Proper geometry of leaflets is important for their movement in legumes

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Most legume species have compound leaves with multiple joined units termed leaflets, and the geometry of leaflets (the spatial structure and organization of leaflets) largely determines the compound leaf shape,

which has been broadly recognized in model compound-leafed species.

Previous studies mainly focused on the role of the pulvinus in leaf movement, but to date, there is very little information about the contribution of other elements of the compound leaf, e.g., the leaflet geometry, to the movement phenomenon.

In a study published in *New Phytologist*, Prof. Chen Jianghua's team from the Xishuangbanna Tropical Botanical Garden (XTBG) performed a large-scale forward genetic screening and whole -genome resequencing in Tnt1 retrotransposon-tagged mutant populations of the model legume Medicago truncatula.

They found that two allelic mutants of M. truncatula with unclosed leaflets at night were impaired in MtDWFARF4A (MtDWF4A), a gene encoding a cytochrome P450 protein orthologous to Arabidopsis DWARF4.

A combination of whole genome sequencing, genetic linkage and complementation analyses revealed that those mutants are loss-of-function mtdwarf4a (mtdwf4a) alleles.

The mtdwf4a mutant also had a mild brassinosteroid-deficient phenotype bearing pulvini without significant deficiency in organ identity. Both mtdwf4a and dwf4 could be fully rescued by MtDWF4A, and mtdwf4a could close their leaflets at night after the application of exogenous 24-epi-BL.

Surgical experiments and genetic analysis of double mutants revealed that the failure to exhibit leaf movement in mtdwf4a is a consequence of the physical obstruction of the overlapping leaflet laminae, suggesting a proper geometry of leaflets is important for their movement in M. truncatula.

"These provide us with a novel insight into the nyctinastic leaf movement, that the proper geometry of compound leaf is important for leaflets to close in the night, and shedding light on the importance of open space for organ movements in plants," said Prof. Chen Jianghua, principal investigator of the study.

More information: Weiyue Zhao et al. The geometry of the compound leaf plays a significant role in the leaf movement of Medicago truncatula modulated by mtdwarf4a, *New Phytologist* (2021). DOI: 10.1111/nph.17198

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