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REVIEW

on dissertation for obtaining the educational and scientific degree "Doctor" in field of higher education; 6. Agricultural Sciences and Veterinary Medicine; professional field 6.5 Forestry (incl. Dendrology), scientific specialty.

Author of dissertation: Teodora Milchova Markova
Assistant at the Department "Dendrology" at the University of Forestry (UF), Sofia, Bulgaria.

Dissertation Topic: "Classification of Forest Vegetation in the Plana Mountain Range"

Reviewer: Prof. Dr. Rosen Todorov Tsonev, Department of Ecology and Environmental Protection, Faculty of Biology, Sofia University "St. Kliment Ohridski", professional field 4.3 Biological Sciences; Scientific specialty: 02.22.01 Ecology and Ecosystem Conservation, appointed as a member of the scientific jury by Order No. RD-145/02.04.2026 of the Rector of the UF.

1. Brief introduction of the candidate.

Teodora Milchova Markova was born in Sofia in 1995. She graduated from 32nd Secondary School "St. Kliment Ohridski" with learning of foreign languages. In 2019, she graduated with a degree in Landscape Architecture from the University of Forestry in Sofia. Even as a student, she was an activist in the Student's Club for Environmental Protection (SCEP) and worked at NGOs focused on environmental education and health prevention. She has also worked in green space maintenance, as a floral arranger, sales consultant, and in other gardening-related roles. Since 2021, she has served as a part-time teaching assistant and assistant in the Department of "Dendrology" at the University of Forestry.

2. Relevance of the problem.

The inventory of the vegetation cover in Bulgaria using the current Braun-Blanquet's methodology is a significant task for Bulgarian phytocenologists because it has important practical applications, particularly for the conservation of biodiversity. Two main approaches are used in this inventory across the country. One involves a comprehensive study of a specific area in Bulgaria, but focusing only on a particular type of vegetation, while the second one is a regional — studies of a broader range of plant communities within a specific phytogeographic region. Teodora Markova's dissertation employs the second approach. Thus, the Plana Mountain, at least in terms of the forest vegetation, becomes one of the well-studied phytogeographic units in Bulgaria. Furthermore, the doctoral candidate has determined the relationship between syntaxa and the classification of forest habitats, according to the EUNIS

classification scheme. Overall, the dissertation also has important practical applications, e.g., for the conservation of forest habitats within the Natura 2000 ecological network, for updating the classification schemes used in forest typology and management, and others. The doctoral candidate's work is timely because it is significant both for the development of fundamental scientific research in Bulgaria and for the management and conservation of biological diversity at the level of forest plant communities and natural habitats - forests.

3. Degree of knowledge of the state of the problem and creative interpretation of the literature review.

The doctoral candidate is very well versed in the literature concerning the forest communities she has studied, both within the study area and at the national level. It should be emphasized that her research is also based on several publications from the first half of the 20th century, primarily by the forester Prof. Nikola Penev. Since the studied area almost entirely coincides with the area of these previous studies, this has enabled the doctoral candidate to track a series of succession changes related to both - the ecological condition of the forests and their floristic composition.

The reference list includes 158 sources, of which 80 are in Cyrillic and 78 in Latin script. The cited literature, as well as its analysis and the conclusions based on it, demonstrate that the doctoral student possesses a solid theoretical foundation, which she skillfully applies in practice. The comparability of the results with those from Nikola Penev's publications from the 1930s is proof that the research and analyses were conducted with the necessary scientific precision.

4. Aim, objectives, hypotheses and research methods. Relevance of the chosen research methodology to the stated aim and objectives of the dissertation.

The main objective of this dissertation is to study the forest phytocenoses in the Plana Mountain using the floristic approach of the Braun-Blanquet's phytocenological school. To achieve this goal, a sufficient number of phytocenological relevés had to be collected to characterize the diverse coniferous and broad-leaved forest vegetation of the studied area. The affiliation of the syntaxa to different habitats was determined according to the EUNIS classification. For this purpose, original phytocenological relevés were collected and subjected to cluster and ordination analysis. In my opinion, the doctoral candidate excellently fulfilled the objective and successfully completed the assigned tasks. The work is based exclusively on 185 original phytocenological relevés, which were produced as a result of intensive work over a relatively short period of time, covering a sufficiently large area with diverse topography.

5. Visualization and presentation of the results.

The results of the dissertation are clearly illustrated, primarily through graphs, numerous tables, and maps. The dissertation comprises 130 pages, 44 figures, 9 tables, and 8 appendices, which contain photographs of the identified syntaxa. All graphs and tables are presented in the main text, while the appendices are separate ones.

6. Discussion of results and literature used.

According to the findings of the dissertation, a wide variety of forest plant communities and natural habitats has been identified within the relatively small area of the Plana Mountain. Fifteen syntaxa have been identified, represented by 9 associations and 6 plant communities, which belong to 9 alliances, 8 orders, and 5 classes of vegetation. Eleven EUNIS habitats and ten habitats listed in Annex 1 of Directive 92/43 have also been identified. For the Plana protected zone within the NATURA 2000 ecological network, a new natural habitat 91W0 Moesian beech forests has been identified, which is not included in the subject and objectives of its conservation.

Most of the plant communities studied during the work on the dissertation generally confirm those identified by Penev (1938a) at the beginning of the last century for the Plana Mountain. Some changes resulting from anthropogenic pressure in the past, and which occurred after the cessation of part of this pressure—mainly grazing and clear-cutting—have been observed and analyzed. The results are discussed in relatively detail and with sound reasoning.

7. Contributions of the thesis.

The dissertation contains important fundamental contributions, as well as also some applied contributions related to the application of phytocenology and the classification of natural habitats, forest typology, and forest management in Bulgaria.

Scientific contributions

The most significant scientific contribution is that, for the first time, all types of forest communities in the Plana Mountain region have been studied and systematized using the methodology of the Braun-Blanquet's school. The chorology and characteristics of the following associations, already known from other regions of the country, have been supplemented: *Fago sylvaticae-Betuletum pendulae, Aremonio agrimonoidis-Fagetum sylvaticae violetosum reichenbachianae, Galio pseudaristati-Fagetum sylvaticae, Luzulo luzuloidis-Fagetum sylvaticae, Genisto carinalis-Quercetum petraeae, Quercetum frainetto-cerridis, Stellario nemorum-Alnetum glutinosae, Alnetum incanae*. Some plant types, which have been classified at the community level, have also been studied. Important succession processes and succession series in the forests of Plana Mts. have been noted. Nikola Penev's view that the Scots pine forests are remnants of the natural coniferous forests, which were more widespread in the past, has been more definitively confirmed. These contributions are entirely

sufficient as evidence of the value of the work

Scientific and applied contributions

According to the scientific and applied contributions outlined by the doctoral candidate, these ones include the first mapping of the forest vegetation of the Plana Mts., as well as of the natural habitats according to the EUNIS classification. Here I would add also the mapping of the target natural habitats from Annex 1 of the Biodiversity Act and the Habitats Directive (92/43 EEC) on the territory of the Plana Mts., including the Plana protected zone from the NATURA 2000 network that partially overlaps with it. I would classify the identification of the new natural habitat 91W0 Moesian beech forests for the area as a contribution to the applied science rather than to fundamental science, as it was stated in the Abstract. Overall, I believe that the doctoral candidate has not succeeded in clearly articulating the specific practical application of her findings. For example, this section lacks the recommendations for the management of the relict Pine's forests in the studied area.

8. Assessment of the extent of the dissertator's personal involvement in the contributions.

Based on the documentation provided to me - the scientific publications included in the dissertation, as well as the abstracts accompanying them - I believe that the research presented in this work is primarily the result of the doctoral candidate's efforts, albeit with the active participation of the academic supervisor. The large number of phytocenological relevés, as well as their relatively even distribution across the mountain, is evidence of a well-planned and meticulously conducted study, which was also sufficiently representative of the main types of forest and shrub communities in the Plana Mountains.

9. Critical comments and questions.

The dissertation is a detailed study that is well-written and well-structured, with the main focus on presenting and analyzing the results. Of course, it cannot be said that it is without weaknesses and points of criticism. Some of these have already been discussed and subsequently corrected during the preliminary discussion of the dissertation. I would say that while sections of the dissertation such as "Literature Review" or "Results" are developed in great detail and with the necessary precision, other sections have clearly not been given serious attention by the doctoral candidate. My critical comments and questions are presented below and mainly concern these sections:

- As I already noted during the preliminary discussion at the expanded departmental council meeting, the section on conclusions and recommendations seems overly simplistic and incomplete. I believe there are sufficient findings in the dissertation that should also have been discussed in greater detail in the conclusions, and recommendations should have been derived from them. For example, the work presents certain theses regarding changes in the structure,

distribution, and successional shifts in the proportion of areas occupied by xerophytic oak forests, beech forests, and mesophytic communities of hornbeam and Sessile Oak. These generalizations should also have been presented in the conclusions. It was necessary to formulate conclusions regarding the other major and widespread forest communities in the Plana Mountain area, not just the Scots Pine forests. The recommendations should also have been based on results that include a wide variety of community types. I believe that, based on the observed anthropogenic changes and the derived succession sequences, the doctoral candidate should have made some recommendations regarding the management (stewardship, conservation, etc.) of oak, hornbeam, riparian forests, and other types.

- The contributions, particularly the applied scientific ones, are not well articulated, as has already been made clear above. I believe they are even visibly underestimated. For example, in the two points presented as such contributions, the same contribution is repeated - maping of forest communities. At the same time, an important applied contribution has not been formulated. It is the fact that the natural habitats listed in Annex 1 of the Biodiversity Act have been mapped, and that their areas within the Plana protected zone of the Natura 2000 ecological network have been updated. Recommendations for the management of Scots Pine forests and others are not reflected as contributions.

- A fundamental remark regarding the analysis of diagnostic species using the JUICE program is that the results obtained by stratum are, to some extent, misleading ones. They lead to the repetition of the same species across multiple levels and to the "masking" of the actual diagnostic role of other species. The principle of determining of the "fidelity" indicator is clearly dependent on the size and number of groups of phytocoenoses and on the size of the analyzed database of phytocenological relevés, which also reduces its objectivity. For this reason, I strongly recommend that, for greater objectivity, analyses of diagnostic species to be conducted by eliminating the strata, which is an optional feature in the JUICE program. This will make the results more comparable to the established forest syntaxa of neighboring countries and other parts of Europe, because hese analyses there tare primarily conducted without the strata.

- Also regarding the analysis, my question is: during this analysis, were some of the phytocenological descriptions omitted as atypical, or were practically all of them used in the results?

10. Published articles and citations.

The dissertation includes two publications, one of which appears in a peer-reviewed journal indexed in SCOPUS. Out of the 30 points required for the program, she has earned 37.08 points, which is significantly above the required minimum. To date, there are no known citations of the publications related to the thesis topic.

11. Assessment of the publications on the dissertation: number, nature of the publications in which they are printed. Reflections in science - use and citation by other authors.

One of the publications in Forestry Ideas (SJR 0.131; Q4), which presents a study of the syntaxonomic diversity of forest communities in the Plana Mountain, appears in a journal that is indexed and cited in the international SCOPUS database. The abstract presented objectively reflects the structure and content of the dissertation. To date, there are no known citations of the two publications on the topic of the dissertation.

CONCLUSION:

Despite the critical remarks and comments made, based on the quality of the work, which constitutes a detailed study of the forest vegetation of the Plana Mountain, appropriately illustrated and presented - I believe that the dissertation by doctoral candidate Teodora Markova meets the requirements of the FRAADB and the Regulations of the University of Forestry for its application. It gives me the reason to evaluate it as **POSITIVE.**

I take the liberty of suggesting that the Honourable Scientific Jury also vote in the and to award Teodora Milchova Markova the educational and scientific degree ***"Doctor"*** in the scientific specialty of "Forestry (including Dendrology)".

Date: .....
Sofia

REVIEWER. .....
(Prof. Rosen Tsonev)