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#091

Identification of shoot architectural traits to promote winter oilseed rape vigour during the vegetative growth: a simulation approach

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Background:

Winter oilseed rape (WOSR) cultivation can often face establishment difficulties due to the lack of water at the beginning of growth and/or pest damage, recently increased by climate change and environmental regulations. Farmers are therefore looking for more vigorous cultivars, which are able to better resist such stresses due to high carbon uptake efficiency and lead to improved crop establishment and yield.

Objective:

Our work aimed to identify and classify important shoot architectural traits of WOSR during the vegetative growth which improve light capture and favour the selection of vigorous WOSR cultivars.

Methods:

Our strategy was to build a model of leaf area establishment of WOSR at vegetative stage, to calibrate and evaluate it with experimental architectural data on isolated plants, and to connect it to a light interception model. Our model describes the establishment of leaf area through time (expressed in degree.days), with a 3D representation of the leaves and their geometry. We use phyllochron (time between the emergence of two leaves) to parameterize the appearance of a new leaf over time. Leaves are separated by an angle of 137,5 °. Each leaf is characterized by its length of the limb, from which infers its width, leaf area, petiole length and curvature angle through allometric relationships. Limb length, and thus leaf area, increases with thermal time, according to a growth rate parameter and a maximal leaf area, which varies with the total leaf area of the plant. This architectural model was connected the architectural model to a light interception model (Caribu; Chelle and Andrieu, 1998), in OpenAlea modelling platform (Pradal *et al.*, 2008).

Results:

We will showcase our results and model assembly (light interception model and leaf area establishment model) used to simulate a wide range of phenotypes and estimate which parameters (e.g. phyllochron, leaf length, leaf curvature angle, leaf speed growth) can maximize light capture, depending on plant density.

Conclusions:

We developed a new data-driven 3D architectural model of leaf area establishment for WOSR during the vegetative growth. The model represents a powerful tool to design ideotypes that improve light capture and guide the selection of vigorous WOSR cultivars. In the near future, we intend to add metabolic processes (C acquisition and effects on leaf area expansion and biomass) and complete the model during the entire crop cycle.

References:

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