Regulation of fruiting body development in Winter Mushroom

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Most of the edible mushrooms cannot be cultivated or have low yield under industrial conditions, partially due to the lack of knowledge on how fruiting body development is regulated. From Winter Mushroom (Flammulina velutipes), one of the most popular industrially cultivated mushrooms, three novel regulators of fruiting body development were identified.

FvCPC-2 is a protein containing a seven-WD40 repeats domain. The fruiting body development could be completely impaired by Fvcpc2 knockdown. Overexpression of Fvcpc2 could shorten the cultivation time by 3 days. FvCPC-2 regulates the expression of some genes important for fruiting body development. The ortholog of FvCPC-2 in Neurospora crassa, CPC-2, was reported as a positive regulator of protoperithecium formation. Fvcpc2 could restore the fertility phenotype to the ∆cpc-2 mutant, indicating that FvCPC-2 and its ortholog CPC-2 have the same function.

PDD1 is a transcription factor with a HMG-box domain. It increased transcription during fruiting body development. The pdd1 knockdown strain with 89.9% reduction in the pdd1 transcription failed to produce primordia, while overexpression of pdd1 promoted fruiting body development. PDD1 positively regulated several genes related to fruiting. PDD1 homologs are widely present in other basidiomycetes. Transcription factor LFC1 has a ZnCys domain, and its encoding gene decreases transcription during fruiting body development in F. velutipes. The lfc1 overexpression strains delayed primordia formation and produced abnormal fruiting body with stubby stipe and irregular cap. Conversely, knockdown of lfc1 promoted fruiting body development. Thus, LFC1 is a negative regulator of fruiting body development in F. velutipes.