STATEMENT

on the Habilitation thesis (dissertation) for scientific degree “Doctor of Sciences”
in the professional field 4.3 "Biological Sciences", Scientific discipline "Plant Physiology"

**by Prof. Dr. Vasilij Nikolaevich Goltsev, Dept. Biophysics and Radiobiology,
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Author of Dissertation: Prof. Violeta Borisova Velikova

Topic: Physiological role of biogenic isoprene in plants

In the biosphere, living organisms exist in continuous interaction with the environment. An important condition for maintaining their vitality and high efficiency is their ability to respond sensitively to external stresses and to adapt to different changing environmental conditions. In plants, the damaging effect of external factors is often associated with the induction of oxidative stress. The mechanisms of antioxidant protection have been described in detail in the scientific literature. However, unduly little attention is paid to the analysis of the involvement of isoprene synthesized in the plant cell in the regulation of the stress response. Considering the fact that, in isoprene-emitting plants, a plant cell devotes a substantial part of its energy and carbon resources to the synthesis of this volatile hydrocarbon, one can assume the crucial role of isoprene in the plant cell physiology.

The large-scale studies of Violeta Velikova largely fill the gap in the knowledge about the protective role of isoprene and reveal detailed mechanisms of regulation of numerous physiological processes in the plant cell, which determines the importance and relevance of the research and the dissertation of Dr. Velikova.

Violeta Velikova's doctoral dissertation includes 422 pages, with the first part of 149 pages presenting the essence of her work – the basic hypotheses, the way of their analysis and the results of her own experiments that prove or reject them. Photocopies of Velikova's publications, reflecting the main developments in the dissertation thesis (DT), are presented as appendices.

The author has presented a Summary that fully reflects the basic principles and scientific contributions of DT.

The main focus in DT research is on the participation and role of isoprene in the plant's protective response against various adverse environmental factors. In her research, Violeta Velikova applies a productive and informative experimental approach, comparing plants capable of producing and emitting isoprene, with plant objects non-

emitting (naturally or after genetic or chemical modification) these molecules in the atmosphere. The results are based on a wide range of physical, biophysical, biochemical, genetic experimental methods, which have to present sufficiently clear pictures of stress-induced events running with or without participation of isoprene.

The major scientific contribution of Dr. Velikova's research is the demonstration that endogenous isoprene increases the resistance of plants to oxidative stress induced in the plant cell by ozone, singlet oxygen, high temperature, drought, anthropogenic nickel contamination. The basic mechanisms of the stabilizing action of isoprene were disclosed. They includes two ways: chemically – by reducing the formation of active oxygen and nitrogen forms, and physically – by associating this small hydrophobic molecule with the membrane components, stabilizing the membrane structure and increasing its thermotolerance,

In support of her dissertation, Dr. Violeta Velikova chooses to present a relatively small number of publications in her entire scientific output – 20, 19 of which are ranked as Q1 and one publication is ranked Q2. The articles have been published in prestigious international scientific journals with a high IF between 1,395 and 7.21, with an average IF of the submitted articles being about 4.35. The results of presented in the DT researches are published in the journals *Plant, Cell and Environ*. (5 papers), *Plant Physiol.* (4), *New Phytologist* (2), *Environ. Pollut.* (2), and by one article are published in journals *Agricult. Ecosystems & Environ.*, *Funct. Plant Biol.*, *J. Exp. Botany*, *J. Proteome Res.*, *Physiologia Plantarum*, *Plant Biol.* This illustrates the high scientific value and quality of her research. The studies of Prof. Violeta Velikova, including those presented in DT, had a significant influence on the development of scientific researches in the field of Plant Physiology. Her publications have been cited in the scientific literature over 6,000 times, and only 20 DT articles have been cited over 1,300 times, with the Hirsch index for these articles alone h = 15.

In most of the publications presented, Dr. Velikova is a leading author involved in all stages of the scientific activity – from strategy design and experiment planning to completion of the publication process, in 14 of the articles she is the first and/or corresponding author.

Conclusion

The dissertation presented by Dr. Violeta Velikova to obtain the qualification "Doctor of Sciences" is devoted to an important and topical field of plant biology, it is

implemented at an extremely high methodological and theoretical level, and makes a significant contribution to the scientific fields of Physiology of Plants: “Physiology and Biochemistry of Plant Stress” and “Biogenic Volatile Compounds”. The analysis of the DT and the appended publications shows that Dr. Velikova is a recognized scientist of high international prestige; she has a significant contribution to the science. Her researches have a significant impact on the development of scientific researches not only in Bulgaria but worldwide.

All publications are collective, with her key and/or leadership role in them. There were no signs of plagiarism in DT and Velikova's publications.

What I have said so far leads me to believe that Dr. Violeta Borisova Velikova is a highly erudite, internationally recognized scientist with significant scientific contributions in the field of Stress Physiology and is a leading scientist in the field of Physiology of Biogenic Volatile Compounds. Velikova's DT completely fulfils the high criteria of this type of work. On this basis, I support the award of the Doctor of Science degree to Dr. Violeta Borisova Velikova.

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Prof. V. Goiltsev