

PhD Thesis Acceptance Report
Research Discipline Council of Biological Sciences
Jagiellonian University in Kraków

Candidate's name and surname: Katarzyna Toch

PhD Thesis Title: Dynamics of epistatic interactions under various environmental conditions in *Caenorhabditis elegans*

Thesis Supervisor: dr hab. Dominika Włoch-Salamon

Assistant Supervisor / Second Supervisor/ Co-supervisor (if applicable): dr Marta Labocha-Derkowska

Reviewer: prof. dr.ir. JE (Jan) Kammenga

THESIS EVALUATION

1. **Scientific merit of the thesis**

a. Originality of the research (25-200 words):

This thesis addresses the issue of epistasis in C. elegans in a complex setting. Understanding epistasis is one of the next frontiers in genetics and evolution and this study makes an interesting contribution to the field. Studying interaction of genes is a daunting task by itself, let alone to study epistasis in different environments and genetic backgrounds is a major challenge. The candidate builds on a paper by Vu et al. and elegantly addressed the epistasis issue and performed the experiments very well. The statistics are robust as well as the interpretation. The candidate has taken care to motivate the choices that were made like strains, factors, and environments.

b. Scientific merit of the chapters / articles (25-200 words):

The introduction provides a comprehensive and well written description of the background literature and context of the work. Although it could have made a more thorough reference to other papers on this issue in C. elegans or other model species like Gaertner et al. 2012; Brem et al. 2005. I believe the thesis could have benefitted from these previous studies. I recommend including these and other before submitting these chapters for publication in a journal.

The M&M are well described and explained. Care was taken to include proper controls and correct for errors or multiple testing issues.

In the result chapters, I was impressed with the analysis part, including bootstrap analyses. I might wonder though about the impact of batch effects. Were these taken into account and was that corrected for. The results are well presented and worked out in a clear and concise way. The figures are clear and self-explanatory.

2. **Substantial merit of the thesis**

(ability to introduce the research topic and clarity of research hypotheses, the choice of research methods and statistical tools for data analysis, presentation and critical analysis of the research data, the ability to discuss research data and the theoretical background, clarity and quality of the conclusions) (25-200 words):

The overall impression is that this thesis makes an important contribution to epistasis analysis. It complements current insights with more quantitative information on interaction of genes in different environments and in different backgrounds. The choice of research methods is well defined, and the hypotheses are clearly explained and discussed regarding other previous work. What is more is that this is one of the few experimental approaches toward gene interactions. There are many theoretical papers that address this issue, but this is quite a unique and comprehensive work. It is clearly written and the quality of the conclusions are proper and at the right level.

3. **Layout and register**

(layout, register and the clarity of the language, the quality of the visual material etc.) (25-200 words):

Layout of the thesis is straight forward and well-structured into readable parts and well-defined sections and paragraphs. Language is fine and sentences are well phrased. Visual material as well as tables are well included and explained.

4. **Critical notes**

*Although the thesis addresses and reflects on some papers of epistasis, there could have been more reference to other papers that bear on similar issues in *C. elegans*. For the paper by Paaby and Rockman, 2015, Elife, on a modifier screen to interrogate the alleles segregating in natural populations of *C. elegans* using induced gene knockdowns. Also, the basic paper by Tijsterman et al. 2002, on PPW-1, a PAZ/PIWI protein required for efficient germline RNAi, showing that it is defective in a natural isolate of *C. elegans*, is not referred to. More importantly, it is a bit worrying that the RNAi libraries have not been sequenced. It is assumed that these RNAi's are all correct but our experience is that quite few of them are not what they supposed to be. Sequencing revealed that not all RNAi clones are correctly labelled.*

5. **Final grade** (justification 25-200 words):

This is a very good thesis. Well written, sound analysis, proper presentation, and conclusions as well as visualizations. See above for further reasons.

I, hereby, declare that the reviewed PhD thesis by **Katarzyna Toch** meets the criteria pursuant to art. 13.1 of Act of 14 March 2003 on Academic Degrees and Academic Title and Title in the Arts (O.J. no 65 item 595 as amended) and request that the Research Discipline Council of Biological Sciences of the Jagiellonian University in Kraków accepts **Katarzyna Toch** for further stages of doctoral proceedings.

YES

I, hereby, request that the thesis is accepted with distinctions. Justification (25-200 words)

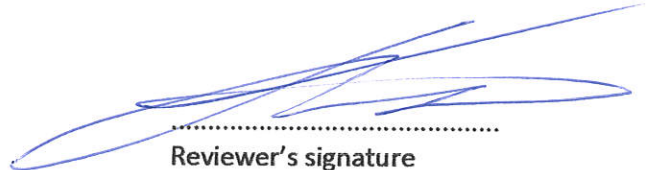
(Please note that I leave this to the discretion of the University since I am not familiar with the criteria to provide a Distinction)

My main reason for not giving this a distinction is two-fold: first it is important that all RNAi libraries are sequenced to make sure that it is exactly the right clone. Some clones we know have multiple sequence differences rather than just the single one. Further the thesis should have made a more clear interpretation regarding major epistasis papers in other model species and theoretical analyses. Much work has been done in yeast and multiple models have been proposed and presented.

NO

June 10, 2022

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date


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Reviewer's signature

INFORMATION FOR THE REVIEWER:

A digital copy should be sent to:
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A duly signed original should be sent to:

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