Comments to the MS by Yacine & Loueille

This MS presents a model about the stability of plant animal-interactions when there is an ecological trade-off between attracting pollinators and deterring herbivores. Authors use adaptive dynamic modelling and invasibility analysis to find a relationship between the intensity of this trade-off and the resulting natural selection (stabilizing, directional, or disruptive) on a plant trait that influences both pollinator attraction and herbivore deterrence. The main results are that a high pollination strength compared to herbivory leads to stabilizing selection and coexistence of pollinator and herbivore, while a high herbivory strength compared to pollination leads to directional selection and extinction of one of the interactors. In cases of strong ecological trade-off, disruptive selection can occur, with the evolution of polymorphism in plant traits.

I found this MS inspiring. It may be relevant, for example, in the analysis not only of ecological trade-offs in which pollinators and herbivores are different species, but also in those cases in which pollinators and herbivores are the same species, such as in nursing pollination systems (Table 1 in Hahn & Brühl, 2016), or in the case in which the outcome of the interaction is not always of the same sign (Gómez et al., 2023).

As an empirical ecologist, I will not deal with the modelling itself, but on the ecological framework of this study. This ecological framework requires some clarifications. First, when reading this MS I wondered if the model applies to all potential tripartite interactions of plants with pollinators and herbivores or specifically to those in which there is a trade-off in attraction of pollinators vs. deterrence of herbivores. In principle, this model applies to the latter scenario. However, authors refer to a gradient between a strong trade-off and a weak trade-off, which makes me think that in the limit, the trade-off disappears and the interaction of the plant with its pollinator(s) or its herbivore(s) are independent of each other. Whether this limit situation can be interpreted from this model or not is relevant because the empirical evidence for trade-offs between pollination attraction and herbivore deterrence is limited and biased to strong trade-offs. Thus, authors should be careful in choosing the empirical references cited in the discussion; not any study including pollinators and herbivores is necessarily relevant, as many interactions may not entail a trade-off.

Second, a clarification about the meaning of the trait match between plant and animals is needed, early in the methods section. On page 21, line 406, trait match is mathematically described as t_p-t_m or t_p-t_h but (a) this description is given too late for readers to follow the argument and (b) the ecological meaning of t is uncertain; I found myself thinking sometimes in actual values of a trait (e.g., phenology) and sometimes in terms of (behavioural, chemical) preferences of both kinds of animals towards the plant (actually, it is easier to define t in the same "units" for the animals -t_p vs. t_h- than for any comparison between the animals and the plant).

Third, a clarification about the connection between animal dissimilarity and the strength of the trade-off should be provided. In particular, what do the authors mean by dissimilarity? Taxonomic, morphological, behavioural, in their preference for the plant, in the chemical receptors used to locate the plant, all of it, any of it?

The logic of this model seems to build on a previous model by the same authors (Yacine & Loeuille, 2022). It would be advisable to clearly present in the Introduction how the present study advances the arguments provided in the previous work.

Other minor aspects of the MS that need to be addressed:

1. Lines 91-113 should be a single paragraph.
2. Fig. 1. Please, in the figure caption make clear that panel A pictures an eco-evolutionary landscape. It was difficult to read this panel at first.
3. Results are rather long. I advise to add headings for the various kinds of results presented, at lines 265, 308, 353, and 407.
4. Lines 340-346, please, add strength after pollination or herbivory, to avoid confusion. Same in line 378. Same on the title of panel A in Fig. 6.
5. Line 380, "toward the pollinator phenotype and away from the herbivore one".
6. Line 564, *Nicotiana*, instead of *Nicotinia*.

I hope these comments will be useful to the authors.

Marcos Méndez
May 2023

References

Gómez, J. M.; Iriondo, J. M.; Torres, P. (2023). Modeling the continua in the outcomes of biotic interactions. *Ecology* 104: e3995.

Hahn, M.; Brühl, C. A. (2016). The secret pollinators: an overview of moth pollination with focus on Europe and North America. *Arthropod-Plant Interactions* 10: 21-28.

Yacine, Y.; Loeuille, N. (2022). Stable coexistence in plant-pollinator-herbivore communities requires balanced mutualistic vs antagonistic interactions. *Ecological Modelling* 465: 109857.