



# BIOLOGY CENTRE CAS

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Review of Master thesis of Veronika Běhálková

### **“Testing the synteny of genes in *Yponomeuta evonymella*”**

The aim of this Master thesis was to create gene-based physical maps of sex chromosome and an autosome in bird-cherry ermine, *Yponomeuta evonymella*, and to compare synteny of genes between *Y. evonymella* and other lepidopteran species (a diamondback moth *Plutella xylostella* and silkworm *Bombyx mori*) by means of Fluorescence *in situ* hybridization (FISH) with bacterial artificial chromosome (BAC) probe. Overall it seems that the experiments of this study were well done, and this Master thesis was well organized and written. In first and second chapters (Introduction and aim), author clearly described backgrounds and motivation of this study by citing appropriate articles. Materials and methods used are clearly and sufficiently detailed, although there are some minor errors. The next chapter Results were well arranged and clearly described by well-prepared figures and tables. Especially Figures 8 and 9 are very nice results (I like both figures very much) and the most successful part of this thesis. Discussion was also logically organized and clearly written based on results obtained in this study. The motivation, results and discussion of this study are summarized in one-page Conclusions. Hence I have only some minor suggestions and comments about this Master thesis. The following is my minor suggestions and comments.

#### Minor suggestions and comments:

- (1). In page 1, author cited Lukhtanov et al. 2018. In this case author should cite like Lukhtanov, Vladimir A et al. 2018 in reference in page 32. In the reference, “et al” is missing.
- (2). In 2<sup>nd</sup> paragraph of page 1, Noor et al. 2001 should be first, like Noor et al. 2001; Brown et al. 2004; Kandul...
- (3). In 2<sup>nd</sup> or 3<sup>rd</sup> paragraph of page 1, if author describe the role of chromosome rearrangements in speciation, it would be better to mention and cite the article in *Ostrinia nubilalis* (Wadsworth et al. 2015 Heredity), because this article mentioned the role of chromosomal inversion in speciation in Lepidoptera.
- (4). In 2<sup>nd</sup> paragraph of 1.3 Neo-sex chromosomes in page 2, change chromosome W to W chromosome.
- (5). In page 3-4, author showed chemical structural formula of Dulcitol and Sorbitol in Figure 1. I can see the explanations of Dulcitol and Sorbitol in the text of section 1.4. However I could not find citation of Figure 1 in the text. Why did author make and show Figure 1? If author makes and shows figure, author should cite and explain Figure in the text.

- (6). In first paragraph of page 5, author described "As mentioned above, the karyotype of *Y. evonymella*.....". However author did not mention the karyotype (chromosome number) and sex chromosome constitution in *Yponomeuta* ssp. before. I suggest to omit "As mentioned above", and add the information of karyotype and sex chromosome constitution in *Yponomeuta* ssp. in this section or before. Additionally, in this section 1.5, it would be better to mention that  $Z_1$  in *Y. evonymella* could be corresponding to Z in ancestral lepidopteran karyotype in the text, because author did not mention that in the text.
- (7). In the legend of Figure 3 and text in page 10, author mentioned *P. xylostella* Chr $Z_1$ . However this should be Z chromosome in *P. xylostella* (not  $Z_1$ ).
- (8). In Table 1, author showed gene ID of *B. mori* ortholog and localization in *B. mori*. Where did author get these information of *B. mori*? I guess they are from KAIKObase. Author should cite KAIKObase in the Table.
- (9). In page 11, change *Hind* III to *Hind*III.
- (10). In section 3.5.5 of page 14, change *E. coli* BAC library to *Y. evonymella* BAC library.
- (11). In section 4.4 of page 22, author described FISH experimental design of Chr.  $Z_1$  and Chr. 15. However author did not cite the results shown in Figure 8. It would be better to explain this text of section 4.4 using Figure 8, for example, something like "the markers *DnaJ*, *ftz* and *SNF4* were hybridized to the chromosome spreads ♂1, ♂2 and ♂3, respectively (Figure 8a-c red signals)."
- (12). In the legend of Figure 9, *Yponomeuta evonymella* should be italic, and change chromosome  $Z_1$  to  $Z_1$  chromosome.

### Conclusion

The master thesis of Veronika Běháľková fully met the planned objectives. The author successfully created gene-based physical maps of  $Z_1$  chromosome and chromosome 15 in *Yponomeuta evonymella* and determined the gene orders in both chromosomes. The gene-based comparative mapping between *Y. evonymella* and other lepidopteran species clearly showed detailed chromosome rearrangements of the Z chromosome and chromosome 15 between three species studied. Previous reports suggest synteny of gene in Lepidoptera is relatively well conserved even among distant species. These results obtained by molecular cytogenetic analyses provided important insight into the genome architecture in *Y. evonymella* and these results should be also useful to achieve genome assembly in all *Yponomeuta* spp. The author thus proved the ability of independent research work and obtained original results. The submitted thesis meets the requirements for the master study.

**It is my pleasure to recommend the thesis for defence.**

I recommend grading the work as **excellent to very good**, depending on the quality of the oral presentation.

Atsuo Yoshido

In České Budějovice, 15 January 2020

