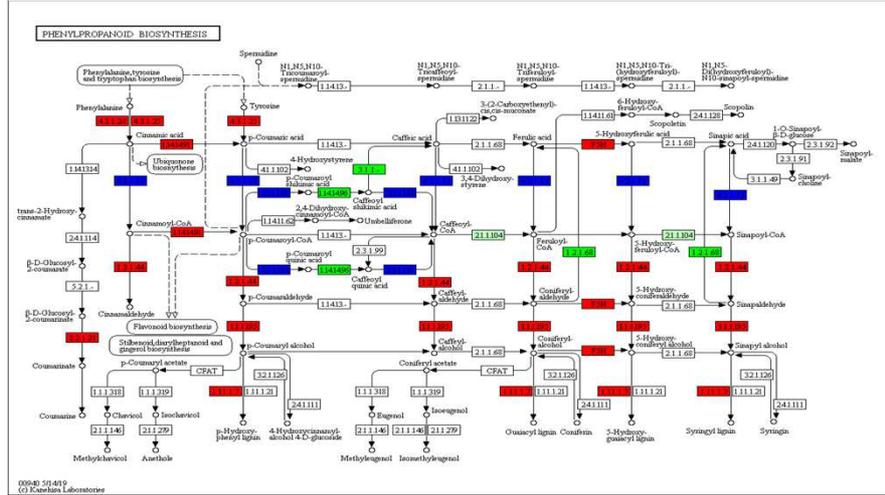
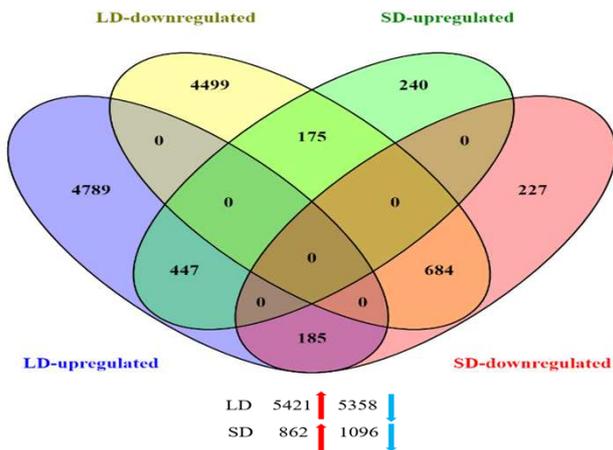


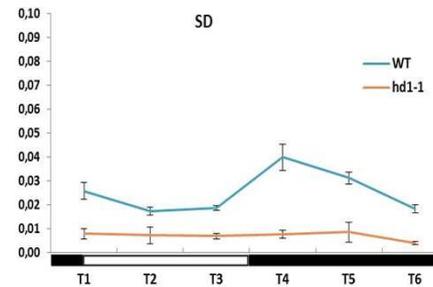
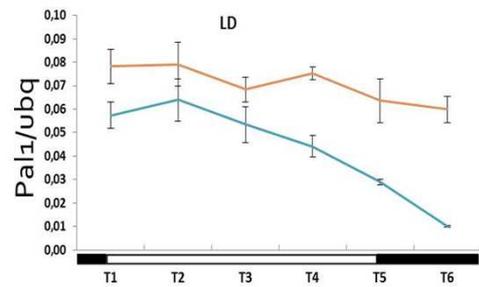
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**Background:** The *Oryza sativa* gene *Hd1*, orthologous of Arabidopsis *CONSTANS* (*CO*), encodes for a zinc finger transcription factor that is known as one of the master regulators of flowering time in rice. Hd1 regulates the reproductive transition under both short days (SD), promoting it, and long days (LD), delaying it. This functional switch is a major feature of Hd1, but its impact on global gene expression remains unexplored. In this work, we performed a global analysis of gene expression and identified all the genes whose transcription depends upon Hd1 either under SD or LD. We thus detected the main regulatory pathways under Hd1 control.



RNA-Sequencing identified 1958 and 10779 genes differentially expressed under SD and LD, respectively. Interestingly 360 genes were differentially expressed in opposite directions depending upon the photoperiod

RNA-Sequencing highlights the deregulation for many genes involved in phenylpropanoids biosynthesis. In red are shown the genes up regulated in LD; in blue the genes up regulated in SD; in green the genes upregulated in both the conditions.

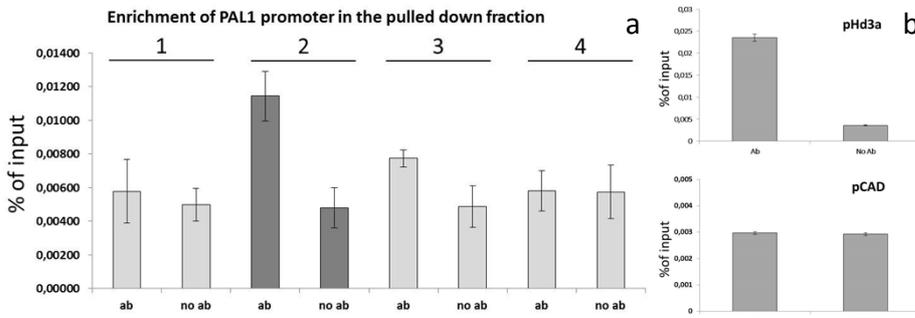


Phenylalanine Ammonia Lyase 1 (*Pal1*) time course expression under LD and SD in wild type plants, blue line, and in *hd1-1* mutants.

Up LD		Down LD	
motif	score	motif	score
GTGTGTGCTG---	1.249	GCTAGGGTTT-	1.266
--GGTGACTGA-	1.199	--TAGGGTTT-	1.172
--GTGAGCTG---	1.146	--GAGGGTTT-	1.142
--GTGTGCTG---	1.089	----GGGTTT-	1.141
--TGCTGCTT---	1.074	--TTGGGGGA-	1.128
----CAGCTACT-	1.065	--TGGGGTTC	1.125
		--TAGGGT---	1.087

Up SD		Down SD	
motif	score	motif	score
-GTGTGTGTG-	1.159	-GGGTTGGAT	1.458
---TGTGTGCTGC	1.125	--GGTTTGG-	1.294
-GTGGTGTG---	1.06	--GGATTGGA-	1.229
----TGTGCTGC	1.051	--GGATTGGA-	1.119
		---GTTTGGG	1.067
		---GTTTT---	1.002
		---GTTTGG--	0.9916



*De novo* motif discovery (-500 +100 from TSS) revealed enrichment for the 5'-TGTG-3' motif in the promoters of genes differentially regulated, similar to the published 5'-TGTGG-3' motif bound by both CO and Hd1<sup>1,2</sup>.

**Conclusions:** This work shows that Hd1 has additional roles, other than photoperiodic flowering control, describing the link between Hd1 regulation and secondary metabolites production.

**References:**

- 1 Gnesutta et al., The Plant Cell, 2017.
- 2 Cuicui Shen et al., The Plant Cell, 2020
- 3 Goretta et al., Plos Genetics, 2017

ChIP assays showed the physical interaction of Hd1 on this motif present in the promoters of *PAL1(a)* and *Hd3a (b)*, the latter being a known target of Hd1<sup>3</sup>. The promoter of the gene *Cad* is not bound by Hd1 protein.

Sequence 2: GCGCGACCAACCA **CCACA** CAG **CCACA** GCGCCGCACACGAAACTT **CCACA** CCGCAGAGCCCAAAA