Disentangling polyploid genetics

An example of hexaploid chrysanthemum

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Polyploids

• Each chromosome >2 copies
• Disomic polyploids (allopolyploids)
• Polysomic polyploids (autopolyploids)
• Chrysanthemum → polysomic
Genetics in polyploids

• Dosage of polymorphisms
  • 2n=2x:
    AA
    AB
    BB
  • 2n=6x:
    AAAAAA
    AAAAAAB | AAAAABB | AAABBB | ABBBBB | ABBBBB
    BBBB

• Linkage map construction
  • Calculation of linkage

• QTL mapping
  • Multiple alleles per locus
Materials

• F1 population: 406 individuals

• 183k Affymetrix SNP array
SNP dosage
Linkage mapping - marker types

Parent 1 × Parent 2

Parent 1 × Parent 2

1 : 1
0  1

1 : 4 : 4 : 1
0  1  2  3
A. Parent 1 × Parent 2

B. Simple segregating marker

C. Locus of interest
Parental haplotypes
QTL mapping - flowering time
Multi-allelic QTL

Flowing time at CLG2

Flowing time at CLG4

-log10(p-value)
Applications

• Methods for linkage- and QTL mapping

• Reference linkage map:
  • integrated information on co-segregation
  • fine mapping

• Decision making DNA-informed breeding
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The polyploids project

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Parental haplotypes

Calculate "r" and LOD

**Coupling**

![Coupling Diagram]

**Repulsion**

![Repulsion Diagram]
Linkage mapping - markertypes

30,523 markers
49 markertypes
19 basic markertypes