Impact of intraspecific trait variance on interspecific competition: a theoretical case study using the Virtual Grassland model

Béatrice Wolff, Bernadette Julier, Gaétan Louarn

HAL Id: hal-03323282
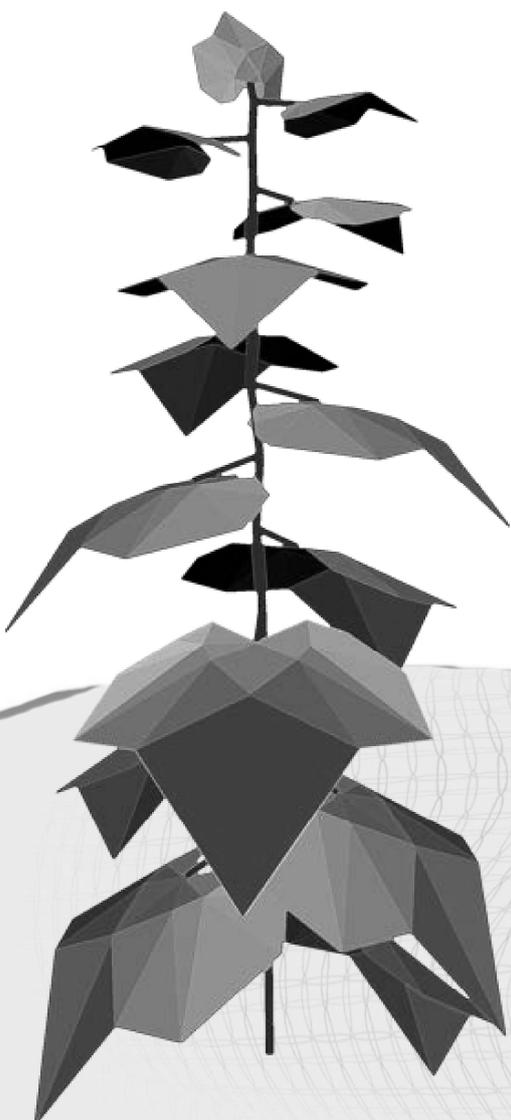## https://hal.inrae.fr/hal-03323282

Book of Abstracts

Editors
Katrin Kahlen
Tsu-Wei Chen
Andreas Fricke
Hartmut Stützel

FSPM2020:

Towards Computable Plan

9th International Conference o
FUNCTIONAL-STRUCTURAL PLANT MODELS
5-9 October 2

Impact of intraspecific trait variance on interspecific competition: a theoretical case study using the Virtual Grassland model

Béatrice Wolff [1], Bernadette Julier [1], Gaëtan Louarn[1]

[1] INRAE, UR 004 P3F, route de Saintes, F86600 Lusignan, France

For correspondence: gaetan.louarn@inra.fr

Keywords: grasslands, intraspecific variability, individual-based model, competition, stability

Increasing intra-specific genetic variability has been identified as a potential factor stabilizing yield and botanic composition in grasslands. However, little is known about the mechanisms by which such diversity might promote stability. Virtual Grassland (Louarn and Faverjon, 2018) is an individual-based model available on the Openalea platform that simulates plant-plant competition for resources (light, water, nutrients). This model has already been assessed for contrasting legume-based binary mixtures. However, the parameters of each species were considered as for an « average plant » and did not reflected the intraspecific diversity actually present in grassland species populations (Louarn et al., 2020). The present study proposes to test the impact of incorporating trait variance through a Gaussian distribution of parameter values, and to test its effects for a major parameter involved in light competition (i.e. internode length). The range of trait variability was calibrated for two species from nursery experiments on isolated plants of alfalfa and red clover. A series of virtual binary competition experiments was then simulated following a de Wit replacement design to analyse the potential impact of average trait value differences, trait variance and species proportion on the outcome of competition in terms of yield and deviation of species proportion. The results showed that the impact of a greater trait variance on mixture stability depended on the range of variability tested with respect to average trait difference between the species, and thus from the degree of overlap between trait values from the two species. This more precise characterization of interaction traits in grassland species should facilitate the identification of selection criteria for the creation of new varieties adapted to mixture conditions.

References

Louarn, G., & Faverjon, L. (2018). Annals of Botany, 121(5), 875-896., doi: 10.1093/aob/mcx154
Louarn, G., Barillot, R., Combes, D., & Escobar-Gutiérrez, A. (2020). Annals of Botany., doi: 10.1093/aob/mcaa014