EFFECT OF ALTITUDINAL VARIATION ON PHENOLOGY AND HERBIVORY IN *TRIFOLIUM REPENS*

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INTRODUCTION

Phenology is an important ecological feature that can be influenced by many aspects. Climatic conditions related to increased altitude can influence the reproductive phenology of plants (for example, affecting seed production and size)[1]. Furthermore, the decrease in temperature is the most important environmental factor that affects the life cycle and activity of insects and herbivores [2].

Trifolium repens L. (Fabaceae) is one of the most important and widely used legumes throughout the world as a forage crop and nitrogen fixative. Commonly sown with grasses in temperate pastures, naturalized populations of the species can also be found in highland grasslands [3].

OBJECTIVE

The present work aims to evaluate the phenology of white clover (*T. repens*), and damage by herbivores at different altitudes (between 1.700 and 2.400 m) in the Itatiaia National Park (PNI), Brazil.

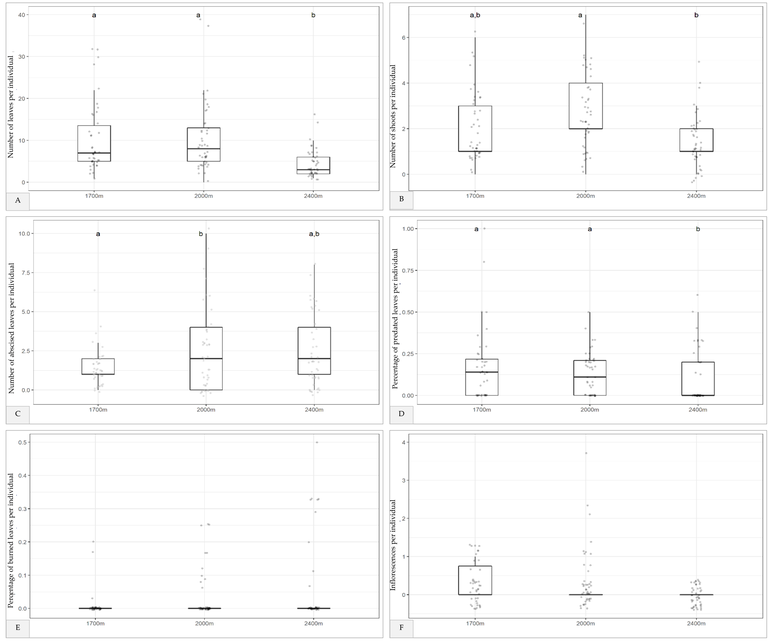
MATERIALS AND METHODS

Monthly observations were carried out at three altitudes (1,700 (L), 2,000 (M) and 2,400 (H) m) from June to August 2021, in 25 individuals of T. repens. For each individual, each phenophase of leaf budding, open leaves, flowering, fructification (ripe fruit), abscission (leaves in senescence and leafless petiole), as well as leaves burned by frost and leaves damaged by herbivory were recorded and quantified.

To assess whether altitude had an effect on phenology, herbivory and frost damage, linear mixed-effects models were performed using packages and functions in the R software[4].

RESULTS

The altitude affected the vegetative phenophases and the damage caused by herbivory (P<0.01). For the number of leaves, individuals from region H had the lowest number of leaves, not differing from the other regions. Region M exhibited a greater number of shoots and abscissions, also not different from the other regions. Altitude H had a lower herbivory rate than the others. It was not possible to observe the influence of altitude on the percentage of leaves burned by frost. Finally, altitude H was the only one that did not show any individual flowering in the months of observation, but the low intensity of this phenophase at other altitudes was not possible to determine whether the altitude is in fact affecting flowering.



DISCUSSION

Altitude M had the highest number of shoots and abscissions and altitude H had the lowest number of open leaves, this fact can be explained by the influence of cli-mate at high altitudes. More than any other bioclimatic zone, phenological events at high altitudes are limited by a short growing season bounded by cold temperatures [5]. The influence of climate on the growing season and therefore on phenology can be observed in transplant experiments. Plants transplanted to lower altitudes usually develop earlier than those left in their native high elevation locations [6]. As for the damage caused by herbivores, altitude H had a lower predation rate compared to the others. This result was already expected, ever since it is widely known that high altitudes can reduce the occurrence of various insects and herbivores [2], among them herbivores such as molluscs that usually feed on clover leaves [7].

CONCLUSION

In this preliminary study, the results were satisfactory with significant indices. Showing that phenological data and herbivory in white clover are related to altitude. However, it is necessary to increase the sampling to obtain robustness in the study. To this end, monthly data collection fields are planned until June 2022 to include one year of morphological data in the analyses.

REFERENCES

[1]. Akhalkatsi, M.; Wagner, J. Reproductive phenology and seed development of Gentianella caucasea in different habitats in the Central Caucasus. *Flora* **1996**, *Volume 191, p., 161-168.* **[2].** Suzuki, S. Leaf phenology, seasonal changes in leaf quality and herbivory pattern of Sanguisorba tenuifolia at different altitudes. *Oecologia* **1998**, *Volume 117, p. 169–176*. **[3].** Zohary, M.; Heller, D. The Genus Trifolium. The Israel Academy of Sciences and Humanities, Jerusalem **1984** p. 606.. **[4].** R Core Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, **2019**. **[5].** Fox, J.; Weisberg, S. An {R} Companion to Applied Regression. *Oaks* **2011**, *Volume 2*. **[6].** Wagner, J.; Reichegger, B. Phenology and seed development of the alpine sedges Carex curvula and Carex firma in response to contrasting topoclimates. *Artic* **1997**, *Volume 29, p.291–299*. **[7].** Dirzo, R.; Harper, J. L. Experimental studies on slug-plant interactions: III. Differences in the acceptability of individual plants of Trifolium repens to slugs and snails. *Ecology* **1982**, *Volume 70, p. 101–117*.