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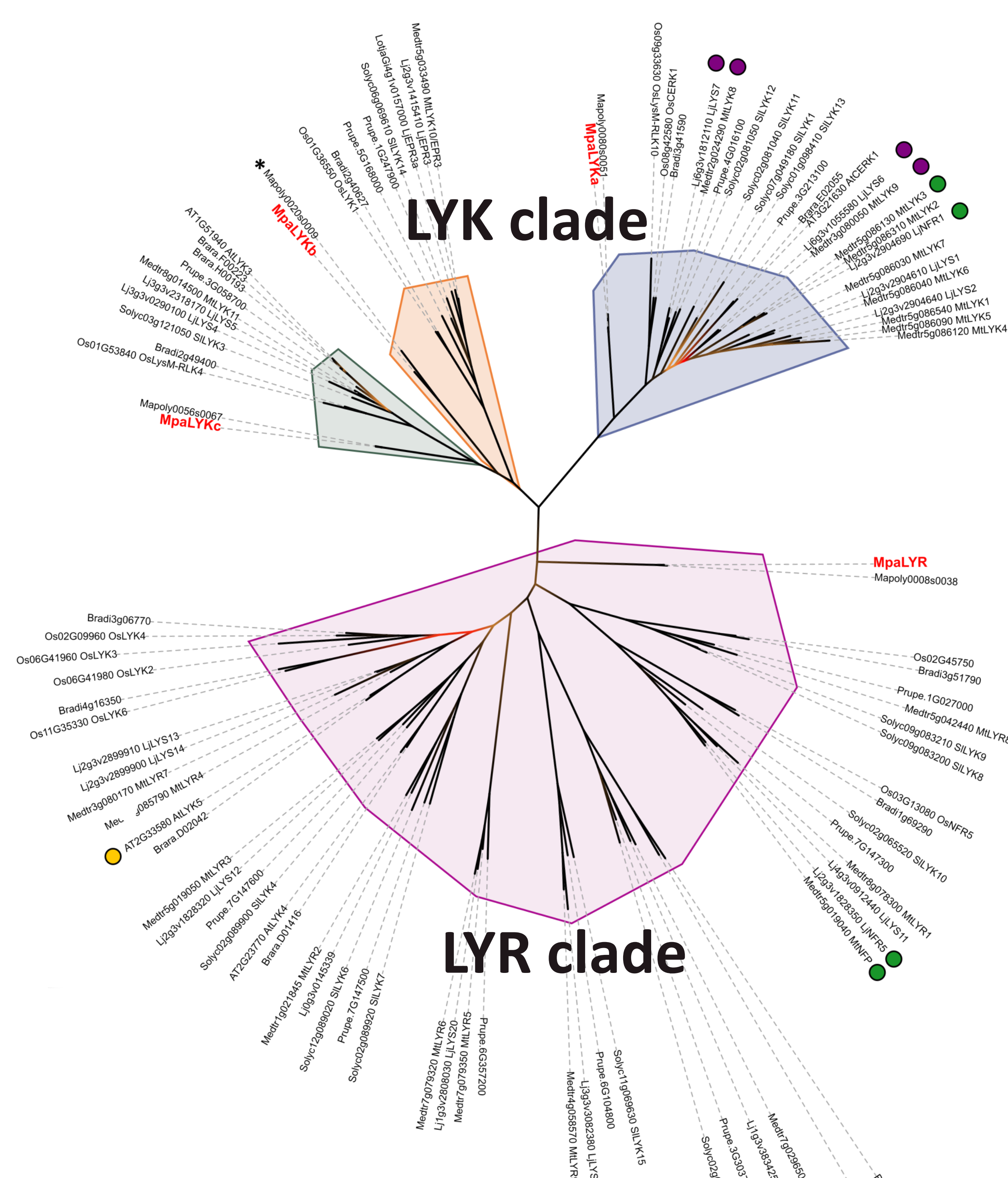
# The *Marchantia paleacea* Myc-factors receptor LYR is not required for AM establishment.

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## Context

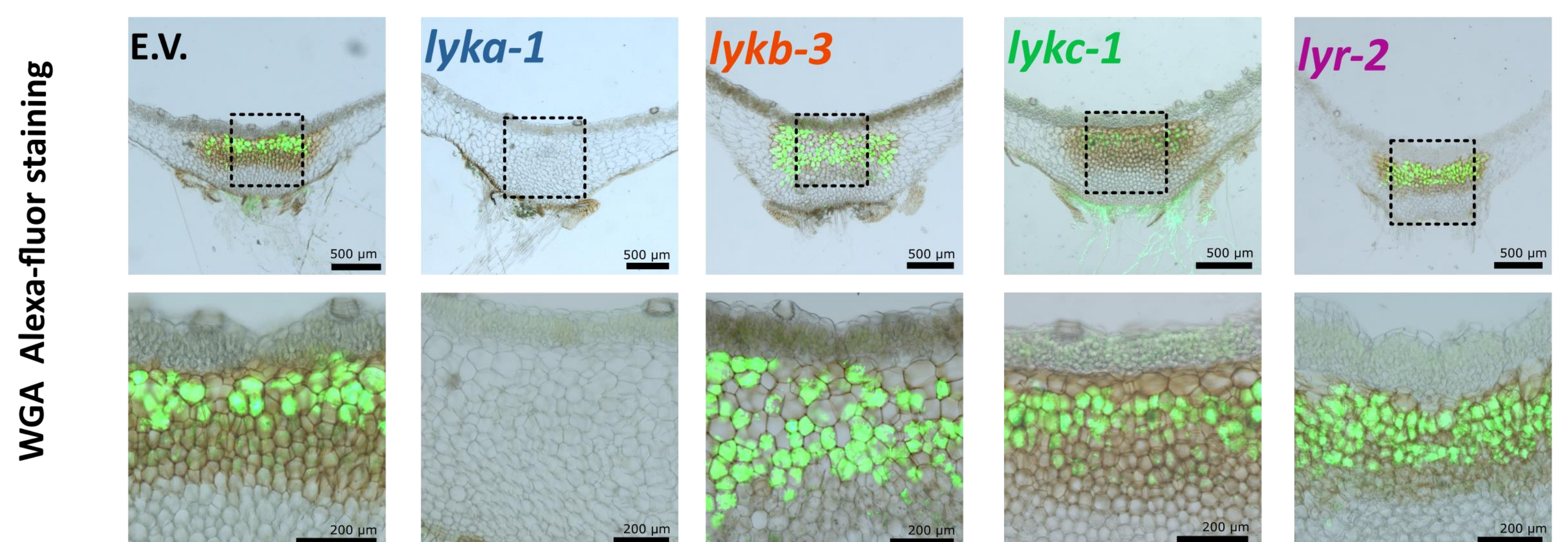
Most land plants form a symbiosis with **arbuscular mycorrhizal fungi** (AM) to acquire water and phosphorus, while nitrogen-fixing symbiosis with rhizobia (NFS) is limited to legumes<sup>1</sup>. Genetic studies on NFS have revealed the crucial roles of plasma membrane-anchored LysM Receptor-Like Kinases in perceiving microbial-derived molecules that are essential for establishing NFS<sup>2</sup>. In contrast, single loss-of-function mutants of LysM-RLKs in angiosperms only have quantitative effects on AM establishment. Here, we conducted a systematic study of this gene family in the liverwort *Marchantia paleacea*, which has only **four LysM-RLKs** in its genome.

## The AtCERK1 ortholog LYKa, but not the single LYR, is strictly required for AM establishment in *M. paleacea*



### 1 - Phylogenetic tree of LysM-RLKs

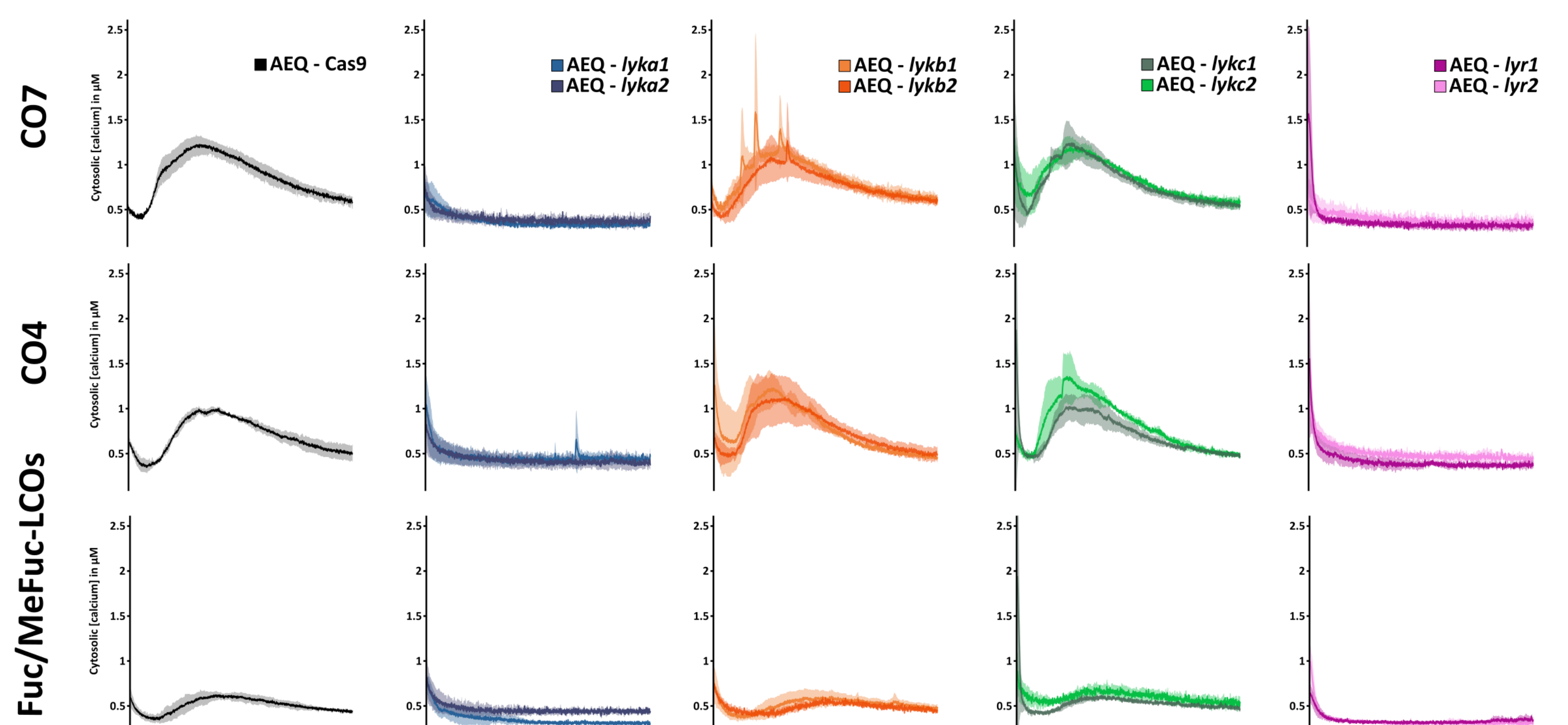
Different phylogenetic groups are shown in different colors. Red: all *Marchantia paleacea* sequences. Green dots: *Lotus japonicus* or *Medicago truncatula* Nod Factor receptors (MtLYK3/LjNFR1 & MtNFP/LjNFR5). Purple dots: *L. japonicus* or *M. truncatula* receptors conjointly required for AM (MtLYK8/MtLYK9 & LjLYS6/LjLYS7).



### 2 - AM phenotypes of single receptor mutants

Transversal sections of *M. paleacea* control (E.V.) or single *lysm-rlk* mutants six weeks after inoculation with *Rhizophagus irregularis*. Panels are overlays of bright fields and fluorescent images of wheat germ agglutinin (WGA) coupled to Alexa Fluor 488 to detect fungal structures. Dashed line-delimited insets are enlarged underneath the original images.

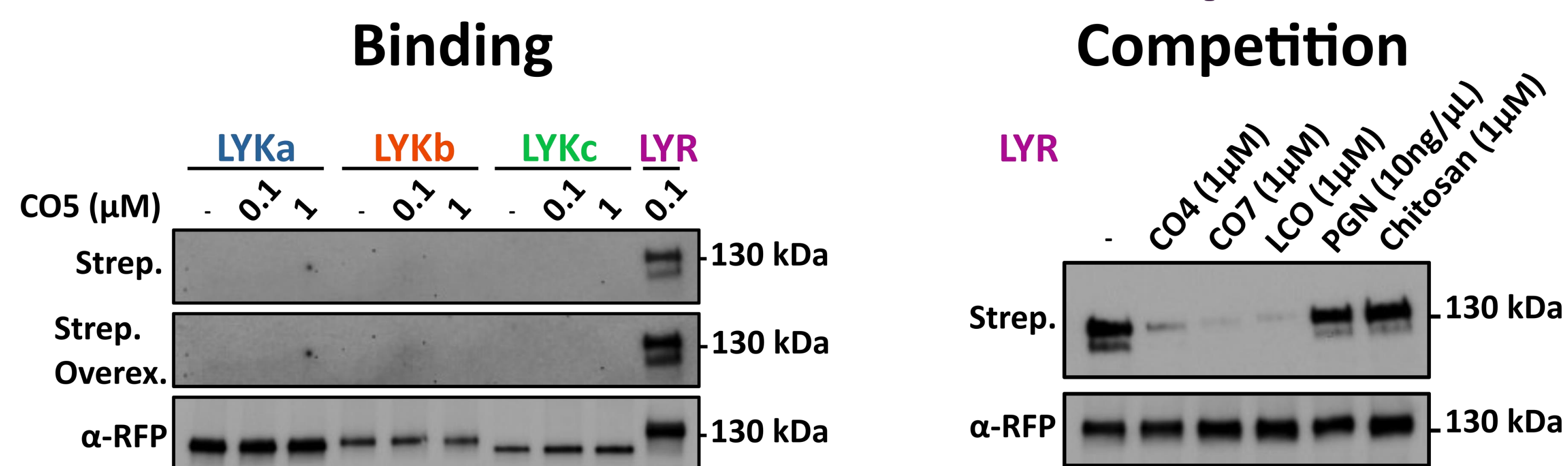
### lyka and lyr lost responsiveness to MYC-factors



### 3 - Cytosolic calcium variation in receptor mutants

Control (AEQ-cas9) or aequorin-expressing single *lysm-rlk* mutants (as indicated) treated with 1µM chitoheptaose (CO7), 1µM chitotetraose (CO4) or 1µM LCOs. Each trace represents the mean (line) ± standard deviation (shading) from at least three replicates over a time course of 15 min.

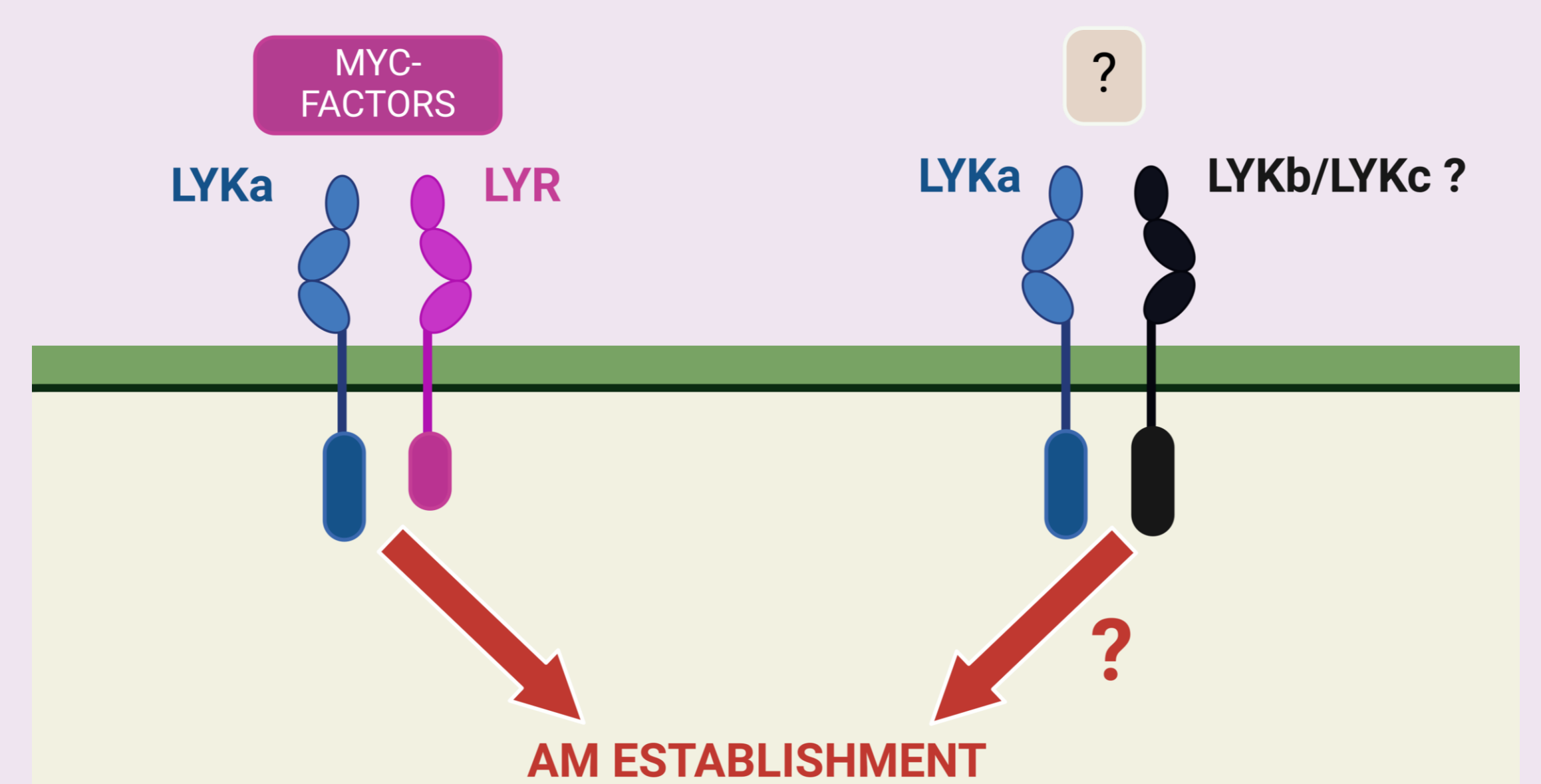
## LYR is the MYC-factors receptor



### 4 - Binding assays on LysM-RLK of *Marchantia paleacea*.

Binding affinity has been tested either with CO5/biotin on all 4 LysM-RLKs at low (0,1µM) and high (1µM) concentrations. Competition assays between 100nM CO5/biotin-bound LYR and unlabelled CO4, CO7 and LCOs or chitosan demonstrate the non-selectivity of LYR for CO4, CO7 and LCOs.

## A model ?



References :  
 1. Oldroyd, G. E. D. (2013). Speak, friend, and enter: Signalling systems that promote beneficial symbiotic associations in plants. *Nature Reviews Microbiology*  
 2. Buendia, L., Girardin, A., Wang, T., Cottret, L., & Lefebvre, B. (2018). LysM receptor-like kinase and lysM receptor-like protein families: An update on phylogeny and functional characterization. In *Frontiers in Plant Science*