

**Review of PhD thesis**  
**“Role of clonal integration in plant competition“**  
**by Mgr. Jana Duchoslavová**

The submitted PhD thesis by Jana Duchoslavová represents a comprehensive examination of the role of clonal integration and the related translocation patterns of two crucial resources in plants: nitrogen and carbon. In her thesis, she specifically investigates whether the benefits of resource translocation in clonal plants align with theoretical predictions, how resources are translocated under simulated aboveground competition, how translocation changes during ramet ontogeny, whether patterns of resource translocation differ among species in predictable ways, and how clonal growth form affects species performance in real-life communities.

To address these questions, she employs a combination of sophisticated experiments using labelled nitrogen and carbon elements, long-term data from the Jena Experiment, and data from the CLO-PLA database. Jana's PhD thesis is well-organized, beginning with an Introduction that covers a wide range of relevant studies, identifies gaps in existing research, and positions her experiments within a broader context. She clearly defines her aims and provides an exhaustive five-subchapter Research Summary, where the results are presented clearly and accompanied by figures. Jana exhaustively summarizes all her findings once again in the General Conclusions section.

Although the thesis is quite lengthy (160 pages) and could be more concise, I found the Research Summary particularly enjoyable. It not only lists the results but also tells “the story of the thesis,” explaining how one idea led to another and how and why subsequent hypotheses were constructed, justifying her thoughts and approaches. Following the General Conclusions, Jana includes five papers, three of which are already published in high-impact journals, and two manuscripts—one under review and the other slightly unpolished. Importantly, Jana is the first author of all these papers.

I have only three minor remarks:

- (1) The thesis could be more concise. While I appreciate the topic, enjoyed the reading, the language is readable, and the text is well-structured, some statements and conclusions are repeated unnecessarily.
- (2) I would suggest not including Paper IV, as its unfinished version is a distraction compared to the other papers. Four strong first-author papers would suffice for the thesis.
- (3) More detailed legends in the Research Summary would be beneficial, as some information is missing. Additionally, the links to the supplements are absent.

To sum up, Jana's thesis is a significant contribution to the field of plant experimental ecology. It is well-written, thoroughly researched, and demonstrates a high level of academic rigor. I take the liberty to recommend this thesis for the defense, and based on the submitted work, I believe, Jana deserves a PhD title without a doubt.

**Questions for discussion:**

**P 21** *“Pitelka and Ashmun (1985) suggested three different strategies of clonal growth – a strategy that emphasizes lateral spread and resource exploration, a strategy that emphasizes ramet maintenance and a strategy of space monopolisation emphasising extensive integration of ramets”*  
Could the author shortly explain under which conditions the above listed strategies may be advantageous?



**P12** *"These studies suggested that the overall translocation pattern is not easily predictable from the pairs-of-ramet approach. It is necessary to keep this in mind, as there are usually multiple ramet systems in natural conditions."*

I consider this statement very important. Could the author briefly discuss how including three or more ramets in an experiment might affect the results of the thesis?

**P27** *„... but carbon translocation was directed to daughters. Therefore, their roots and emerging tillers probably formed a strong sink for carbon..."*

My alternative explanation is: Could it be that this is another way for the mother plants to get rid of their carbon surplus not just because of sink – there are green tillers already?

This my idea may be supported also by the statement on page 30 *"Agrostis daughter ramets appeared to be independent in nitrogen uptake two weeks after beginning of rooting under homogeneous conditions, and later they even translocated nitrogen back to the mothers"*

... To help them use a surplus of carbon by supporting the growth of mothers. Would the author agree?

**P 32** There is a hypothesis *"...clonal species perform better in communities with low proportions of clonals"*

Why does the author expect that? Is it because the intensity of competition among clonal species is higher than the competition between clonal and non-clonal species?

## **Paper 1**

**P 49** *"Daughters also responded to nutrients by changes in clonal architecture. Number of stolons increased, and maximum stolon length decreased in high nutrient levels", „The architectural responses are generally in accord with the foraging behaviour concept."*

Could the author describe the general relationship between clonal integration and foraging strategy in clonal species? There are several translocation strategies - supporting mothers, supporting daughters. When do these strategies align with the foraging strategy, and when do they oppose it?

**Method:** Why did the author study the growth response of *A. stolonifera* to a gradient of fertilizer dosing? Why was the dosing different from that in the integration experiment?

## **Paper 2**

**P 82** *"Overall, the magnitude of absolute resource flows did not decline with time as we originally expected, although individual ramets were obviously self-sustaining in terms of resource acquisition at the late."*

What does the author consider to be the cause of this finding? I did not find the answer in the text.

## **Paper 3**

**P96** *"Extended Hand strategy - We expect this strategy to be particularly effective for exploration of soil-borne resources which might get depleted by older ramets."*

Would the author expect this strategy to be more frequent in rhizomatous species than in stoloniferous as they can "analyse" soil resources directly?

A few sentences later the author state that: *„It is not yet clear how often translocation strategies occur in clonal plants and how translocation strategies depend on environmental conditions"*.

Anyway, does the author consider environmental conditions to be more important than morphology or morphology constraints for employing a specific translocation strategy?

## Paper 4

**P 120** „I aimed to test the proposed nutrient sharing strategies on translocation of nitrogen in six species that form aboveground horizontal stems and occur in habitats of varying productivity“  
However, the author cultivated the mother plants under the same low nutrient availability, which is natural only for some species. How might this fact influence the results? Couldn't mothers adapt their strategy to the experimental conditions?

**Comment:** To increase the informativeness of the figures, I recommend aligning the species according to their nutrient gradient or indicating where each species stands on the nitrogen availability gradient.

**P 130** „The nitrogen sharing strategy under heterogeneous nutrient availability would reflect the productivity of the habitats typically experienced by the species.“

Could the author describe her expectations regarding which translocation strategies she anticipated in the low and high ranges of nutrient availability gradient?

## Paper 5

**P 150** „Whereas absolute biomass of clonal species in mixtures slightly declined, it remained stable or increased in monocultures.“

Could a lower intraspecific competition than interspecific competition in clonal species be expected?

**P150** „Plants with clonal growth forms have been expected to be at an advantage in communities with a prevalence of nonclonal species due to the presence of incompletely filled clonal growth niches. Here we show that in communities with a low proportion of nonclonals, unfilled clonal growth niches may not exist, and plants with clonal growth may be at a disadvantage.“

Could the author explain why even a low proportion of non-clonal species results in no available clonal niche?

From the text on **P 150** results that in low diversity, species with long-rhizomes perform the best, species with short rhizomes perform best in monocultures, and stoloniferous species with non-clonal species. Based on these results, the author expects “only complementary exploitation strategies for light”. Next on the **P 150**, the author, however, states: „When we compared clonal and nonclonal species without distinguishing the different clonal growth forms, no effects of the number of sown species and the proportion of clonals on RY (relative species yield) were observed.“

Is not this the sign of clonal and non-clonal species general complementarity?

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Jana Martínková PhD

