**Unravelling unequal redundancies and novel roles for rice *PISTILLATA* (*PI*) clade organ patterning genes in flowering, floral organ development and fertility**

**Usha Vijayraghavan** [1](https://ipmb-2023.p.asnevents.com.au/days/2024-06-25/abstract/106057#affiliation_193453) , Mohamed Zamzam [1](https://ipmb-2023.p.asnevents.com.au/days/2024-06-25/abstract/106057#affiliation_193453) , Sharad Singh [1](https://ipmb-2023.p.asnevents.com.au/days/2024-06-25/abstract/106057#affiliation_193453) , Raghavaram Peesapati [1](https://ipmb-2023.p.asnevents.com.au/days/2024-06-25/abstract/106057#affiliation_193453) , Sandhan Prakash [1](https://ipmb-2023.p.asnevents.com.au/days/2024-06-25/abstract/106057#affiliation_193453) , Ritabrata Basak [1](https://ipmb-2023.p.asnevents.com.au/days/2024-06-25/abstract/106057#affiliation_193453) , Imtiyaz Khanday [1](https://ipmb-2023.p.asnevents.com.au/days/2024-06-25/abstract/106057#affiliation_193453) , Sara Simonini [2](https://ipmb-2023.p.asnevents.com.au/days/2024-06-25/abstract/106057#affiliation_193455) , Ueli Grossniklaus [2](https://ipmb-2023.p.asnevents.com.au/days/2024-06-25/abstract/106057#affiliation_193455)

1. Indian Institute of Science, Bangalore, KARNATAKA, India
2. Plant and Microbial Biology , Professor, University of Zurich, Zurich, Switzerland

The structure of grass flowers – or florets - is rather distinct, with highly specialized organs. The rice branched inflorescence (panicle) has single florets made on the spikelet- the final short branch of the panicle. Floret organs in the outer two whorls have distinct morphologies and functions. Lodicules are a pair of unique second whorl small fleshy organs regarded as the eudicot petal analogue. Their shape, size, morphology and functions are strikingly different from eudicot petals. These properties direct their role in the timed opening and closing of the floret, permitting stamen emergence and cross-pollination. Here we investigated the developmental functions of the rice floral organ patterning*PISTILLATA* (*PI*) paralogs; *OsMADS2* and *OsMADS4* using mutants, transgenic complementation assays, and functional genomics. We uncover the unequal redundancies between these paralogs and discover their novel developmental roles in many unanticipated aspects of flowering (flowering time, floral meristem size) and in the suppression of parthenocarpy. The developmental pathways and target genes regulated by OsMADS2 were determined through RNA-Seq and ChIP-Seq analyses. These data provide insights into the molecular roles of OsMADS2 in rice floral development with notable (in)direct targets that explain its roles in the control of cell proliferation, cell wall elasticity, cell elongation, vascular development, osmotic regulation, and local auxin levels. Collectively, these data expand the previously established roles of PI clade genes in patterning the second and third whorl floral organs by identifying unique species-specific developmental roles of the rice *PI* clade genes.