

A GENETIC, LIPIDOMIC & BIOPHYSICAL APPROACH TO IMPROVING BREADMAKING QUALITY IN WHEAT



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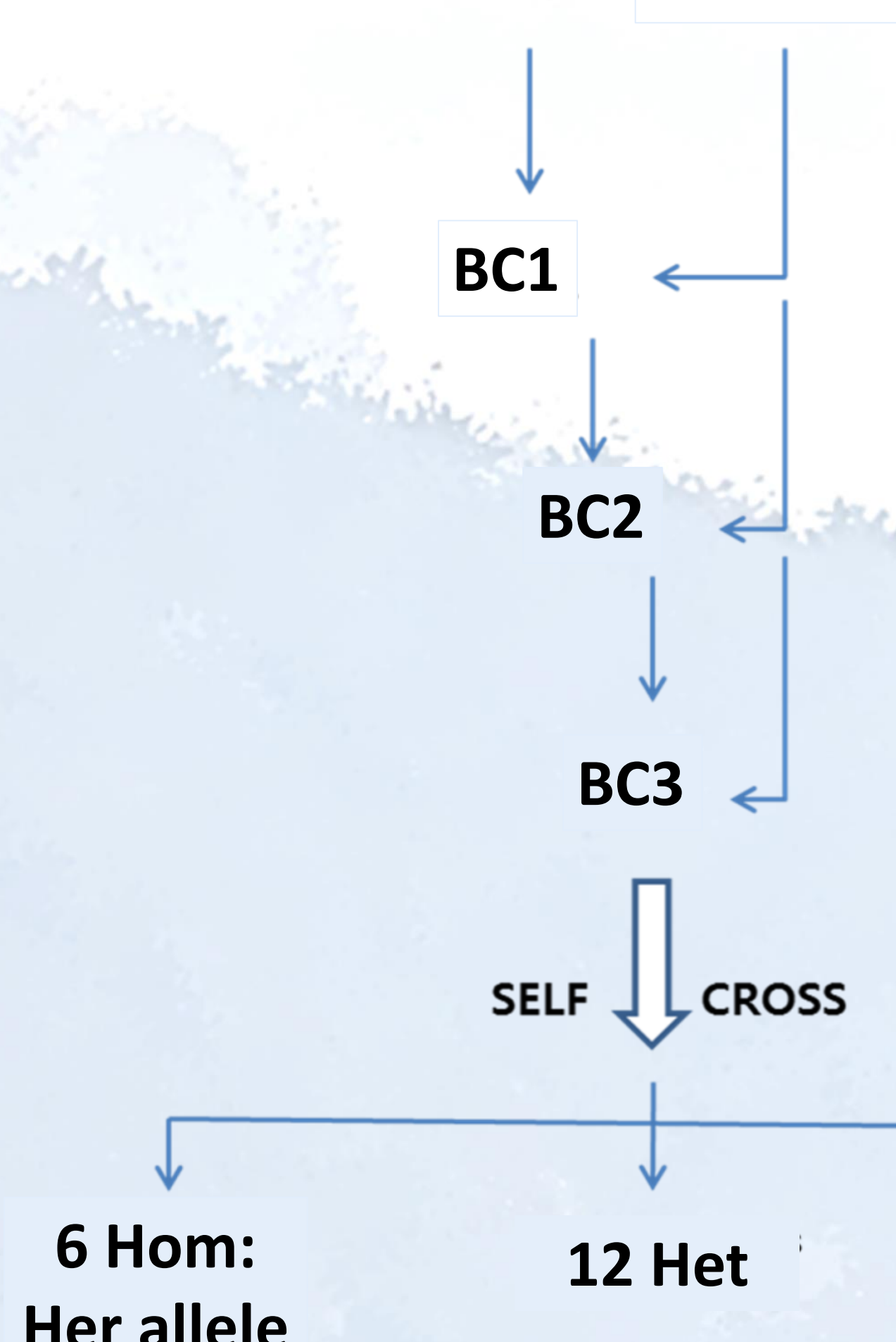
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1) WHY LIPIDS?

- Lipids have been shown to be crucial to **BREADMAKING QUALITY**
- Lipids play an important role on **GAS CELL STABILITY**
- Gas cell stability is critical in providing an even **CRUMB STRUCTURE** and good **LOAF VOLUME**
- Polar lipids especially **GALACTOLIPIDS** improve **LOAF VOLUME**

2) THE MxH NIL POPULATION

MxH DH line × Malacca



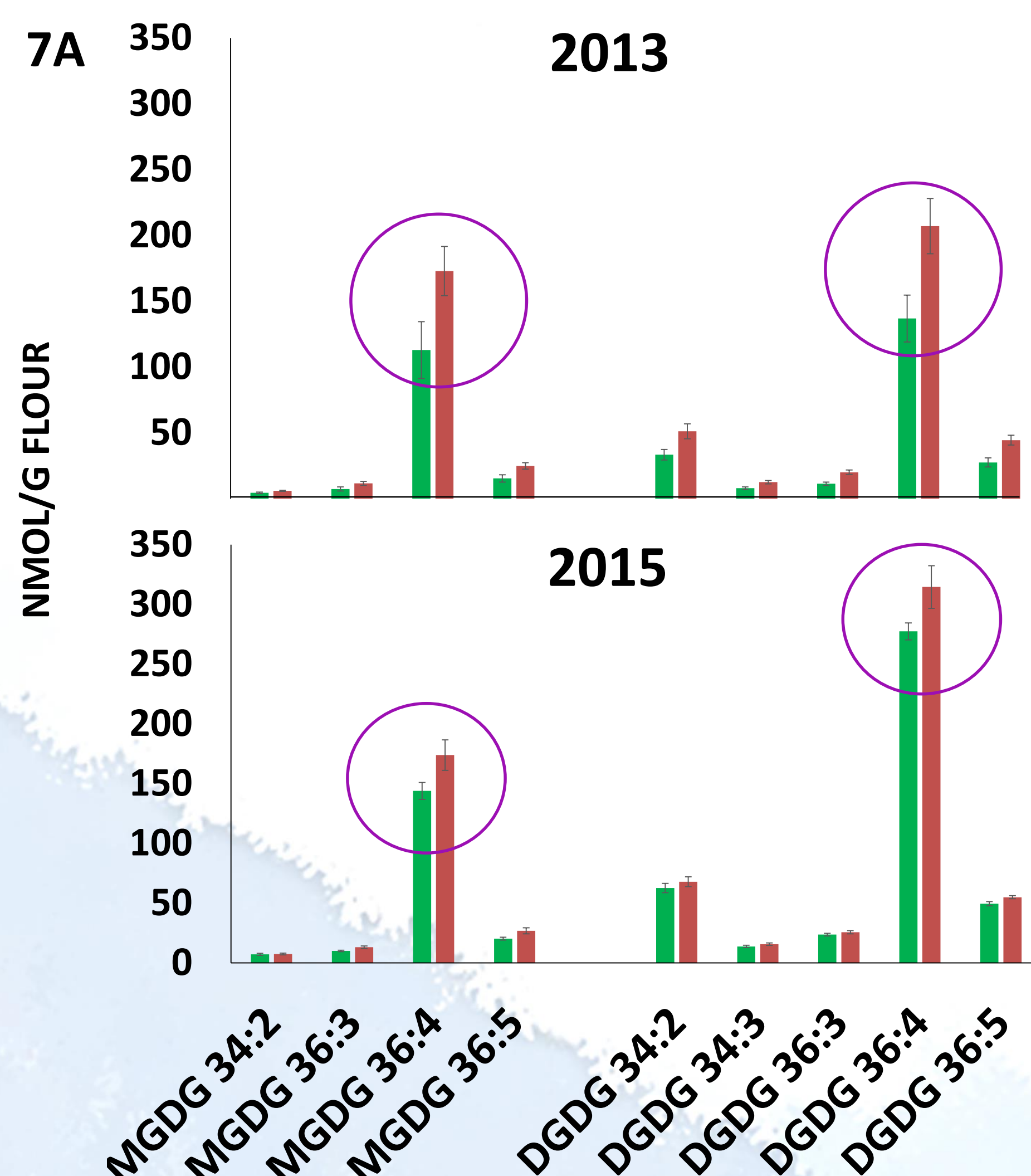
NILs developed at the JIC for the breadmaking quality QTLs present on chromosomes **1B, 4D, 6A and 7A**

Traits-

- 1B, 4D and 6A : **Cell Number**
- 7A: **Cell number/Loaf Volume**

The NILs have almost identical genetic backgrounds apart from these specific allelic regions

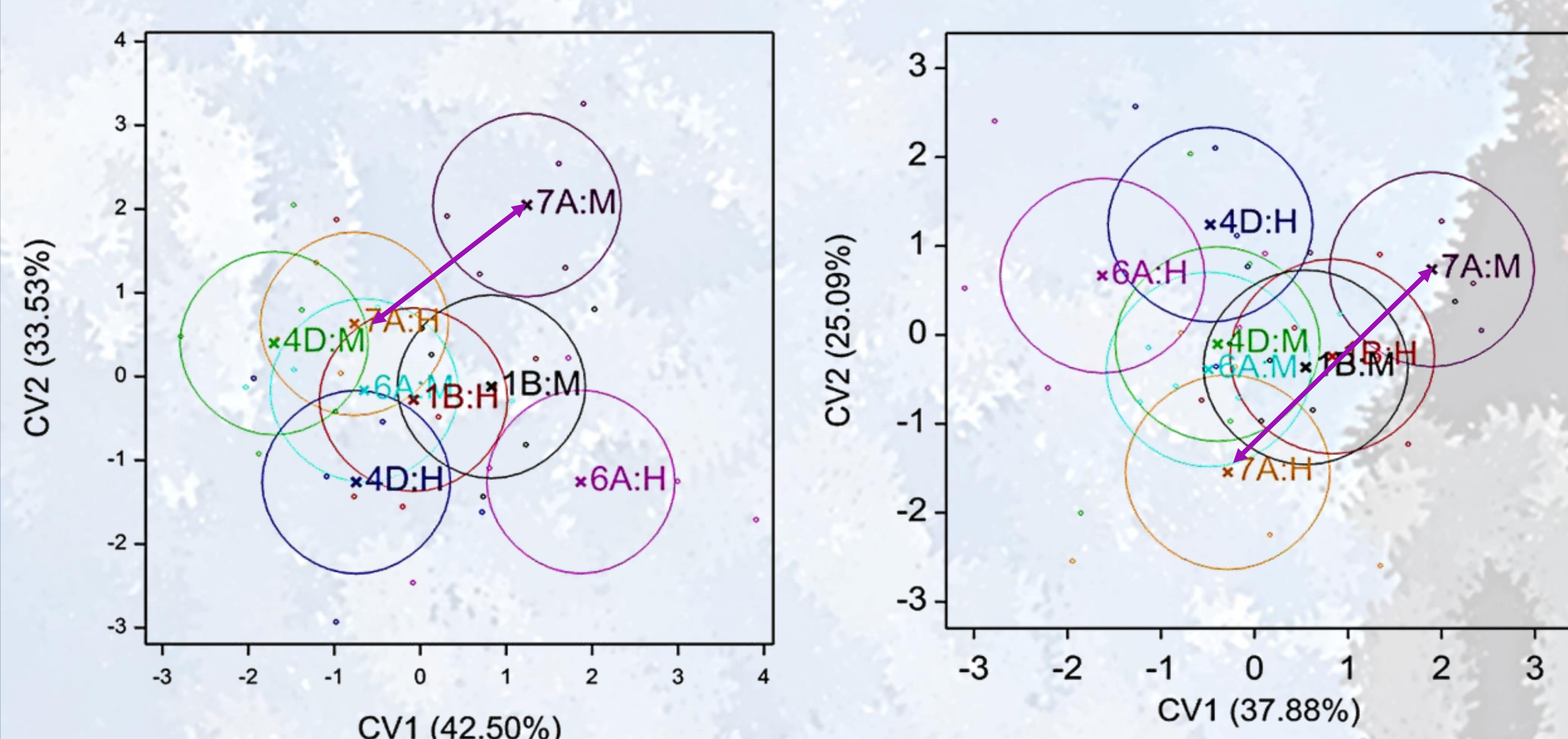
3) ALLELES EXERTING LIPID DIFFERENCES?



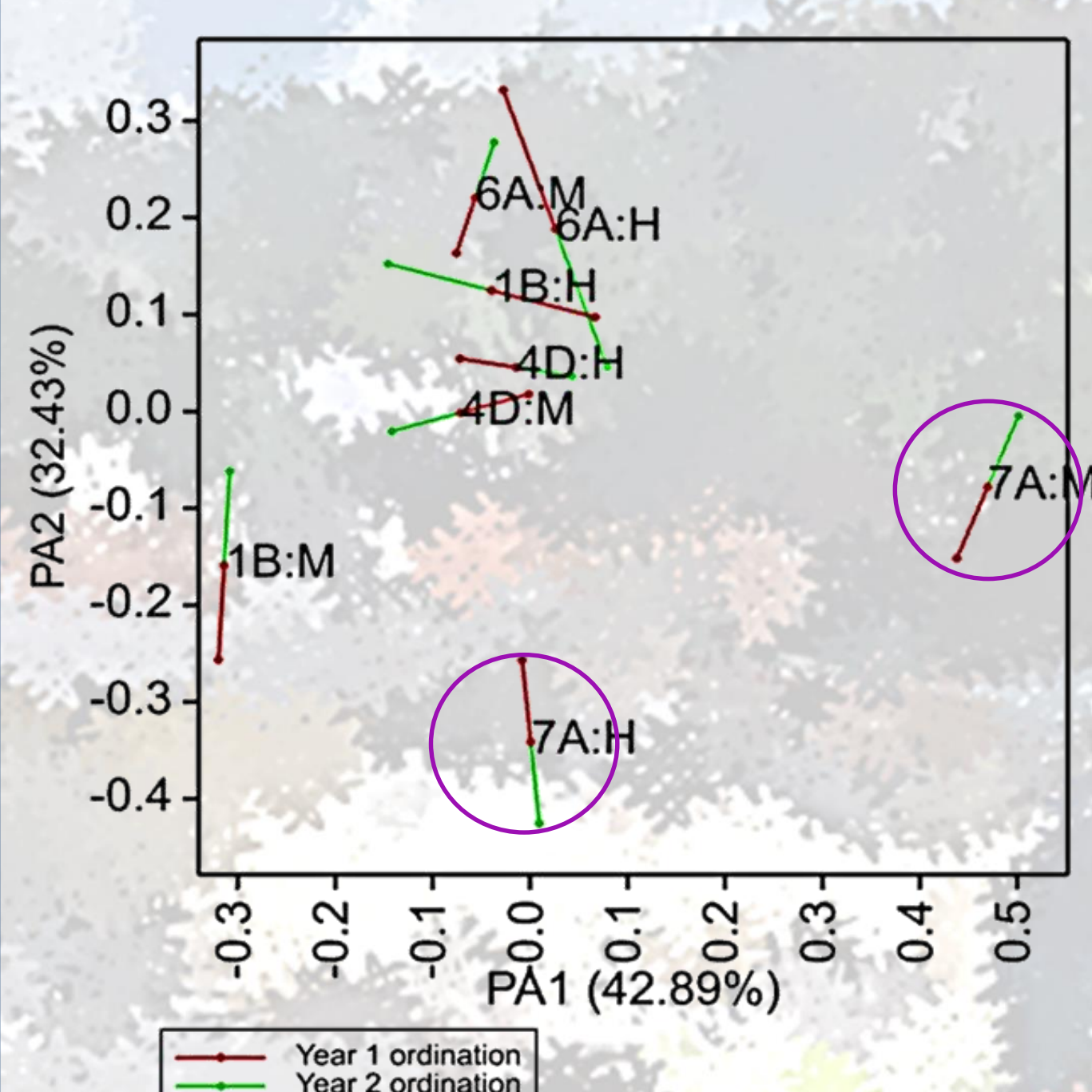
- Significant lipid differences could be seen between the NILs for **QTL 7A**
- Galactolipids in particular showed consistent differences over the two years

Indicate significant difference (p<0.05, F-test)

4) QTL 7A: A POTENTIAL CANDIDATE?

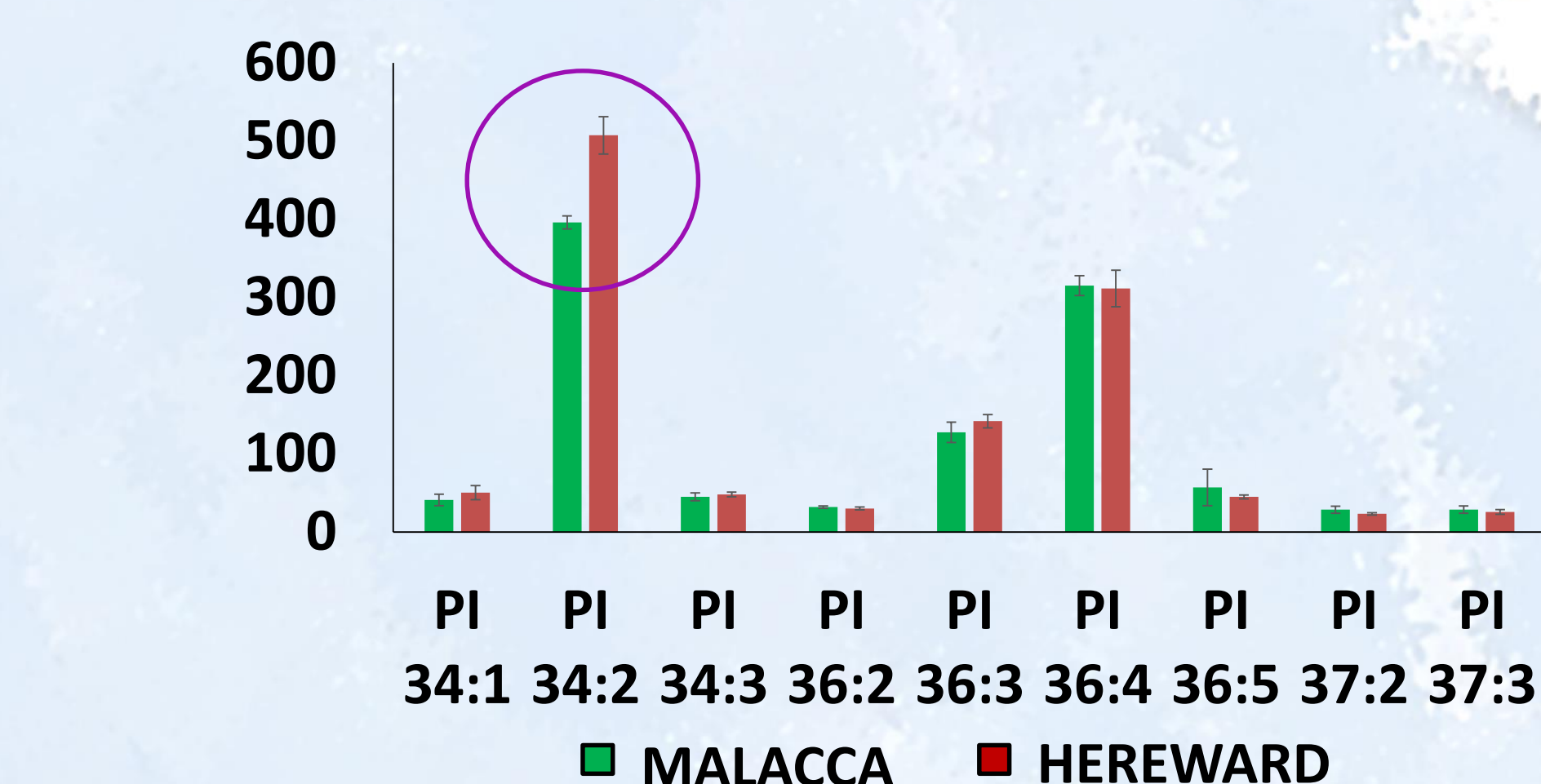


CLEAR SEPARATION BETWEEN **7A:M** AND **7A:H**



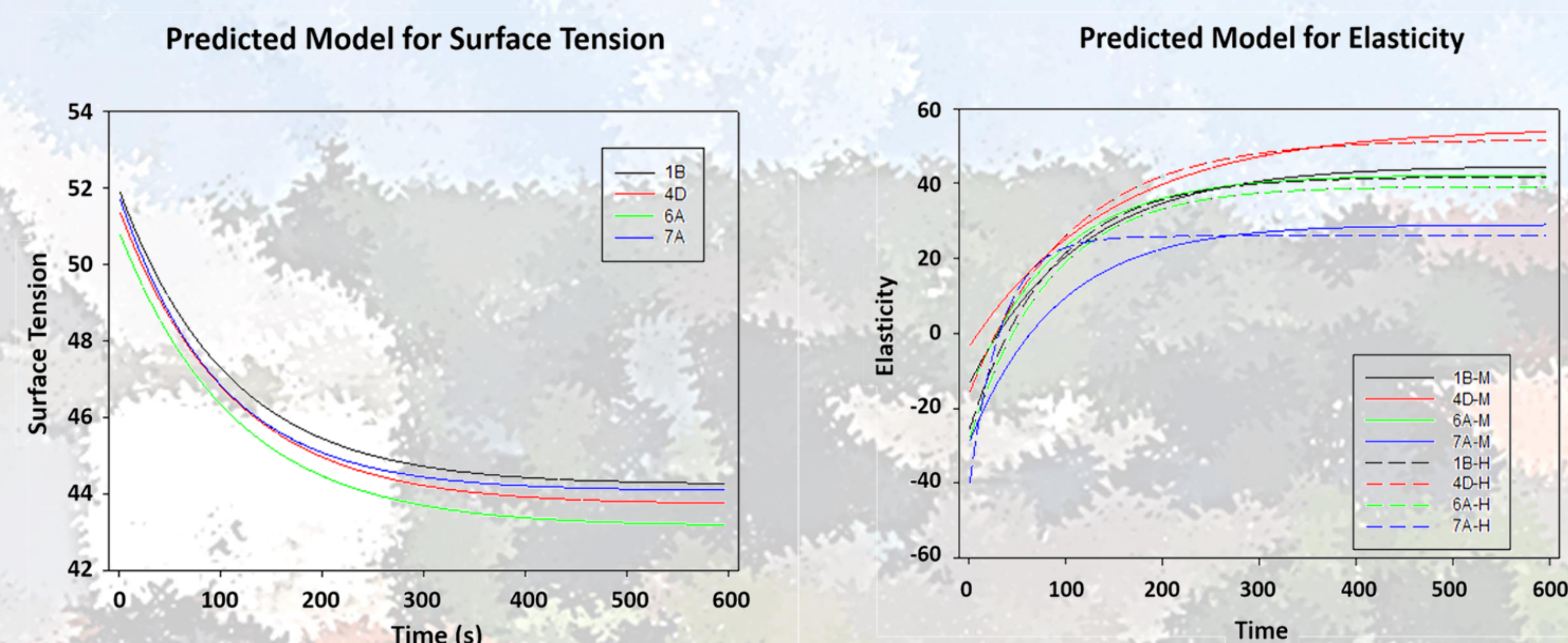
Procrustes Analysis shows significant separation of **QTL 7A** and its alleles **7A:H** and **7A:M** compared to the other NILs

Line length indicates the stability of the 7A:M and 7A:H lipid profile



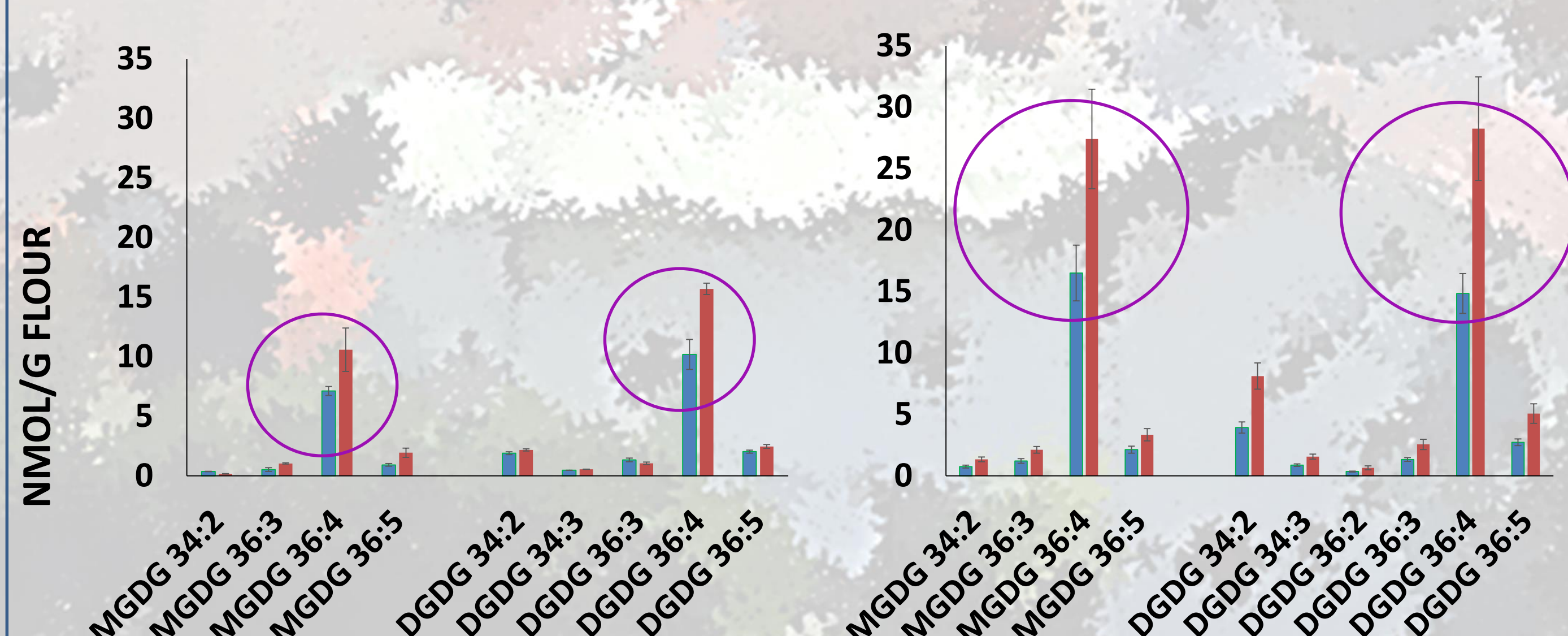
- Some significant differences were also identified for phospholipids such as phosphatidyl-inositidol (PI)

5) DOES IT SHOW FUNCTIONAL DIFFERENCES?: YES



- To identify whether these lipid differences provide functional differences, biophysical analysis was pursued at **IFR** using a diluted dough liquor system
- Surface tension provided **NO SIGNIFICANT DIFFERENCES** between the NILs
- 7A:M and 7A:H showed **SIGNIFICANT DIFFERENCES** in their **elasticity modulus**
- Indicates that there are **different concentrations** of components present between the 7A:M and 7A:H NILs, rather than any difference in the actual components

6) SAME LIPID DIFFERENCES IN DOUGH LIQUOR?: YES



MS Analysis of diluted dough liquor also shows similar lipid differences

7) CONCLUSION

- Genotype & Environment affect the lipid composition of the wheat grain
- Cultivar** exerted greater effects on **polar lipids**
- Nitrogen** condition exerted greater effects on **neutral lipids**
- The allelic regions on QTL 7A may be an interesting candidate to further investigate breadmaking quality

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