Mini-chromosomes as drivers of genetic diversity and host-adaptation in the blast fungus *Magnaporthe oryzae*

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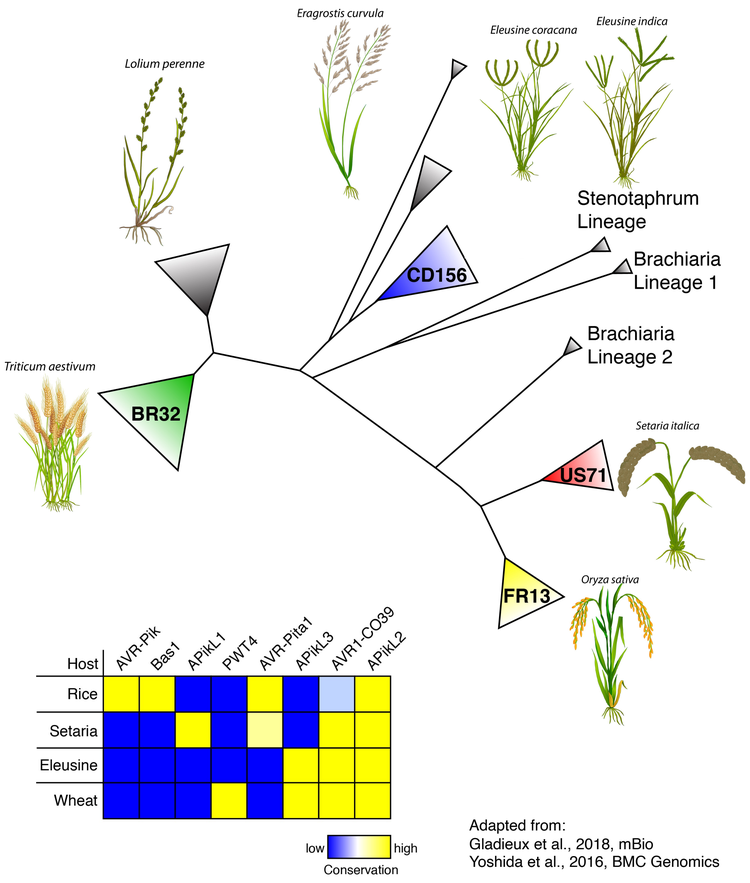
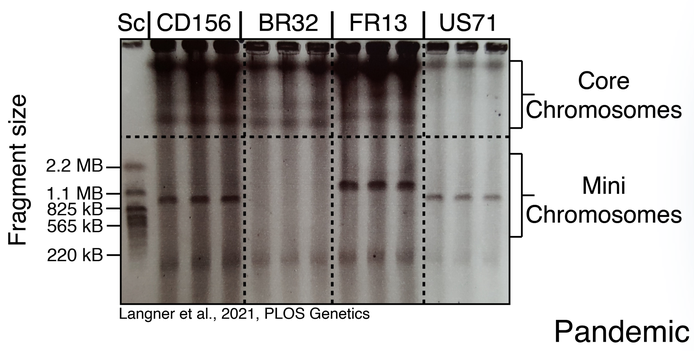
1 Host adaptation of *M. oryzae* involves effector gains/losses



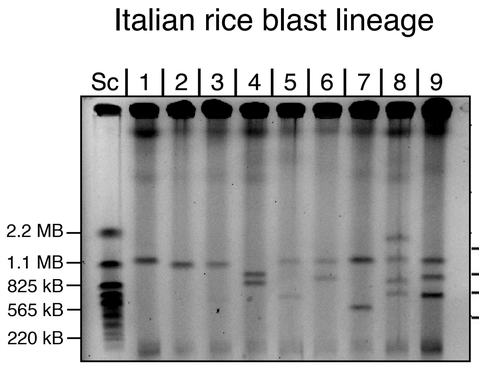
Adapted from:
Gladieux et al., 2018, mBio
Yoshida et al., 2016, BMC Genomics

2 Mini-chromosomes (mChr) contribute to genomic diversity across all pathogen lineages

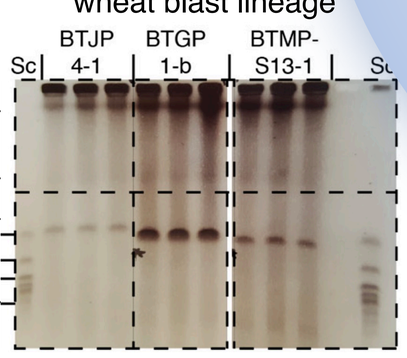


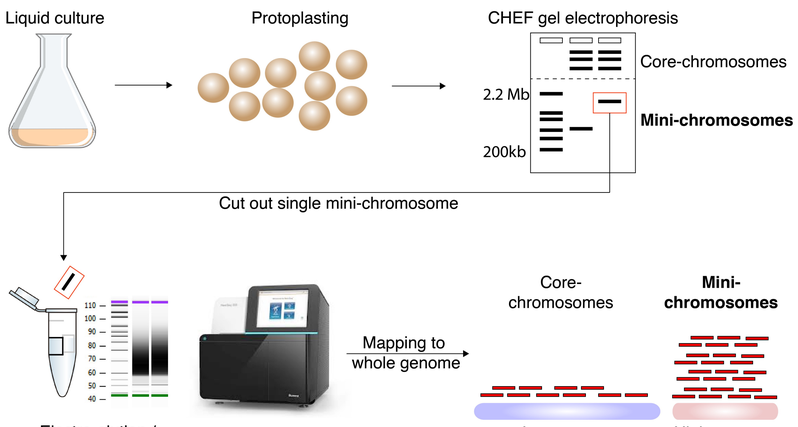
Langner et al., 2021, PLOS Genetics

Italian rice blast lineage



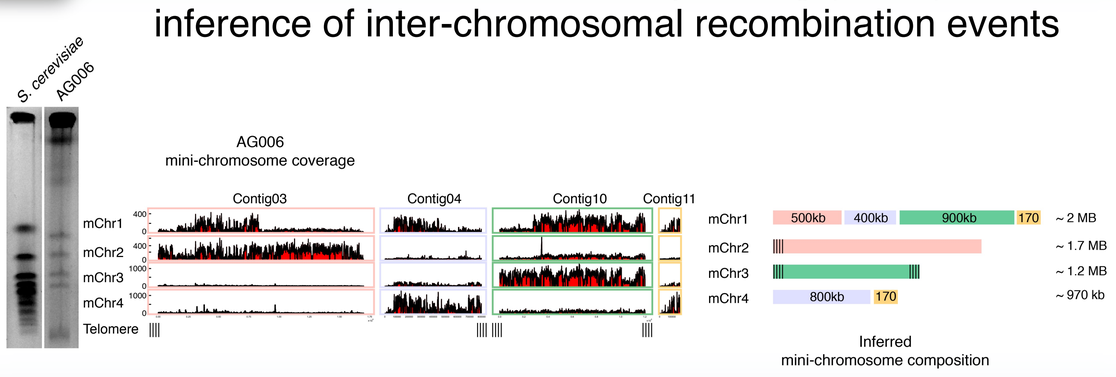
Pandemic wheat blast lineage



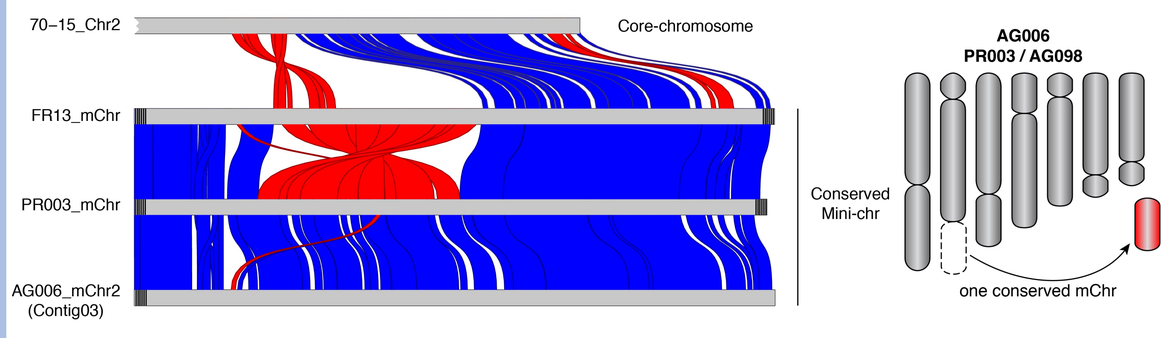


Langner et al., 2021, protocols.io

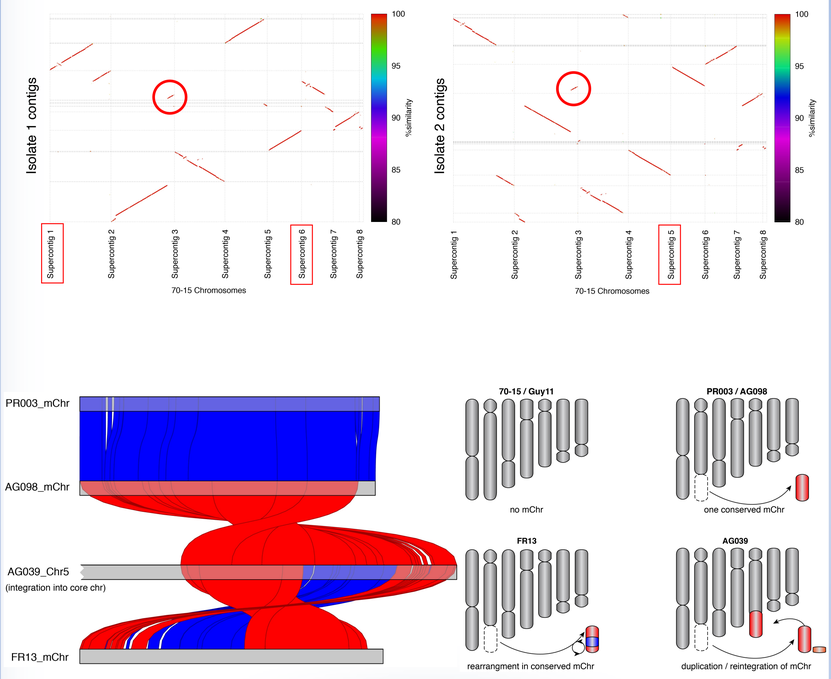
3 Mini-chromosome isolation sequencing (MCIS) allows inference of inter-chromosomal recombination events



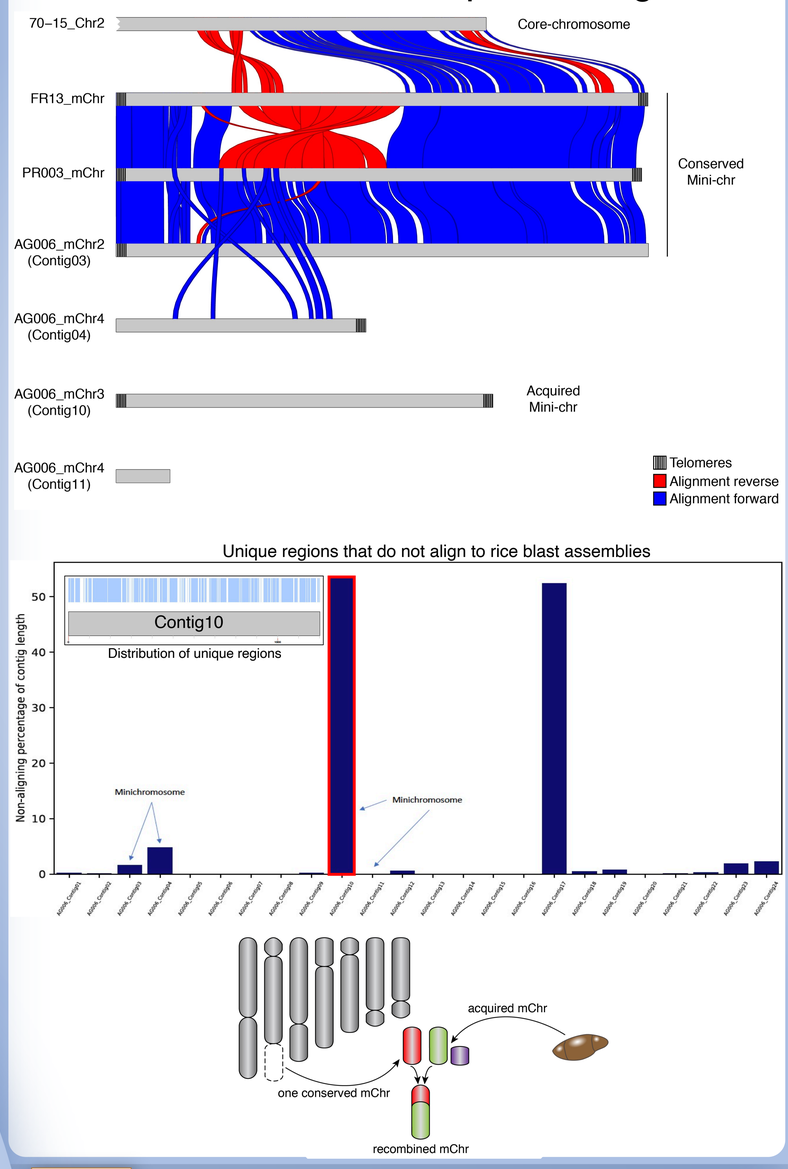
4 European rice blast isolates contain a conserved mchr



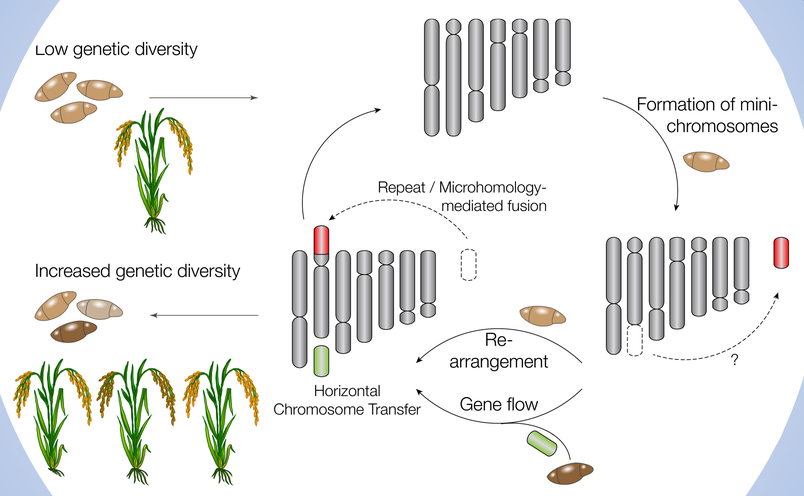
5 mChrs can recombine with core-chromosomes at various genomic locations



6 Horizontal transfer of mChr between diverse host adapted lineages

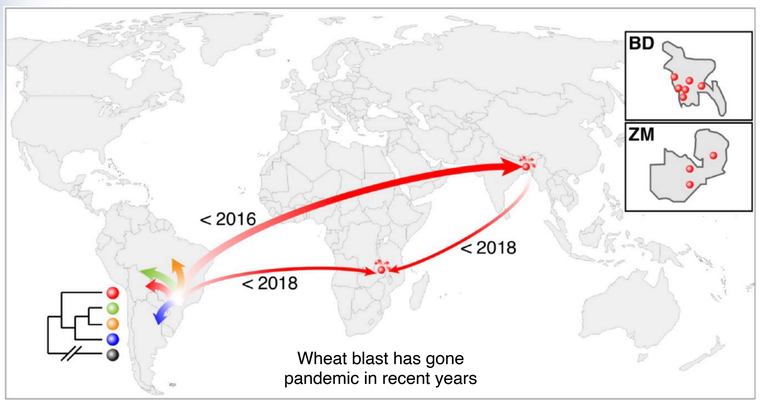


Mini-chromosomes as drivers of adaptive evolution

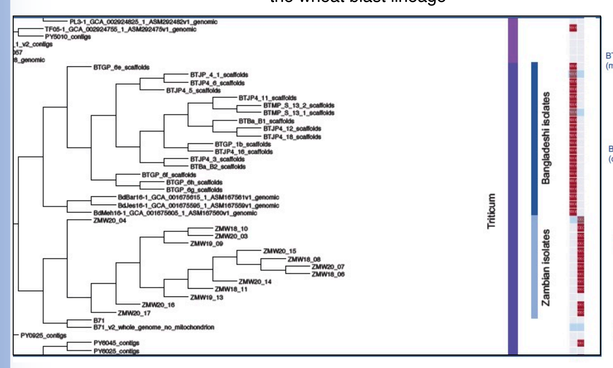


Conclusion: Mini-chromosomes can form and recombine with core chromosomes providing a mechanism to generate structural variants. Further, they can be transferred between lineages increasing genetic diversity in asexual populations.

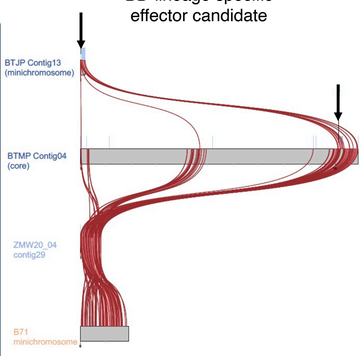
7 Mini-chromosomes and lineage specific regions harbor effector candidates in the pandemic wheat blast lineage



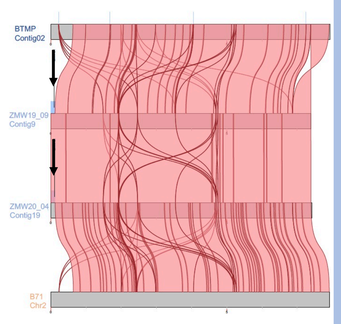
Effector candidates in the wheat blast lineage



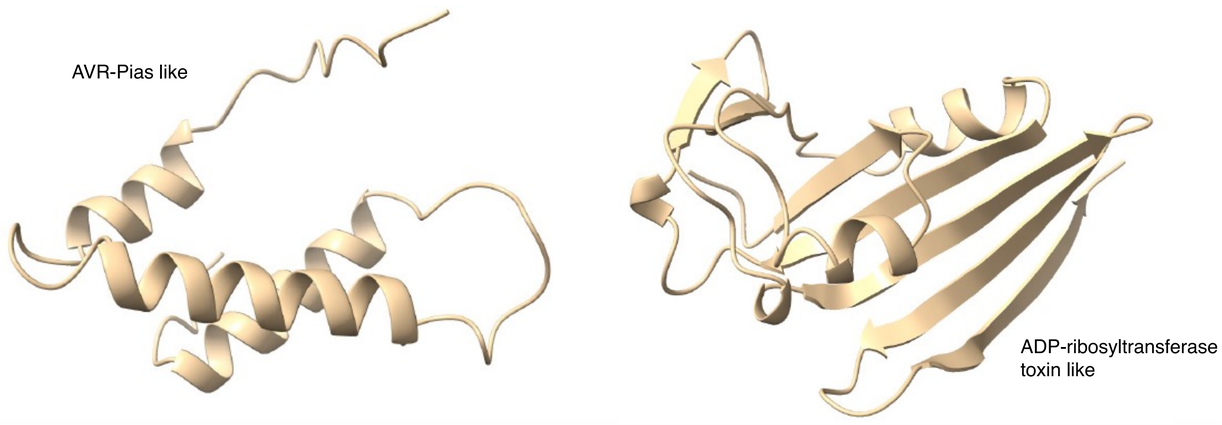
BD-lineage specific effector candidate



ZM-lineage specific effector candidate



8 Novel effector candidates are similar to known effectors and toxins



Outlook

- Confirm mini-chromosome transfer in *M. oryzae* under lab conditions and during infection.
- Identify the source of horizontally transferred mini-chromosomes.
- Mechanistic investigation of mini-chromosome generation, loss and recombination.
- Study the function of mini-chromosome encoded effector genes during infection and host adaptation.

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