Karyollele specific expression in Agaricus Bisporus

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Publication date
2016

Document Version
Final published version

Citation (APA)
Gehrmann, T., Pelkmans, J. F., Wösten, H. A. B., Ohm, R., Sonnenberg, A., Baars, J. J. P., Reinders, M., & Abeel, T. (2016). *Karyollele specific expression in Agaricus Bisporus*.

Karyollele specific expression in *Agaricus Bisporus*

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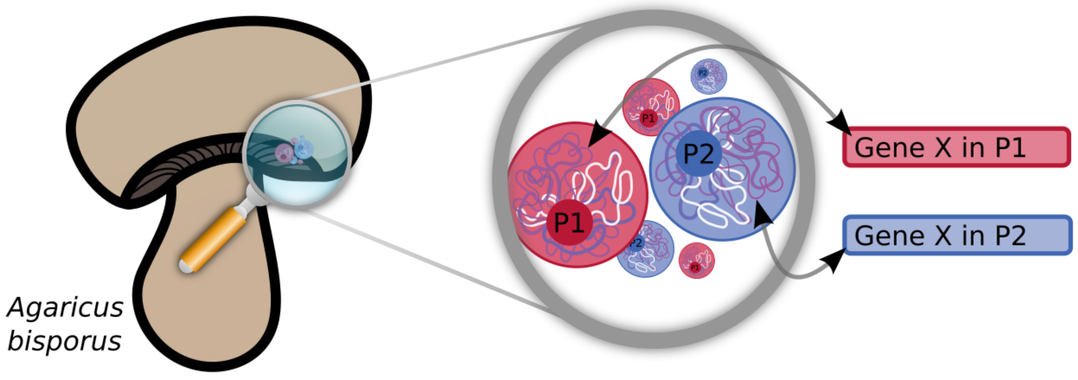
What is a "*karyollele*"?

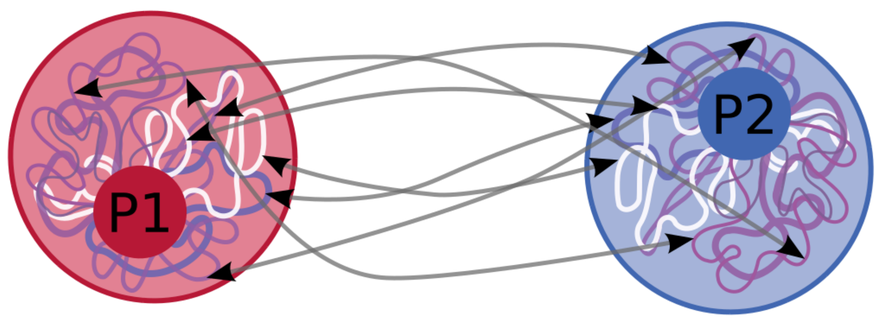
Agaricus bisporus contains on average 6 nuclei (**karyons**) per cell. Each is haploid, and originates from one of the parental genomes, called ***homokaryons***. Genes exist in two forms in different homokaryons, at different ***karyolleles.*** The nuclear separation of the two karyolleles may provide another level of regulation.



Method

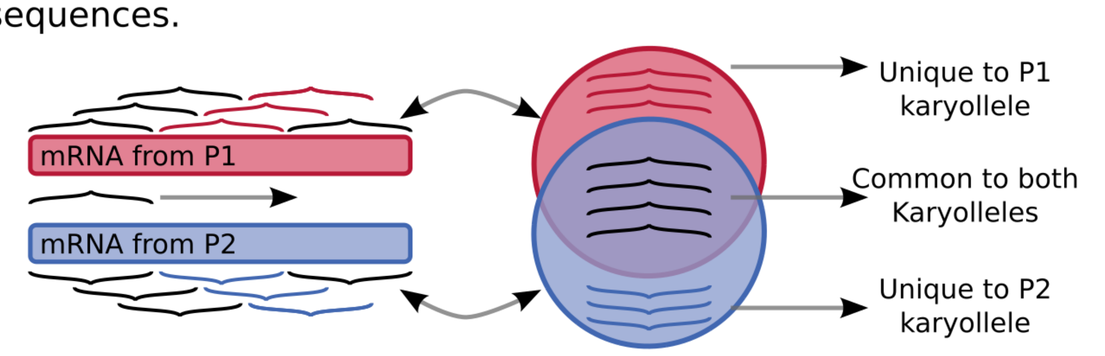
The P1 and P2 homokaryon genomes, recently sequenced, allow us to identify markers unique to each karyollele. First, we must identify the karyolleles, by mapping the genes in the homokaryons.

1) Karyollele identification by gene mapping



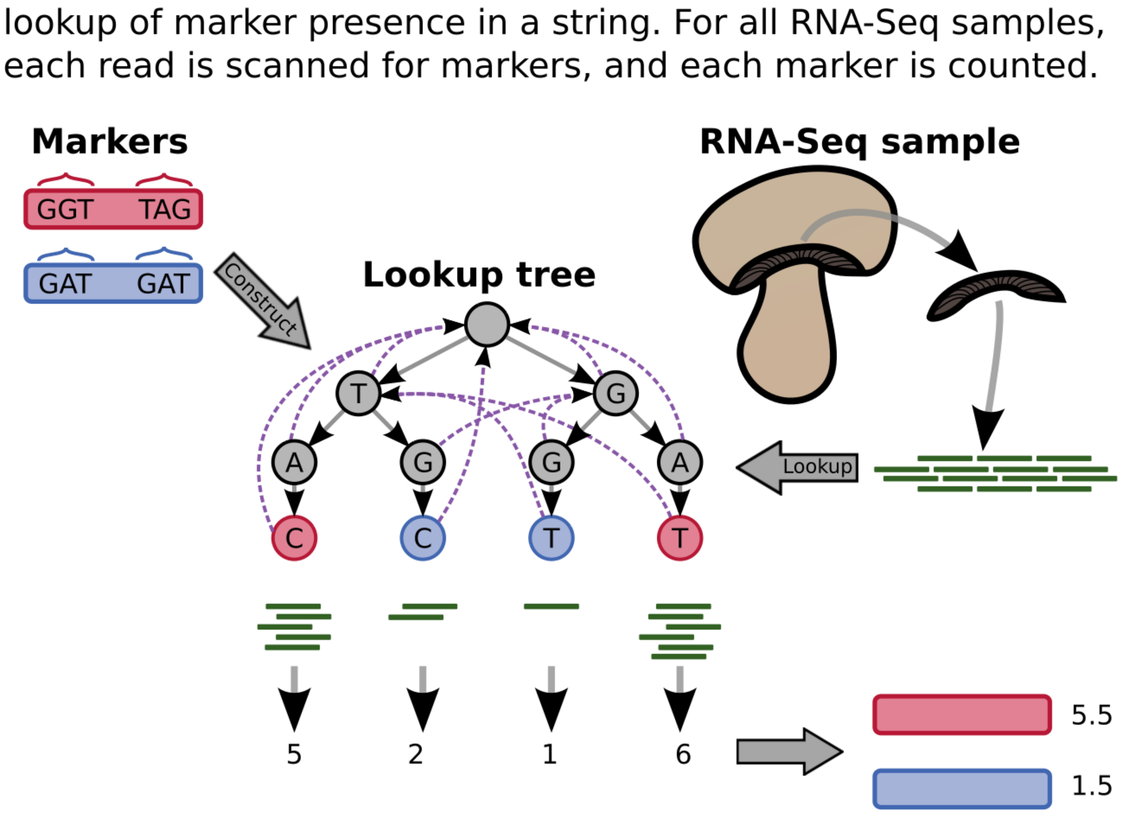
2) Unique Marker Discovery

For each karyollele pair, find markers that distinguish their mRNA sequences.



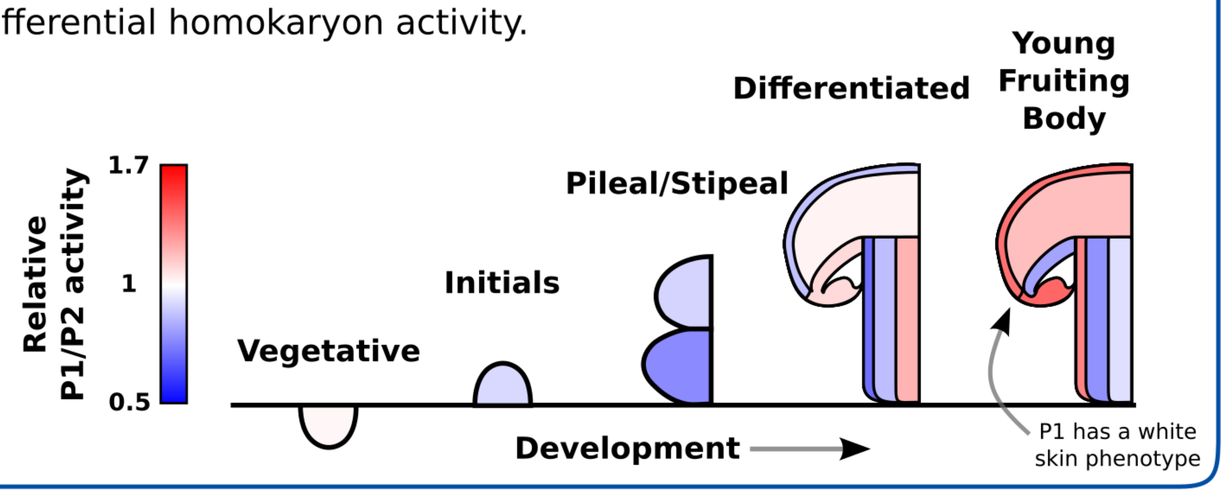
3) Karyollele Quantification

All markers are added to an Aho-Corasick trie to allow efficient lookup of marker presence in a string. For all RNA-Seq samples, each read is scanned for markers, and each marker is counted.



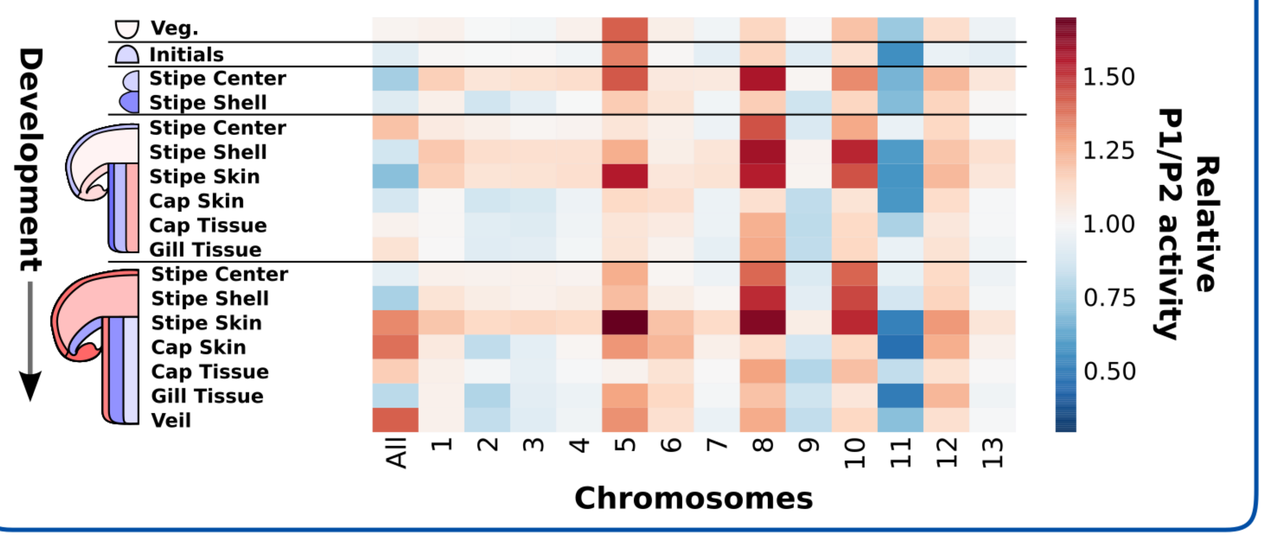
Tissue dependent homokaryon activity

We compare the total homokaryon activity between different tissues, sampled throughout mushroom development. Tissues exhibit a differential homokaryon activity.



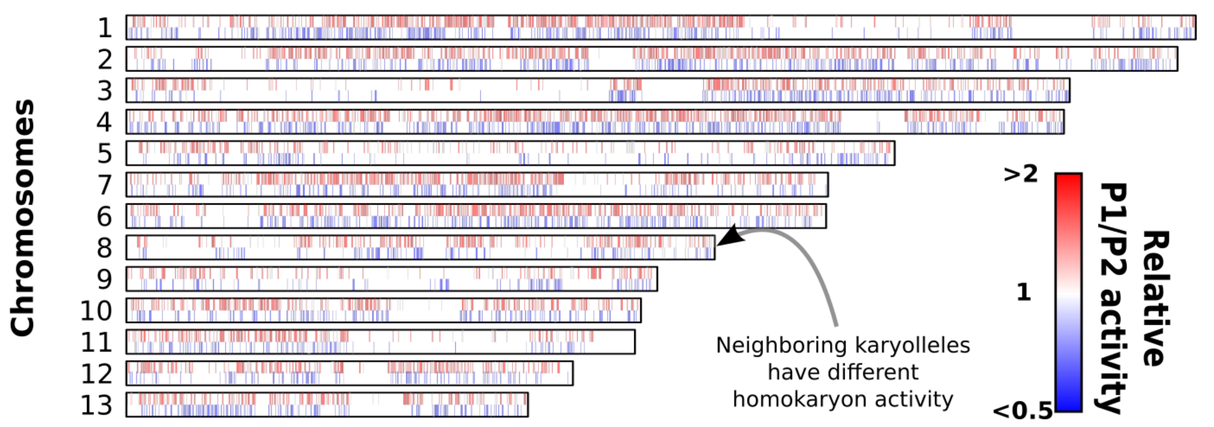
Homokaryons prefferentially express different chromosomes

We examine the homokaryon activity for each chromosme, and find that chromosomes are prefferentially expressed in one over the other.



Karyolleles are differentially expressed

Karyolleles exhibit differential expression between homokaryons. 520 are statistically significant, and function as core metabolic genes and transcription factors.



Biological mechanisms

Since individual genes may be differently regulated on the same chromosome, the results indicate that the changes in expression may be the result of local epigenetic modifications, or promotor/enhancer changes, rather than a regulation of nuclei or chromosomes. However, this can not be entirely excluded, as gene cluster effects may exist.

Practical consequences

The P1 homokaryon, upregulated in skin tissue, has a white phenotype. This, together with differential chromosome activity per chromosome is of particular interest for breeding purposes to achieve better mushrooms. Additionally, many bioreactor fungi have multiple nuclei, and these results are important for the design of better bioreactors.

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