Effect of gene copy number variation on fatty acid biosynthesis in *Brassica* species and hybrids

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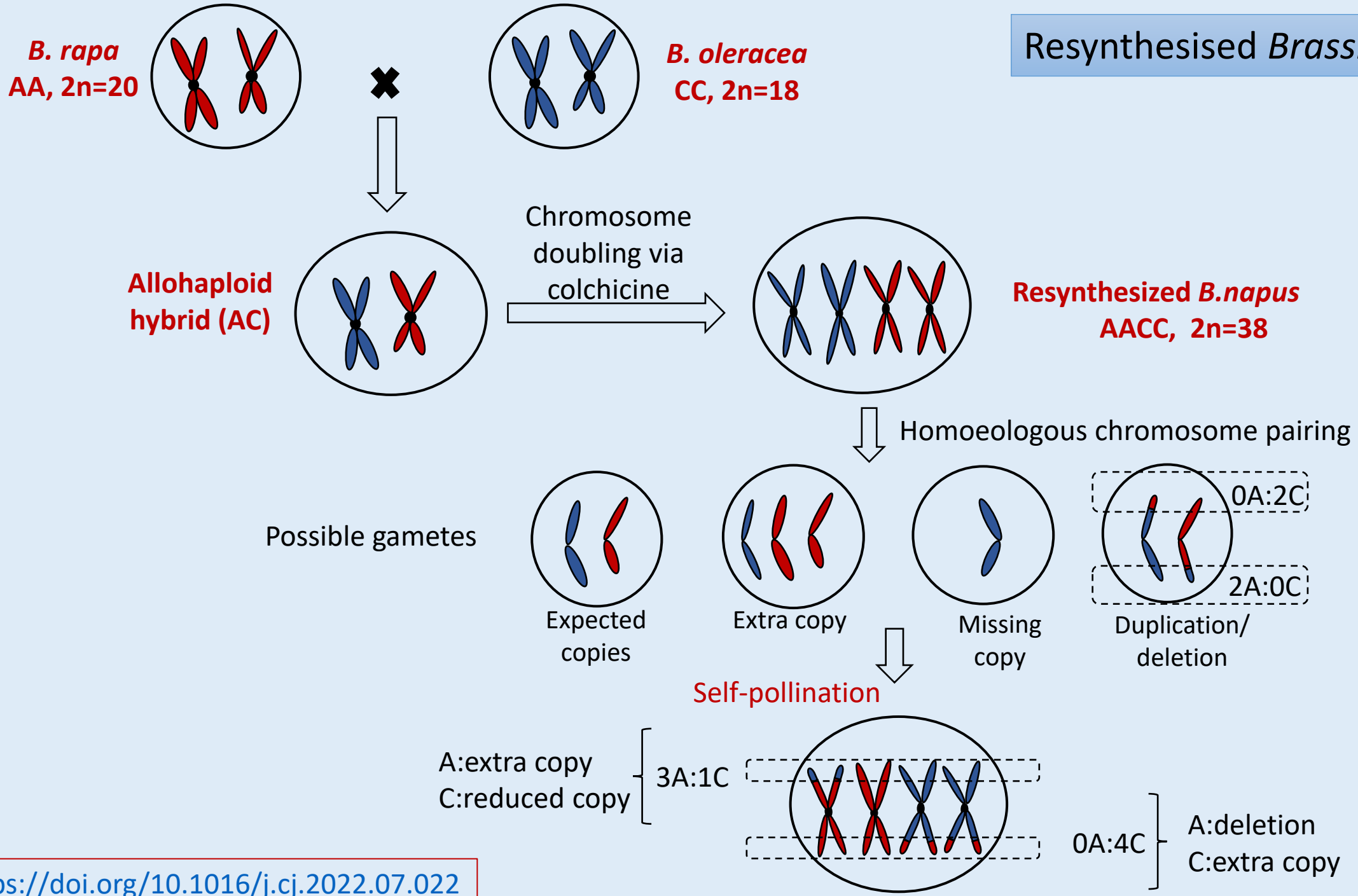
Resynthesised *Brassica napus*



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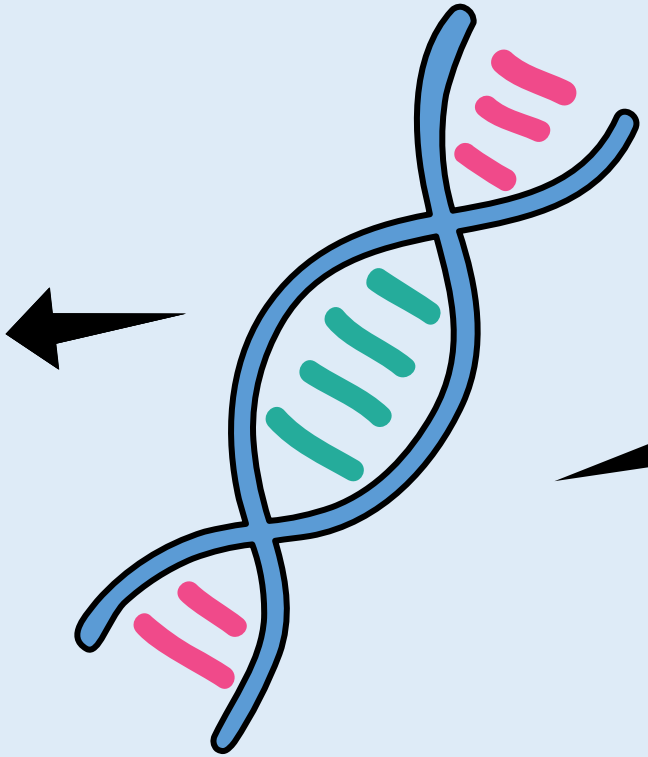
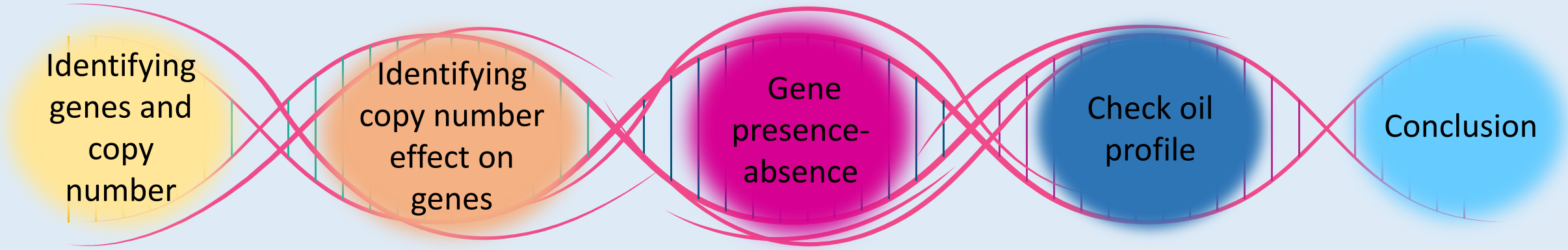
Hypotheses

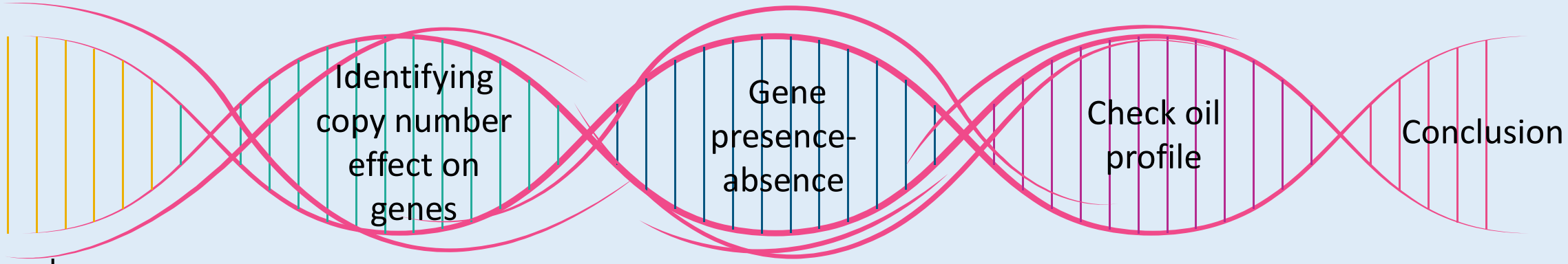
Different oil composition between lines from homozygous genotypes



Different copy numbers and whole or partial deletions of interesting genes or gene regulators will alter oil quality

Workflow


Identifying genes and copy number
Identifying copy number effect on genes
Gene presence-absence
Check oil profile
Conclusion



Identifying genes and copy number

- Identifying key oil related genes → 48 genes in *Arabidopsis*
- Identification of homologs of these genes in *Brassica* species
- Determine the number of copies of these genes

Identifying copy number effect on genes

Gene presence-absence

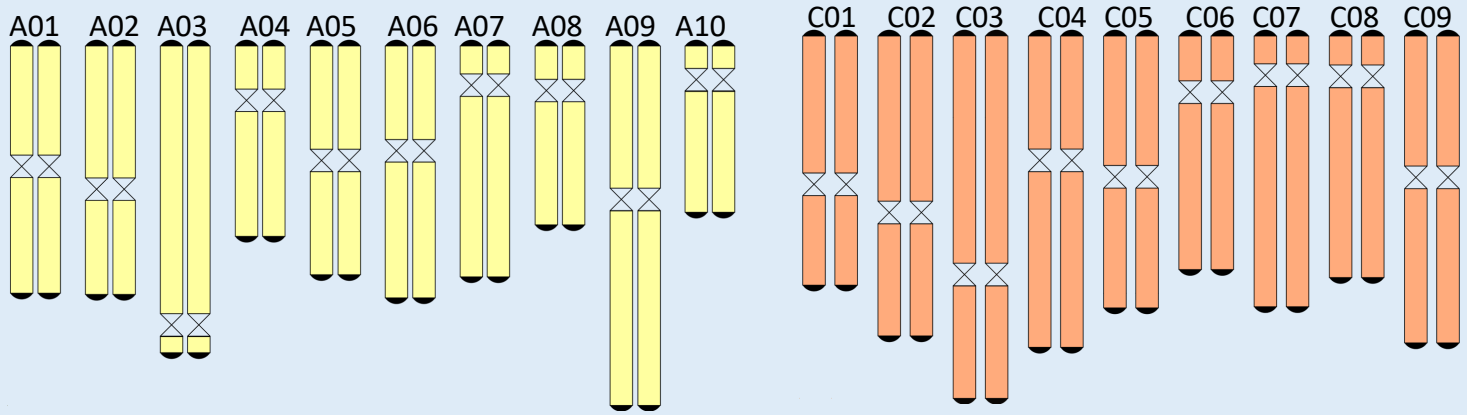
Check oil profile

Conclusion

Identifying genes and copy number

- Determine the number of copies of these genes ✓(1-13)

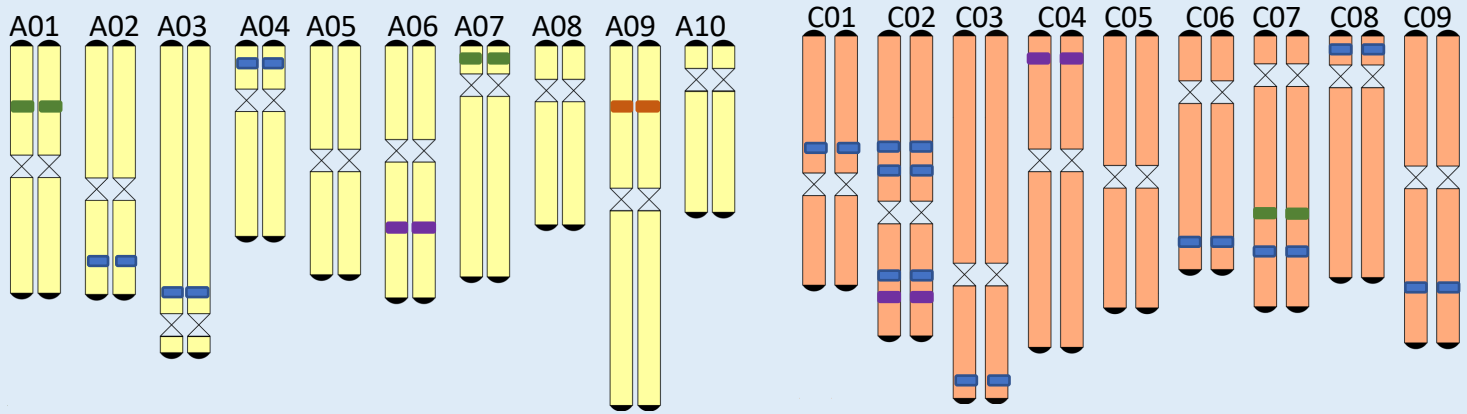
B.napus reference genome (Darmor-*bzh* v8.1)



Identifying genes and copy number

- Determine the number of copies of these genes ✓(1-13)
- Location of copies on the reference genome

B.napus reference genome (Darmor-*bzh* v8.1)



Identifying genes and copy number

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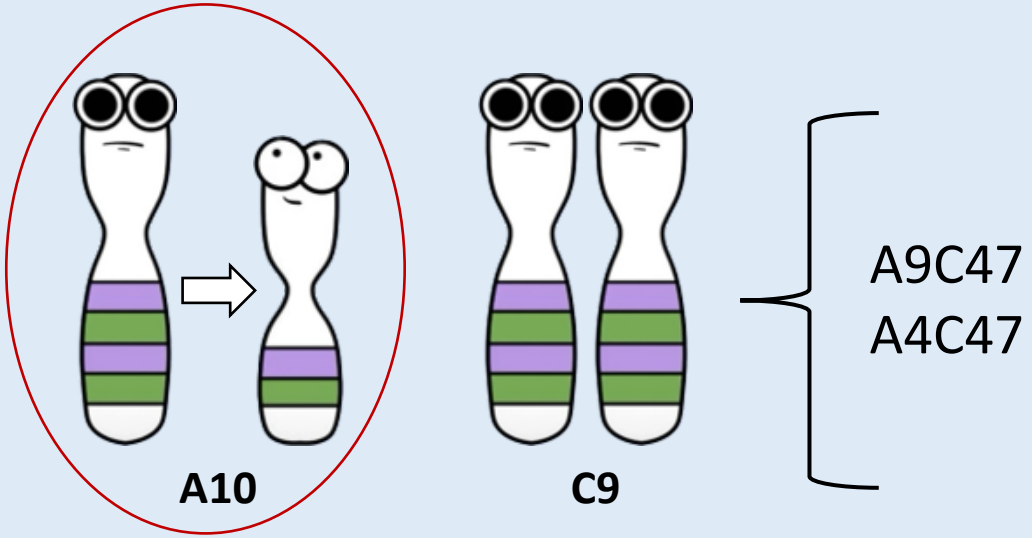
Identifying copy number effect on genes

Resynthesised *B.napus genotypes* → Look for copies located in CNV reigon from SNP data → ***GPAT7***



A9C47
A4C47

https://www.amoebasisters.com/

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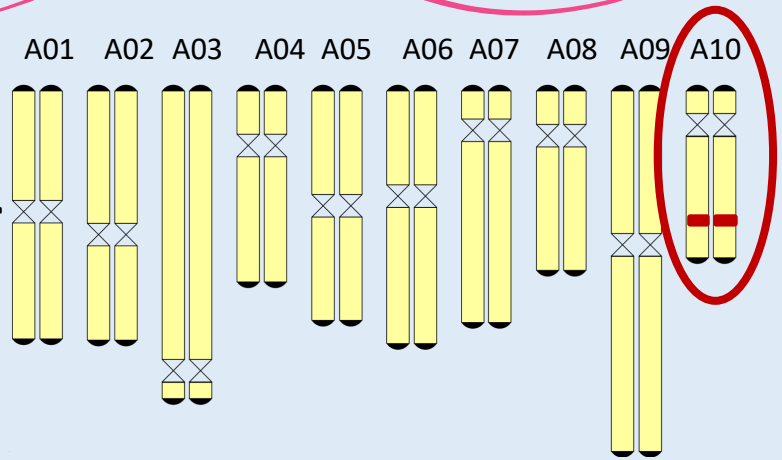
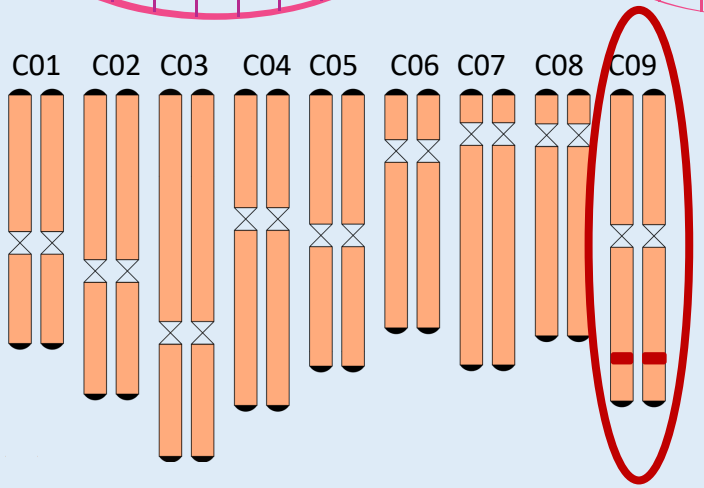
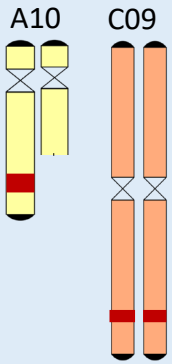
Expected copy number for *GPAT7*:



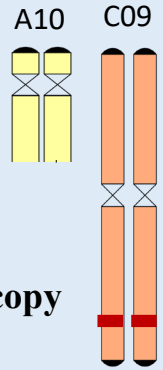
Gene presence-absence

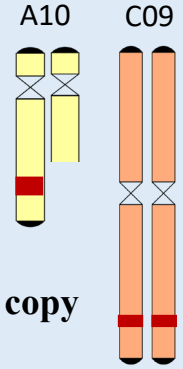


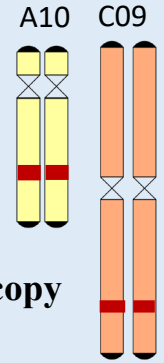
Selected lines:
A9C47, A4C47



expected segregation of progeny:







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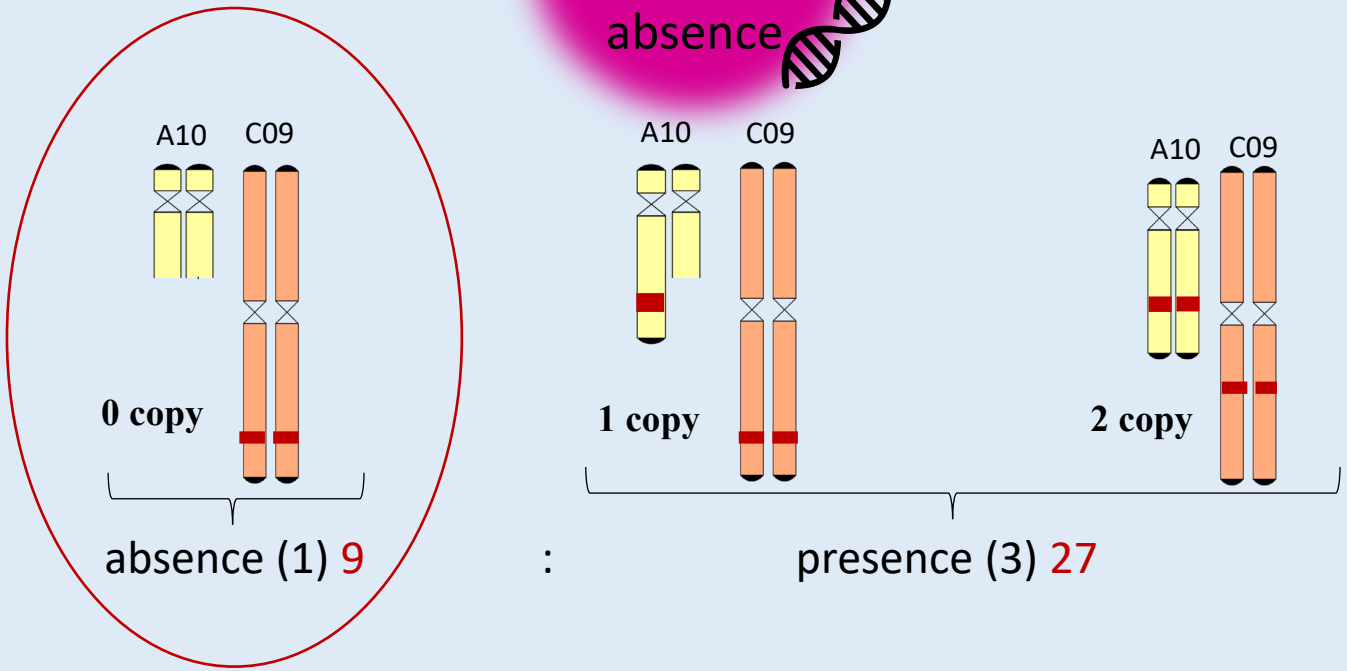
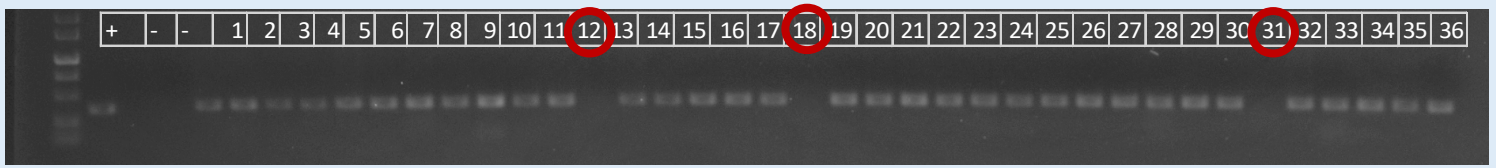
expected segregation of progeny:



A9C47 plant lines from 1-36

Primer: (*Bna.GPAT7.A10*)



observed ratio→3:33

p-value = 0.020

Identifying genes and copy number

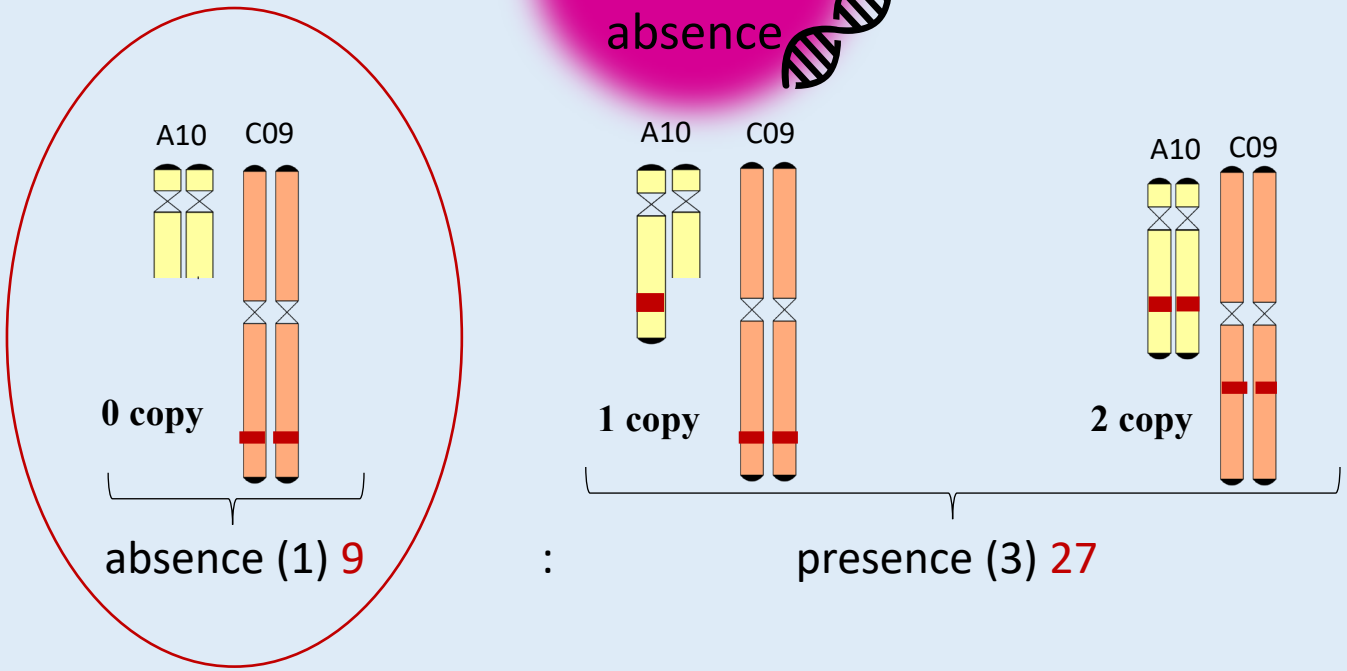
Identifying copy number effect on genes

Gene presence-absence

Check oil profile

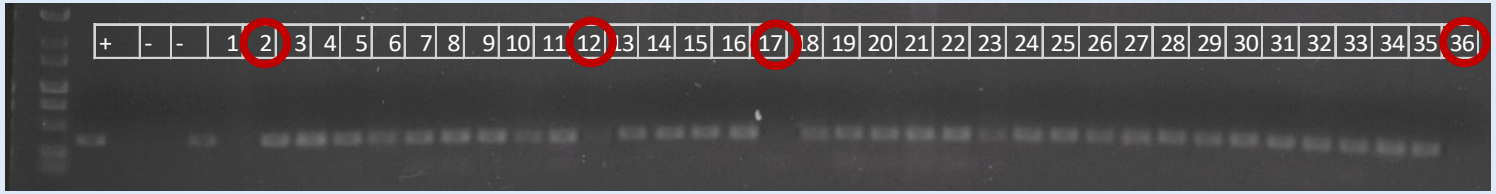
Conclusion

expected segregation of progeny:



A4C47 plant lines from 1-36

Primer: *(Bna.GPAT7.A10)*



observed ratio→4:32

p-value = 0.054

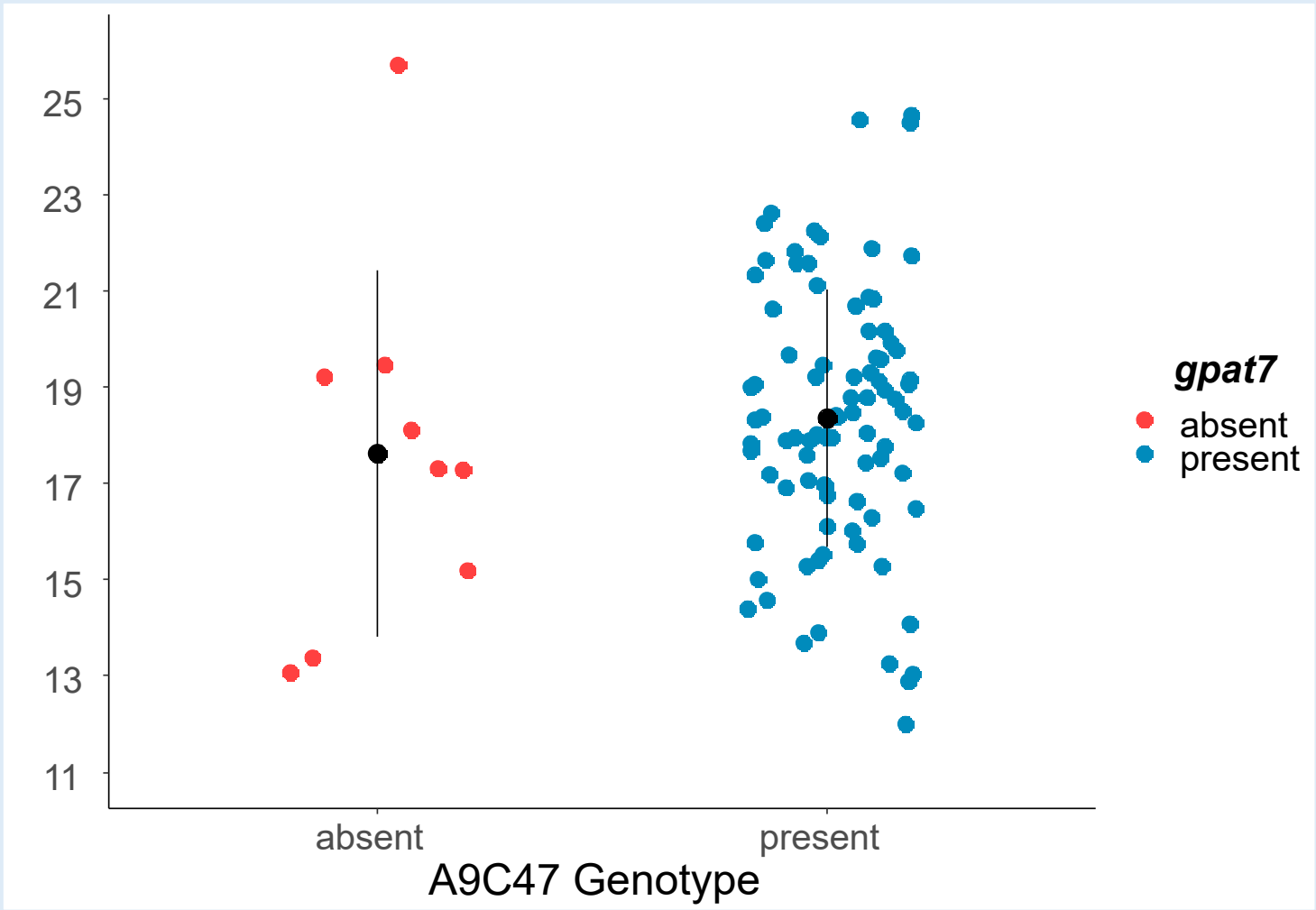
Identifying genes and copy number

Identifying copy number effect on genes

Gene presence-absence

Conclusion

Check oil profile



p-value = 0.52

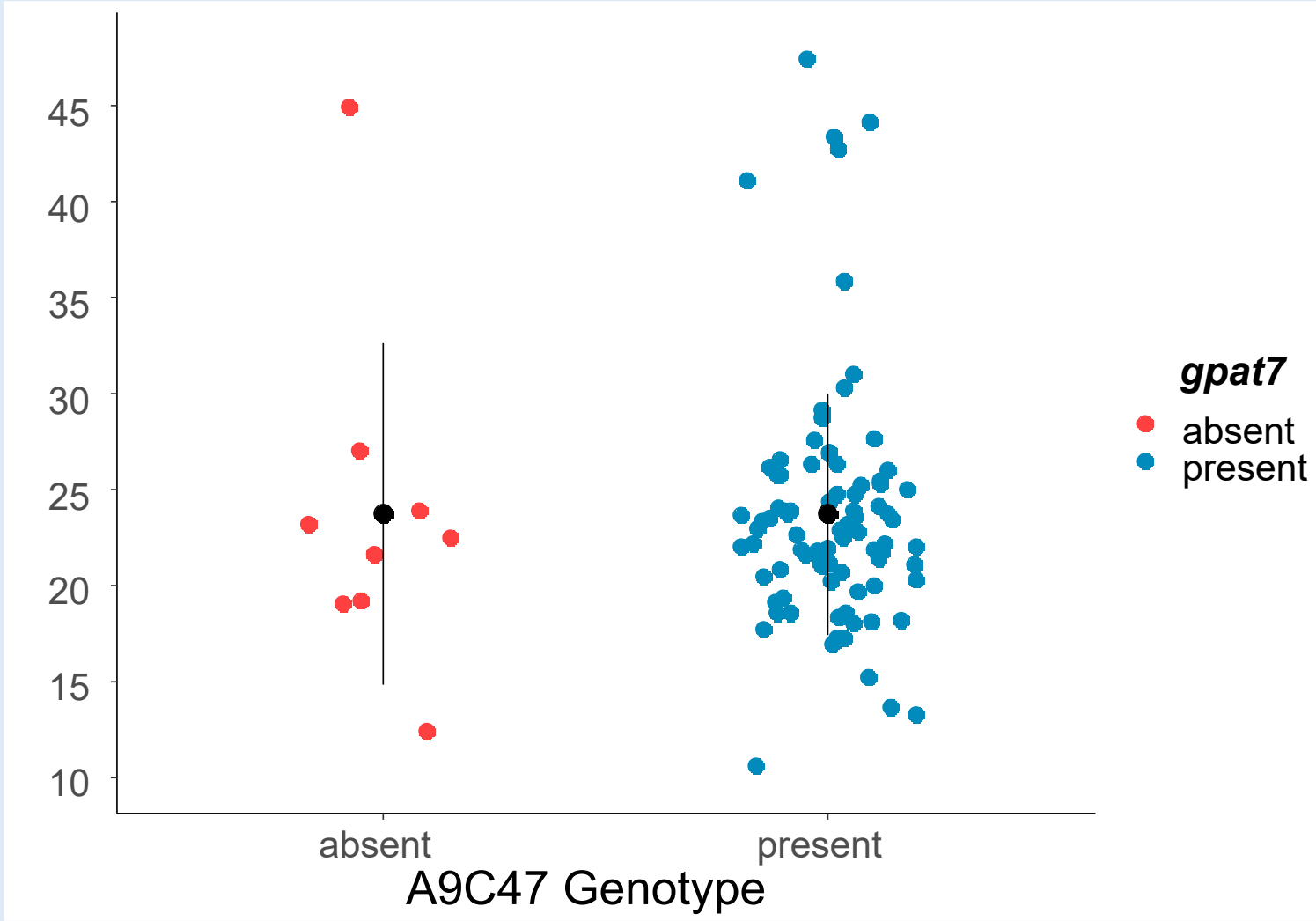
Identifying genes and copy number

Identifying copy number effect on genes

Gene presence-absence

Conclusion

Check oil profile



p-value = 0.97

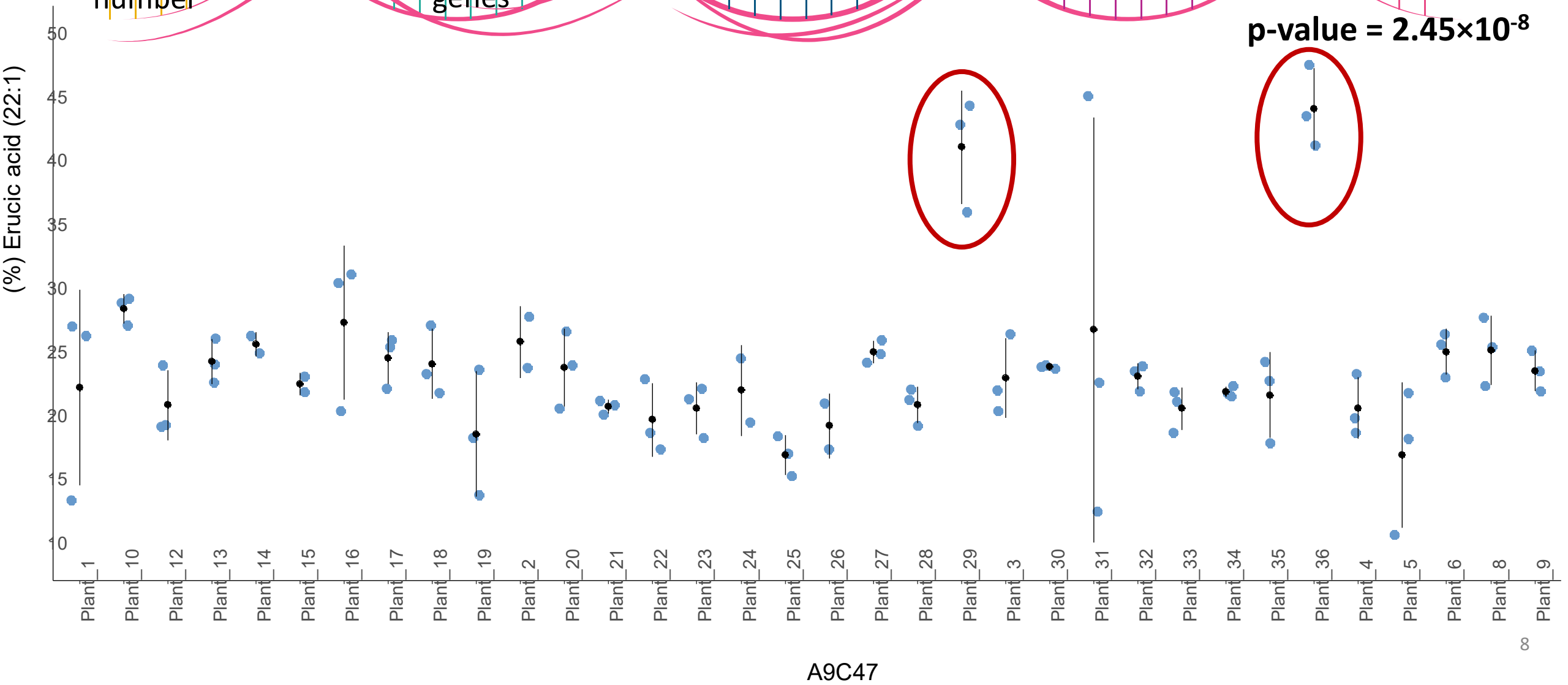
Identifying genes and copy number

Identifying copy number effect on genes

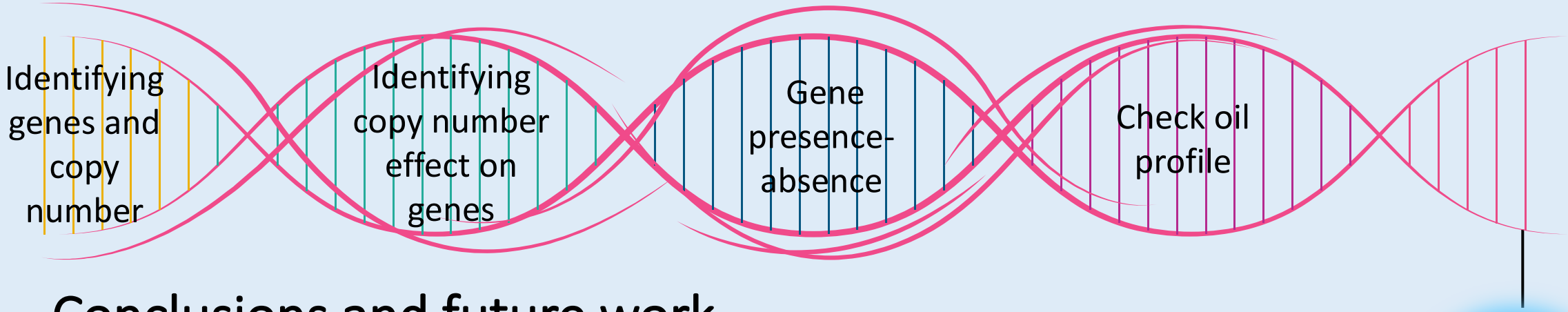
Gene presence-absence

Check oil profile

Conclusion



A9C47



Conclusions and future work

- No significant differences in fatty acid profiles were observed based on segregation of *GPAT7* copy numbers
- However, some individuals within the allelically homozygous progeny sets demonstrated radical changes in fatty acid profiles, putatively due to non-homologous chromosome rearrangements
- Further validation will be carried out using a combination of sequencing, gene expression analysis and molecular cytogenetics as appropriate
- Our results so far suggest that copy number variation can potentially majorly contribute to fatty acid profiles in rapeseed

Acknowledgements

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