successful defense, I propose to award Anton Korban, M.Sc. scientific-academic title "**Philosophiae doctor**" (Ph.D.).

Bratislava, 14.10.2022

RNDr. Róbert Kubinec, CSc.