

Disclosing the Causes Underlying Sterility in *Zygosaccharomyces* Allodiploid Yeast by NGS-assisted Approaches

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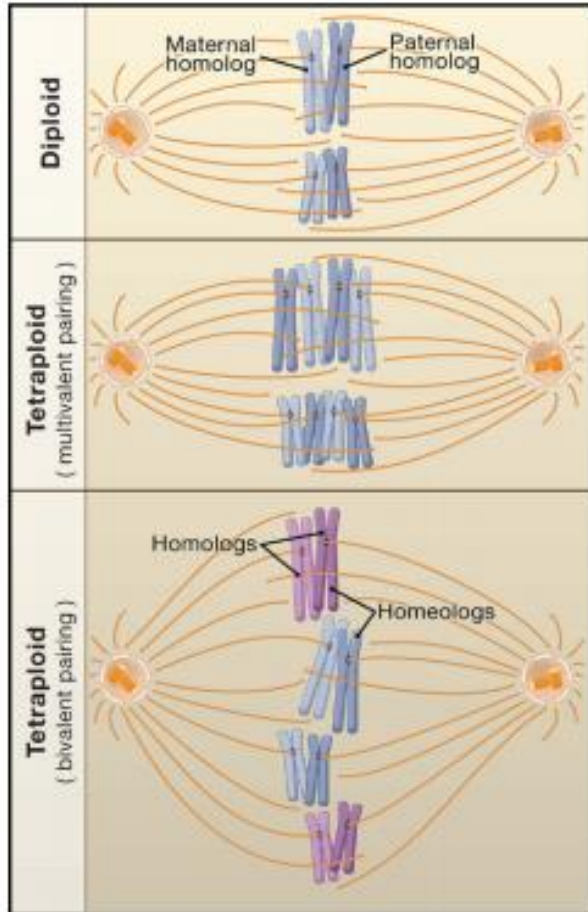


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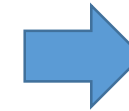
The Evolutionary Impact of Ploidy Variation in Eukaryotic Lineages



Adapted from Otto P. Sarah, 2007.

Autopolyploidization displays:

- Positive short-term and long-term effects:



Enrich organism with
novel functions and
beneficial properties

- Deleterious effects:

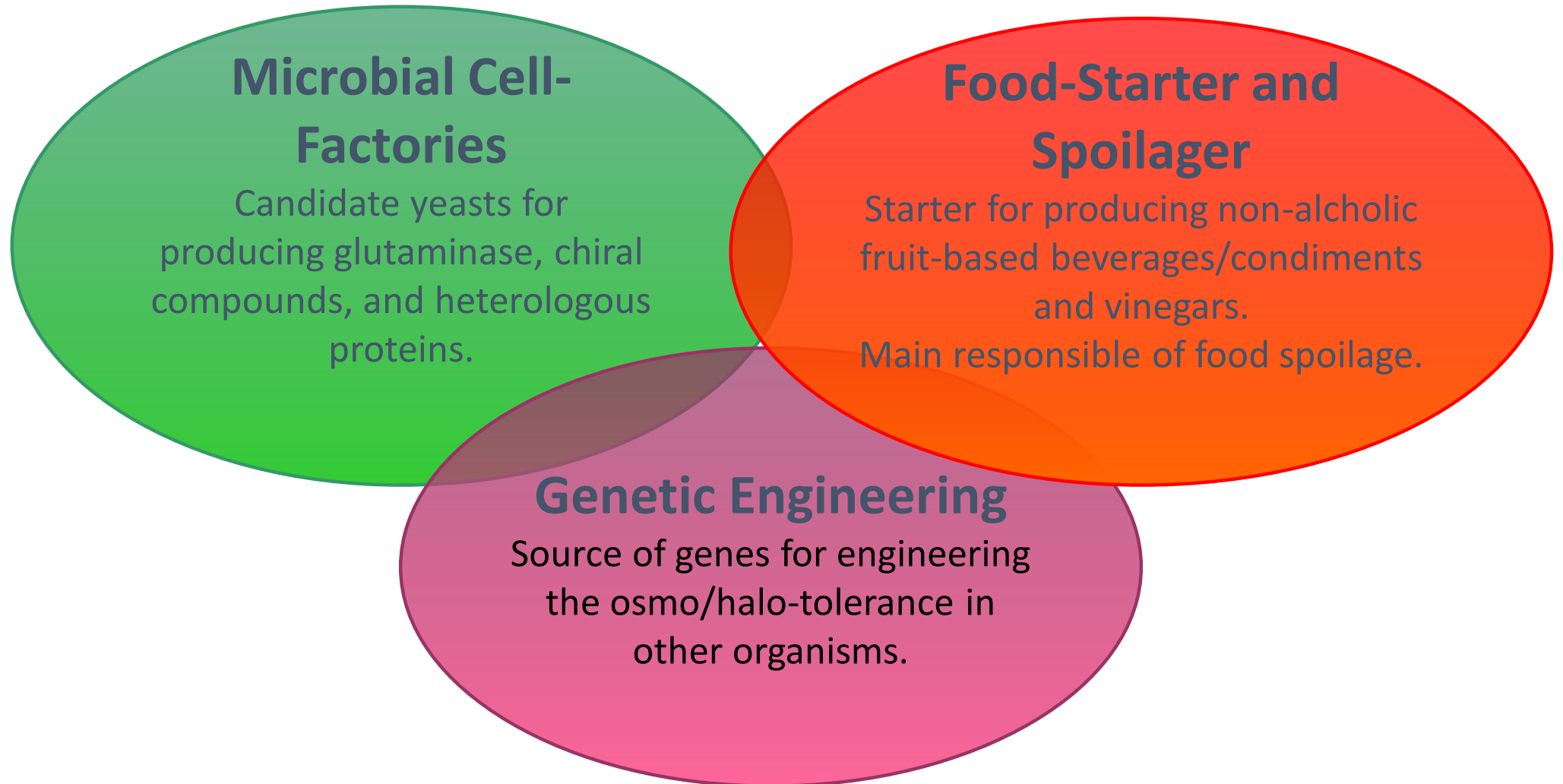


Pre- and post-zygotic
reproductive isolation
of allopolyploid genomes

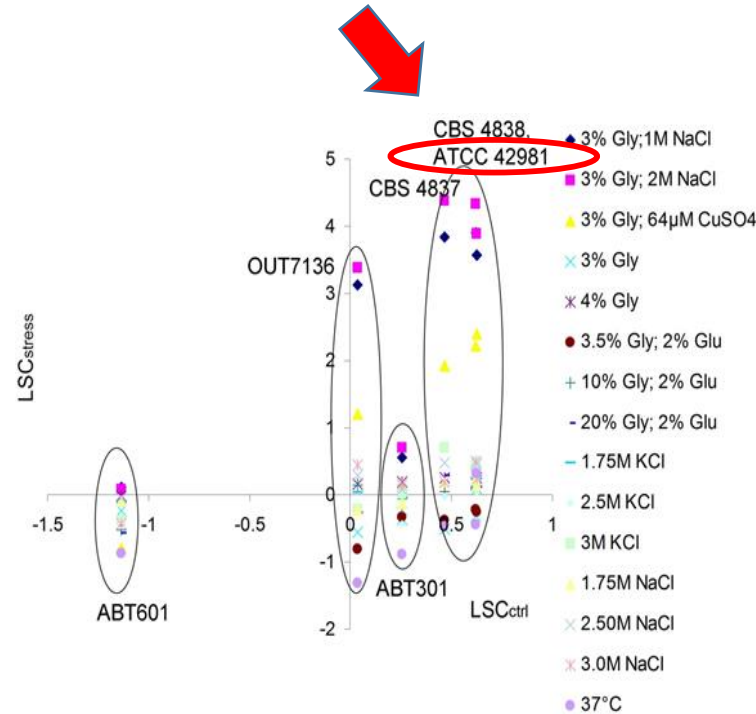
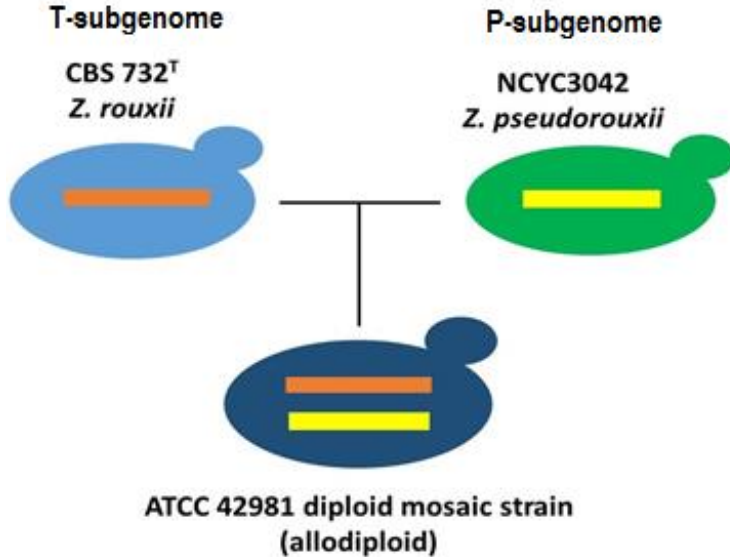
Allodiploid offspring can have:

- Advantages since their increased genome size and complexity enhance heterosis and adaptive flexibility;
- Strong selective disadvantages due to their sterility.

Zygosaccharomyces rouxii Clade: Multipurpose Salt-Tolerant Food Yeasts



Mosaic ATCC 42981 Strain: a Model for Gene-network Interplay and Adaptative Flexibility in Allodiploids



Chimeric Mating System

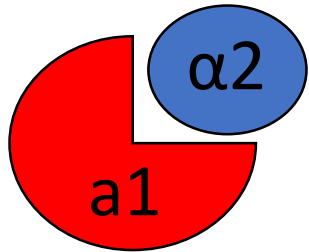




- Two phylogenetically divergent *MATa*/*MATα* expression loci
- Two copies of HO endonuclease gene

Despite its diploid DNA content **ATCC 42981** is unable to undergo meiosis

Is the a1/α2 Heterodimer Functional?

a/α allodiploid ATCC 42981



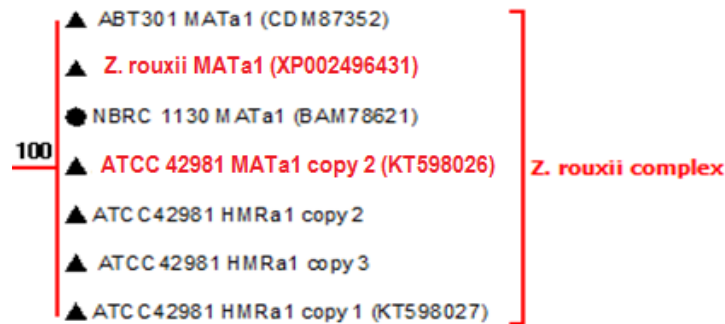
-  *Z. sapae* α2 subunit
-  *Z. rouxii*-like a1 subunit



Master **mating-type** transcriptional factor.



Generation of negative epistasis contributing to **allodiploid sterility** and dysregulation of **cell-type identity**.

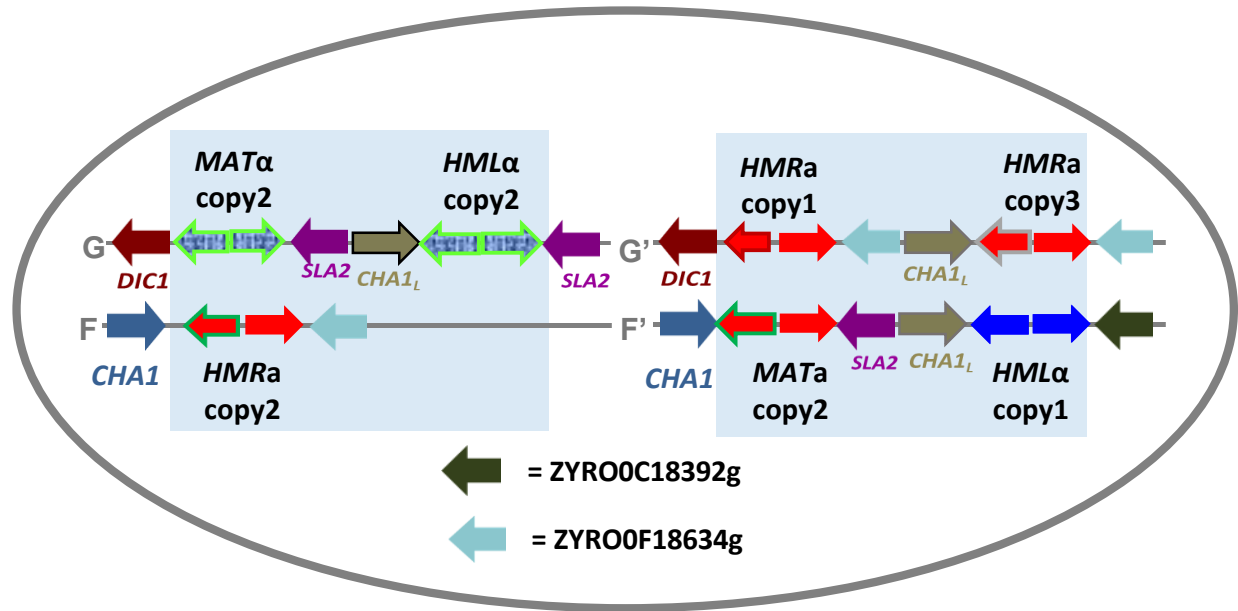
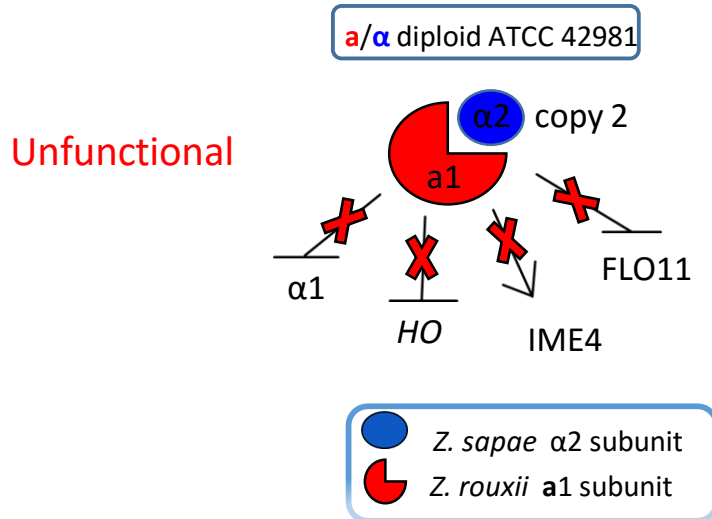


Validation of our Model by Restoring a Functional $\alpha 1/\alpha 2$ Dimer in ATCC 42981

- **Hypothesis:** the chimeric **a1-α2** heterodimer contributes to hamper the switching from mitosis to meiosis in our sterile allodiploid model.



- **Verification:** restoring a putatively functional heterodimer by genetic engineering of ATCC 42981 cells.



Three NGS approaches to unveil how introgressed parental genomes interplay at different levels

1. De-novo genome assembling to establish genome-wide patterns of introgression;
2. Transcriptome analysis of salt stress response;
3. Chip-Seq focused on $\alpha 1$ - $\alpha 2$ heterodimer target genes.



...and if you want to know more...



RESEARCH ARTICLE

Chimeric Sex-Determining Chromosomal Regions and Dysregulation of Cell-Type Identity in a Sterile *Zygosaccharomyces* Allodiploid Yeast

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