Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Rim Gubaev

PhD Program: Life Sciences

Title of Thesis: Genetic association mapping for agronomically important traits in rapeseed and sunflower

Supervisor: Professor Philipp Khaitovich

Name of the Reviewer:

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	
	Dr. Viktor Korzun **Date: 07-09-2022**

The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.

If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.

Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

The Doctoral thesis by Rim Gubaev is devoted to the genetic mapping of the agronomically important traits in rapeseed and sunflower. His used data for diversity panels as well as experimental crosses by means of GWAS and QTL mapping approaches with the aim of scanning SNP markers for further introduction of marker-assisted selection in oilseeds.

The thesis is well written and includes all necessary chapters: abstract, introduction, material and methods, results, and discussion sections.

Chapter 1 represents a brief introduction to the thesis's topic, problem statement, the aim and objectives of the study.

Chapter 2 is devoted to the review of the current status of the knowledge in the context of mapping of important traits in oilseed crops. Author has briefly reviewed past and present approaches used to find genetic markers for crops. Additionally, information is provided on the genetic dissection of important traits in rapeseed and sunflower. It should be noted that the current challenges in rapeseed and sunflower breeding were highlighted in the context of Russian trends in oilseed breeding.

The methods part (Chapter 3) is consistently written. Some details are missing due to the citing of Rim's own work, for example, details on phenotyping procedures, sequencing and library preparation.

The results and discussion section consists of chapters 4, 5 and 6 devoted to GWAS for rapeseed, QTL mapping of oil quality-related genes in sunflower and GWAS made for sunflower diversity panel, respectively.

Chapter 4 starts with the population structure analysis of the Russian rapeseed germplasm from the VNIIMK collection as well as its comparison with the international accessions. Here it should be noted that not so many international accessions were used to compare the genetic diversity. Next, the GWAS was performed to find SNP markers associated with glucosinolates. Novel candidate genes were discussed in the context of affecting the glucosinolate content in rapeseed.

Chapter 5 is devoted to QTL mapping of oil-related traits in sunflower by analyzing F2 crosses. In the present chapter novel SNP markers were detected as well as validated using an independent plant sample. Here I would like to highlight several issues. First, the description of Figure 5.2.2 is confusing to some extent, looks like the mutant and wild-type lines are mixed up. Second, Table 5.2.3 as well as the subsequent paragraph is confusing due to chi-square values for 3:1 and 1:3 segregation ratios non correctly assigned for crosses.

Chapter 6 describes the genetic diversity of the large sunflower diversity panel from two scientific institutions and one breeding company from Russia. A comparison of genetic diversity with international accessions was also demonstrated. Joint phenotype and genotype analysis revealed genetic markers explaining a low amount of phenotype variation (<10%) as well as candidate genes involved in seed parameters expression. Despite the novel results including new genetic markers and candidate genes identified for the studied cohort, these results are just preliminary ones as no information on GxE,

as well as phenotype replications were provided. Thus, these results should be confirmed by the analysis of independent plant samples and/or additional data for different vegetation seasons and/or locations. This is also stated by the author.

Chapter 7 includes a very short description of the conclusion as well as a very brief description of how the obtained results could facilitate plant breeding.

The Bibliography section contains a comprehensive list of 301 references.

Three main research publications (two as first author and one as second author) containing the main results presented in the dissertation have been published in reputable international, scientific journals. I strongly believe that the publications well reflect the content of the dissertation.

In conclusion, the present work represents both scientific and practical insights. On the one hand, novel genetic markers were identified that could be implemented for the introduction of marker-assisted selection approaches in oilseed breeding. On the other hand, scientific results on the novel candidate genes controlling glucosinolate content and seed quality traits in rapeseed and sunflower, respectively, were identified. The thesis contains several issues made within the text were highlighted in the present review.

Provisional Recommendation

X *I recommend that the candidate should defend the thesis by means of a formal thesis defense*

☐ *I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*

☐ *The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*