OPINION

by Dr. Svetla Dimitrova Yancheva,
Professional direction 6.1. "Plant Science", scientific specialty "Selection and seed production of cultivated plants (Plant biotechnology)"
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of a dissertation for awarding the educational and scientific degree **"doctor"**
by: field of higher education **4. Natural sciences, mathematics and informatics**
professional direction **4.3 Biological sciences**
PhD program: **Genetics**

Author: SIBEL DZHEVDET AZIZ

Topic: "***Investigation of genetic variability in representatives of vegetable crops using molecular markers***"

Research supervisors: Prof. Dr. Teodora Atanasova Staykova - PU "P. Hilendarski"
Prof. Nasya Borisova Tomlekova, Ph.D. - IZK "Maritsa"

1. General presentation of the procedure and the doctoral student

By order No. RD-21-457/02.03.2023 of the Rector of Plovdiv University "Paisiy Hilendarski" (PU), I have been appointed as a member of a scientific jury in connection with the procedure for the defense of dissertation work on the topic "Study of genetic variability in vegetable crops representatives through molecular markers" for the acquisition of the educational and scientific degree "doctor" in the field of higher education 4. Natural sciences, mathematics and informatics, 4.3 Biological sciences.

The author of the dissertation is Sibel Dzhevdet Aziz - a doctoral student in the scientific specialty "Genetics" at the Faculty of Biology of the "Paisiy Hilendarski" PU, with the supervisors Prof. Dr. Theodora Atanasova Staykova - "P. Hilendarski" and Prof. Dr. Nasya Borisova Tomlekova - IZK "Maritsa".

The set of materials presented by Sibel Aziz on paper and electronic media is in accordance with Article 36 (1) of the Regulations for the Development of the Academic Staff of the PU and includes the following documents: (1) a request to the Rector of the PU to disclose the procedure for defense of a dissertation; (2) CV in European format; (3) protocol from the Department council related to reporting the readiness to open the procedure and to preliminary discussion of the dissertation work; (4) dissertation; (5) abstract in Bulgarian and English; (6) a list of scientific publications on the topic of the dissertation; (7) copies of scientific publications on the subject of the dissertation; (8) reference to the fulfillment of the minimum national requirements, according to the RSARD; (9) certificates of participation in 4 international and 11 national courses, five

participations in scientific forums, 4 participations in organizational committees and organizations, and (10) declaration of originality and authenticity of the attached documents. Sibel Aziz has co-authored 3 publications, one of which is a book chapter (in press).

2. Relevance of the topic

The successful selection of plant species is directly related to the existing genetic diversity, as well as its maintenance and management. The main priority in vegetable crops is the evaluation of genotypes with valuable economic qualities. The relevance of the topic of the dissertation study is indisputable and stems from the fact that the application of various molecular techniques to assess the genetic potential of a given cultural species increases and accelerates the effectiveness of mutational and traditional selection. The introduction of molecular techniques for the study of plant cultivars provides useful information in relation to the variety protection rights, the establishment of existing genetic diversity, the identification of hybrid nature, as well as in the discovery of new genetic diversity. The correct selection of appropriate molecular marker systems affecting highly variable regions in the genome is of great importance to establish genetic heterogeneity. At its core, Sibel Aziz's dissertation is an in-depth scientific study that uses a range of molecular marker techniques to identify genetic variability in three vegetable crops - tomatoes, potatoes and beans - and reveals perspectives in both fundamental and in applied aspect.

3. Knowing the problem

The literature review includes 6 main sections, successively examining the importance of vegetable crops, the application of mutagenesis and molecular-genetic markers in plant biotechnology, the economic importance of tomatoes, potatoes and beans worldwide, including in Bulgaria, as well as the application of the molecular markers for the study of genetic variability in these crops, the subject of the dissertation. The goal is formulated clearly and precisely, and five main tasks are formulated to achieve it.

4. Research methodology

The rich methodology chosen for the study meets the goals and objectives of the dissertation work. The presented analyzes prove the author's ability to compare different methodological approaches, to summarize and interpret data, to formulate conclusions. The methods and results of the analyzes described in the dissertation correspond logically to the tasks set. The presented scheme of the molecular methods used aptly presents the experimental work comprehensively and comprehensively.

5. Characterization and evaluation of the dissertation work and contributions

The dissertation work "Investigation of genetic variability in representatives of vegetable crops using molecular markers" is presented on 200 printed pages, includes 51 figures, 26 tables and 323 cited literature sources. It is structured according to generally accepted criteria and contains all the necessary sections. The dissertation presents the results of the application of different molecular marker techniques in the three cultures, which are supplemented with rich evidentiary material and statistical processing. Photographs of

electrophoregrams from amplified polymorphic profiles and dendrograms showing the genetic distance between the studied samples based on the generated data were used as evidentiary material for the obtained results. The author shows competence in their discussion, and this is a basis for formulating general conclusions and specific conclusions about the effectiveness of the marker systems used.

Of the four molecular marker techniques applied to tomato, SSR is indicated as the most effective for establishing polymorphism, followed by ISSR, COS II and ISAP. Three molecular marker techniques were used in the potato study and the most effective were ISAP and ISSR, and in beans, the ISSR technique was found to be more effective for polymorphism detection than SSR.

I accept the mentioned contributions in dissertation work and consider that they are formulated accurately and meaningfully and build a clear idea of the success of a voluminous and precise experimental work. The fact that the achieved results are significant and are the result of purposeful and in-depth work on the subject of the dissertation clearly stands out. The specified contributions can be evaluated as: contributions of an original scientific nature (seven), scientific-applied contributions (four), as well as those of a confirmatory (three) and methodical nature (three). The mentioned contributions indisputably demonstrate the significance of the development for science and practice. The use in modern plant breeding of molecular marker techniques to establish genetic variability in the three vegetable crops (tomatoes, potatoes and beans) reveals perspectives in both fundamental and applied aspects.

6. Evaluation of the publications and personal contribution of the doctoral student

The dissertation work, abstract and publications on the topic of the dissertation work presented by Sibel Aziz fully meet the minimum national requirements according to the Low for academical development for the acquisition of the educational and scientific degree "doctor" in the scientific field and the professional direction of the procedure. The list of publications includes two journal articles published in Q4 and Q3 and one book chapter (in press) in English that demonstrate the author's research abilities and skills. It should also be noted the impressive participation of the author of the dissertation in training courses, national and international research projects and numerous scientific forums. I accept that the conducted dissertation study, the results obtained and the conclusions drawn from them are entirely the personal contribution of the doctoral student.

7. Abstract

The abstract comprehensively reflects the essence of the dissertation work and the achieved results of the conducted research. All sections of the dissertation are presented correctly, and a sufficient number of figures and tables have been selected to illustrate the main results.

8. Recommendations for future use of dissertation contributions and results

Given the accumulated rich methodology, skills and consistency in the work of Sibel Aziz, my recommendations are that in her future scientific activity she will continue to work with enthusiasm and publish in prestigious journals that are referenced and indexed in the world's databases.

I have no critical remarks, but I pose the following questions to the PhD student:

1. Are there other studies on the application of the ISAP technique to other plant species, besides representatives of the *Solanaceae* family?

2. You indicate that among the vegetable crops, the subject of the dissertation study, that only in beans have registered Bulgarian mutant varieties. Do you have information about other vegetable crops with registered mutant varieties in Bulgaria and what type of mutagenesis was applied?

3. What is the practical benefit of using molecular markers in plant breeding and agriculture?

CONCLUSION

The dissertation study contains ***scientific, scientific-applied and applied results, which represent an original contribution to science and*** **meet all the requirements** of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for the Implementation of the ZRASRB and the relevant Regulations of PU "Paisiy Hilendarski" ".

The dissertation shows that the doctoral student Sibel Aziz possesses in-depth theoretical knowledge and professional skills in the scientific specialty of Genetics, demonstrating qualities and skills for independent conduct of scientific research.

Due to the above, I confidently give my **positive** assessment of the conducted research, presented by the above-reviewed dissertation work, abstract, achieved results and contributions, and I propose to the honorable scientific jury to award the educational and scientific degree "doctor" to **Sibel Dzhevdet Aziz** in the field of higher education: 4. Natural sciences, mathematics and informatics, Professional direction: 4.3 Biological sciences, doctoral program Genetics.

April 10, 2023. Prepared the opinion: .....

(signature)

(Prof. Dr. Svetla Yancheva)