Re: PhD thesis review of RNDr. Lenka Mártaniová

Dear Prof. Bohuslav Gaš,

I have read and evaluated the PhD thesis entitled “Gene flow and its consequences for microevolution in Taraxacum (Asteraceae)” by RNDr. Lenka Mártaniová. The main subject of the thesis is the measurement of gene flow between sexual and asexual (apomictic) Taraxacum, and the potential impact of such flow for microevolutionary processes. The thesis can be broadly split into sections dealing with (1) the identification of possible modes of gene flow between sexual, apomictic, diploid and polyploid plants, (2) the assessment of facultative apomixis, and (3) an examination of the role of tetraploids as a “bridge” between other ploidy and reproductive biotypes.

The thesis is well-written, and summarizes a great deal of work considering crossing experiments, karyology and flow cytometric analyses. The experimental setup of the different experiments is, for the most part, well thought-out and logical. The results are clearly presented, and the PhD candidate has shown a clear understanding of the interpretations of the many types of data collected. I thus conclude that this thesis fulfills the requirements expected for obtaining a PhD.

I nonetheless have a number of questions for the candidate, some specific, and some more general:

1. My interpretation of facultative apomixis, in the context of this thesis, is that a single plant can produce seeds via both sexual and apomictic processes. Using this criteria, the experimental design of pooling seeds for FCSS analyses seems justified. But what about variability for expression of apomixis in different genetic backgrounds? Could the penetrance of “apomixis factors” differ in different accessions, and hence represent a quantitative trait? If so, should the experimental design be modified?

2. Page 39 – “The presence if a higher amount of viable pollen grains in tetraploids can explain that diploid-tetraploid crosses are much more successful than diploid-triploid ones”. What about maternal to paternal genome ratios during endosperm formation? Could this also have a potential influence on the potential success of interploidy crosses?

3. Page 39, Fig. 4 – Where does the 4C peak come from?
4. Page 63, Fig. 4 – The endosperm peak is interpreted as a single hexaploid value, but it appears that there are 2 peaks, and furthermore that the second peak is 7C. Is this possible, and how would this affect your interpretations of gene flow?

5. The ability of certain polyploid lineages to produce balanced chromosome sets in their gametes is an extremely interesting phenomenon (e.g. a triploid mother producing reduced gametes; Fig. 9, page 44). Is this really a result of meiotic reduction, or does the plant produce a range of aneuploid gametes, but the only surviving seed are ones receiving balanced chromosomes? Are there other known examples (in plants or animals) whereby polyploids segregate their chromosomes in a non-random fashion to produce balanced gametes? If so, how do they do it?

6. What do you think would be the relationship between clonal lineage age (i.e. how many generations a particular genotype has been asexual), and the potential of that lineage to produce viable offspring in a cross with a sexual? What would one expect to happen on both the chromosomal and molecular genetic levels of a clone as its evolutionary age increases?

I hope that my comments and questions are helpful, and wish the PhD candidate the very best of luck with the upcoming defense.

Very best wishes,

Dr. T.F. Sharbel