
Update on Breeding and Genetics Work at USDA
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New releases

- **RHA 476**: early maturity, HO, high yield
- **CMS/HA 482**: HO, semi-short statured
- **RHA 483, RHA 484**: excellent Phomopsis, good Sclerotinia resistance, HO, IMI
- **RHA 485**: high yield and oil content, superior Phomopsis resistance
- **RHA 486**: superior Phomopsis resistance, IMI,DM
- **CMS/HA 487**: HO, IMI

RELEASED INBRED LINES

Please use the order form to request germplasm.

USDA Released Inbred Lines

Line_Designation	Pedigree	Release_Year	Market_Type	B-line_R-line	Downy_Mildew	Rust	Branching	Oil	Herbicide	Other_Comments
HA 487	HA 466/French B-Line bulk	2017	Oilseed	B-line			NA	HO	IMI	
HA 482	HA 466/FR B	2017	Oilseed	B-line			NA	HO		
RHA 486	RHA 428/RHA 426//CAR 125/AS 437B/3/France R-Line bulk	2017	Oilseed	R-line	PI-?		Branching		IMI	
RHA 485	RHA 463/Almanzor	2017	Oilseed	R-line			Branching			
RHA 484	RHA 440/RHA 377//RHA 348/3/IMI/4/France R-Line bulk	2017	Oilseed	R-line			Branching	HO	IMI	
RHA 483	RHA 440/RHA 377//RHA 348/3/IMI/4/BUL R2	2017	Oilseed	R-line			Branching	HO	IMI	
HA 481	HA 441/HA 444/4/HA 411/ROM PH3/IM87 CAES//HA 434/HA 412	2016	Oilseed	B-line			NA	HO		
RHA 480	RHA 443/OLIVKO	2016	Oilseed	R-line			Branching		IMI	
RHA 479	RO 12-13//RHA 274/DOBS/3/PSC8/4/RHA 418/RHA 419/3/RO12-13//RHA 274/PRS5	2016	Oilseed	R-line			Branching			
RHA 478	RHA 443//RHA 455	2016	Oilseed	R-line			Branching	HO	IMI	
RHA 477	RHA 468//I-7009	2016	Oilseed	R-line	PI-ARG		Branching		IMI	
RHA 476	RHA 344/NID HO//NS-H-824/4//RHA 418//RHA 419/3/RO12-13//RHA 274/PRS5//I-7009	2016	Oilseed	R-line			Branching	HO		
HOLS 4	HA 466//PI 170414 + PI372259 bulk	2015	Oilseed	B-line			NA	HO/LP/LS	IMI	
HOLS 3	HA 466/4/HA 466/3/IR55//HA 466//HA 466	2015	Oilseed	B-line			NA	HO/LP/LS	IMI	
HOLS 2	HA 466/4/HA 466/3/IR53//HA 466//HA 466	2015	Oilseed	B-line			NA	HO/LP/LS	IMI	
HOLS 1	HA 466/4/HA 466/3/IR51//HA 466//HA 466	2015	Oilseed	B-line			NA	HO/LP/LS	IMI	
RHA 475	CAR 125/AS 437B//RHA 440/3/RHA 418//RHA 426//YUGO R POP	2011	Oilseed	R-line			Branching		IMI	
RHA 474	RHA 801/AS 437B//RHA 426	2011	Oilseed	R-line			Branching		IMI	
RHA 473	RHA 447//RHA 801/AS 437B	2011	Oilseed	R-line			Branching	HO		
RHA 472	RHA 801/AS 437B//RHA 439	2011	Oilseed	R-line			Branching			
TOCO B1	HA 341/HA 821//Krasnodar 917/3/LG-24	2008	Oilseed	B-line			NA	HO		Run HPLC
TOCO R2	RHA 344/2596-1//Krasnodar 917/3/LG-24	2008	Oilseed	R-line			Branching			Run HPLC
TOCO R1	RHA 344/2596-1//Krasnodar 917/3/LG-24	2008	Oilseed	R-line			Branching			Run HPLC
HA 469	HA 89/NIV//HA 434/HA 412/3/HA 434//SU	2007	Oilseed	B-line			NA	HO	SU	
CONFSCL B2	HA 441/CONF//CONF	2007	Confection	B-line			NA			
CONFSCL B1	HA 411/ROM PH//HA 442/3/HA 441/4/CONF/5/CONF	2007	Confection	B-line			NA		IMI	
RHA 471	RHA 801/AS 437B/4/RHA 377/3/RHA 392//RHA 375/SUR	2007	Oilseed	R-line			Branching		SU	
RHA 470	RHA 801/AS 437B/4/RHA 377/3/RHA 392//RHA 375/SUR	2007	Oilseed	R-line			Branching		SU	
CONFSCL R5	RO12-13//RHA 274/Dobritch/3/PSC8/4/CONF/5/CONF	2007	Confection	R-line			Branching			
CONFSCL R4	RO12-13//RHA 274/Dobritch/3/PSC8/4/CONF/5/CONF	2007	Confection	R-line			Branching			
CONFSCL R3	RO12-13//RHA 274/Dobritch/3/PSC8/4/CONF/5/CONF	2007	Confection	R-line			Branching			
CONFSCL R2	RO12-13//RHA 274/Dobritch/3/PSC8/4/CONF/5/CONF	2007	Confection	R-line			Branching			
CONFSCL R1	RHA 440//SC8/CONF/3/CONF	2007	Confection	R-line			Branching			
HA 467	HA 411/ROM PH//HA 425/87CAES/3/HA 89/NIV//HA 434/HA 412	2006	Oilseed	B-line			NA	HO	IMI	
HA 466	HA 411/ROM PH//HA 425/87CAES/3/HA 89/NIV//HA 434/HA 412	2006	Oilseed	B-line			NA	HO	IMI	
HA 465	HA 89/NIV//HA 434/HA 412/3/HA 434//HA 425 (IMI R, Scl)	2006	Oilseed	B-line			NA	HO	IMI	
HA 460	HA 434*2/ RHA 340	2006	Oilseed	B-line	PI-8		NA	HO		

RECENT POSTS

- Internship Projects: Summer 2017
- RHA 485, RHA 486, HA 487 Release
- HA 482, RHA 483, and RHA 484 Release
- Lab Picnic!
- Intern Highlight: Jonathan Tetlie

Search …

SPECIES WE WORK WITH

Trait mapping

- Glandular trichome abundance mapped
  - May have importance for providing partial resistance to sunflower head moth
- Used GBS data, with trio imputation from parents to fill gaps in GBS data
- GBS data methods in paper just published in Frontiers in Plant Science, download from Publications tab on website!

PUBLICATIONS

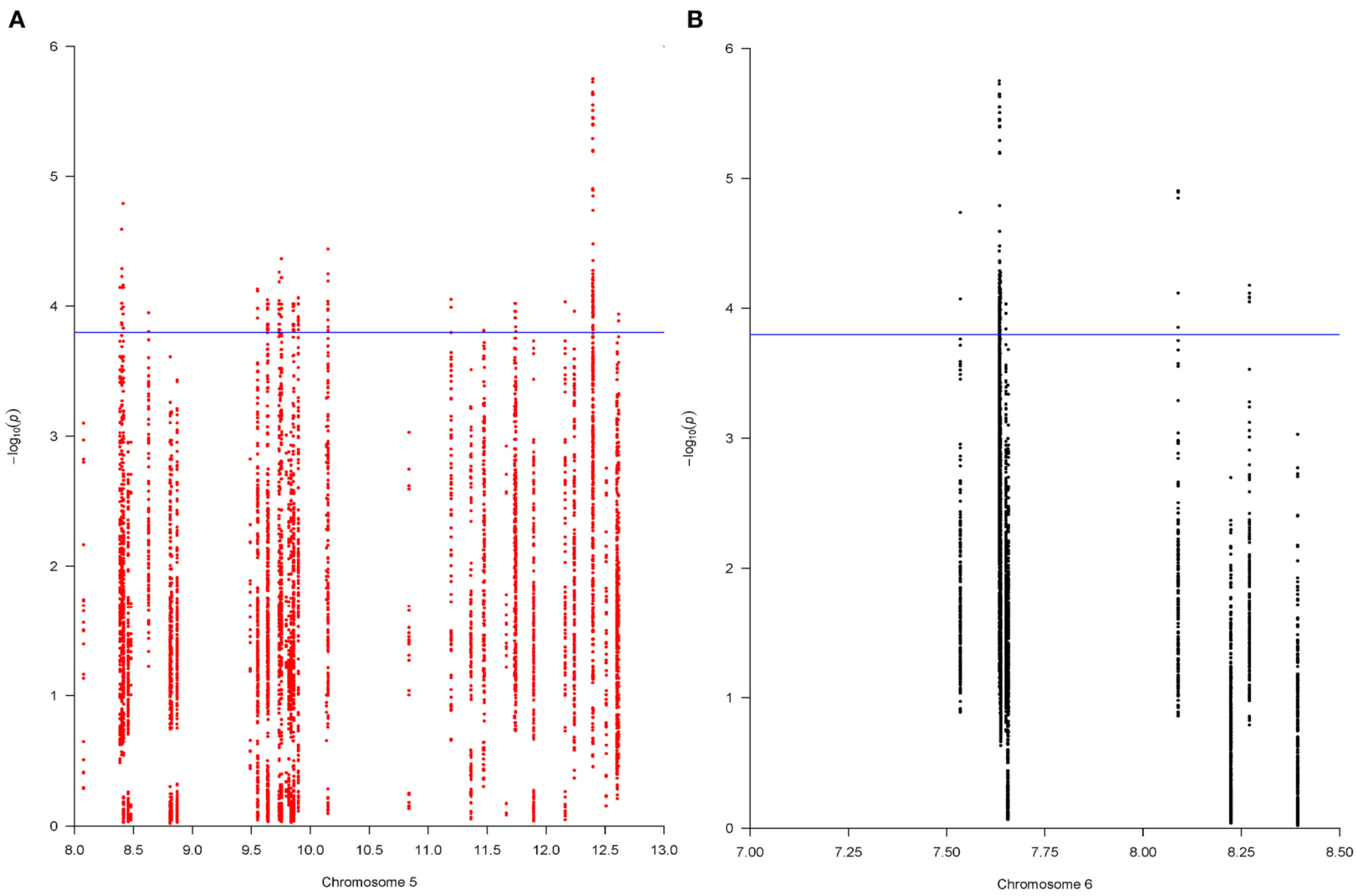
Peer-Reviewed Publications (*graduate students/postdocs in italics*)

1. Portlas, Z.M., J.R. Tetlie, D. Prischman-Voldseth, **B.S. Hulke**, and J.R. Prasifka. 2018. Variation in floret size explains differences in wild bee visitation to cultivated sunflowers. Plant Genet. Res. (in review).
2. Fu, X., L.L. Qi, **B.S. Hulke**, and C.-C. Jan. 2017. Somatic embryogenesis from corolla tubes of interspecific amphiploids between cultivated sunflower (Helianthus annuus L.) and its wild species. Helia 40:1-19.
3. *Gao, Q.M.*, N.C. Kane, **B.S. Hulke**, S. Reinert, C. Pogoda, S. Tittes, and J.R. Prasifka. 2017. Genetic architecture of capitate glandular trichome density in florets of domesticated sunflower (Helianthus annuus L.). Frontiers Plant Sci. doi: 10.3389/fpls.2017.02227.
4. **Hulke, B.S.**, *Q.M. Gao*, and M.E. Foley. 2017. Registration of the sunflower oilseed maintainer genetic stocks HOLS1, HOLS2, HOLS3, and HOLS4, possessing genes for high oleic and low saturated fatty acids, and tolerance to imidazolinone herbicides. J. Plant Registrations doi:10.3198/jpr2016.09.0043crgs.
5. **Hulke, B.S.**, G. Ma, L.L. Qi, and T.J. Gulya. 2017. Registration of oilseed sunflower germplasms RHA 461, RHA 462, RHA 463, HA 465, HA 466, HA 467, and RHA 468. J. Plant Registrations doi:10.3198/jpr2017.04.0023crg.
6. **Hulke, B.S.**, and W.E. May. 2017. Registration of oilseed sunflower restorer germplasms RHA 476 and RHA 477, adapted for short season environments. J. Plant Registrations doi:10.3198/jpr2017.07.0048crg.
7. Prasifka, J.R., R.E. Mallinger, **B.S. Hulke**, S.R. Larson, and D. Van Tassel. 2017. Plant-herbivore and plant-pollinator interactions of the developing perennial oilseed crop, Silphium integrifolium Michx. Environmental Ent. 46:1339-1345. doi.org/10.1093/ee/nvx134
8. Qi, L.L., Z.I. Talukder, **B.S. Hulke**, and M.E. Foley. 2017. Development of diagnostic SNP markers for the downy mildew resistance genes PlArg and Pl8, and marker-assisted gene pyramiding in sunflower (Helianthus annuus L.). Mol. Genet. Genomics doi:10.1007/s00438-017-1290-8
9. Van Tassel, D., K. Albrecht, J. Bever, A., Boe, Y. Brandvain, T. Crews, M. Gansberger, P. Gerstberger, L. González-Paleo, **B. Hulke**, N. Kane, P. Johnson,

RECENT POSTS

Search ...

SPECIES WE WORK WITH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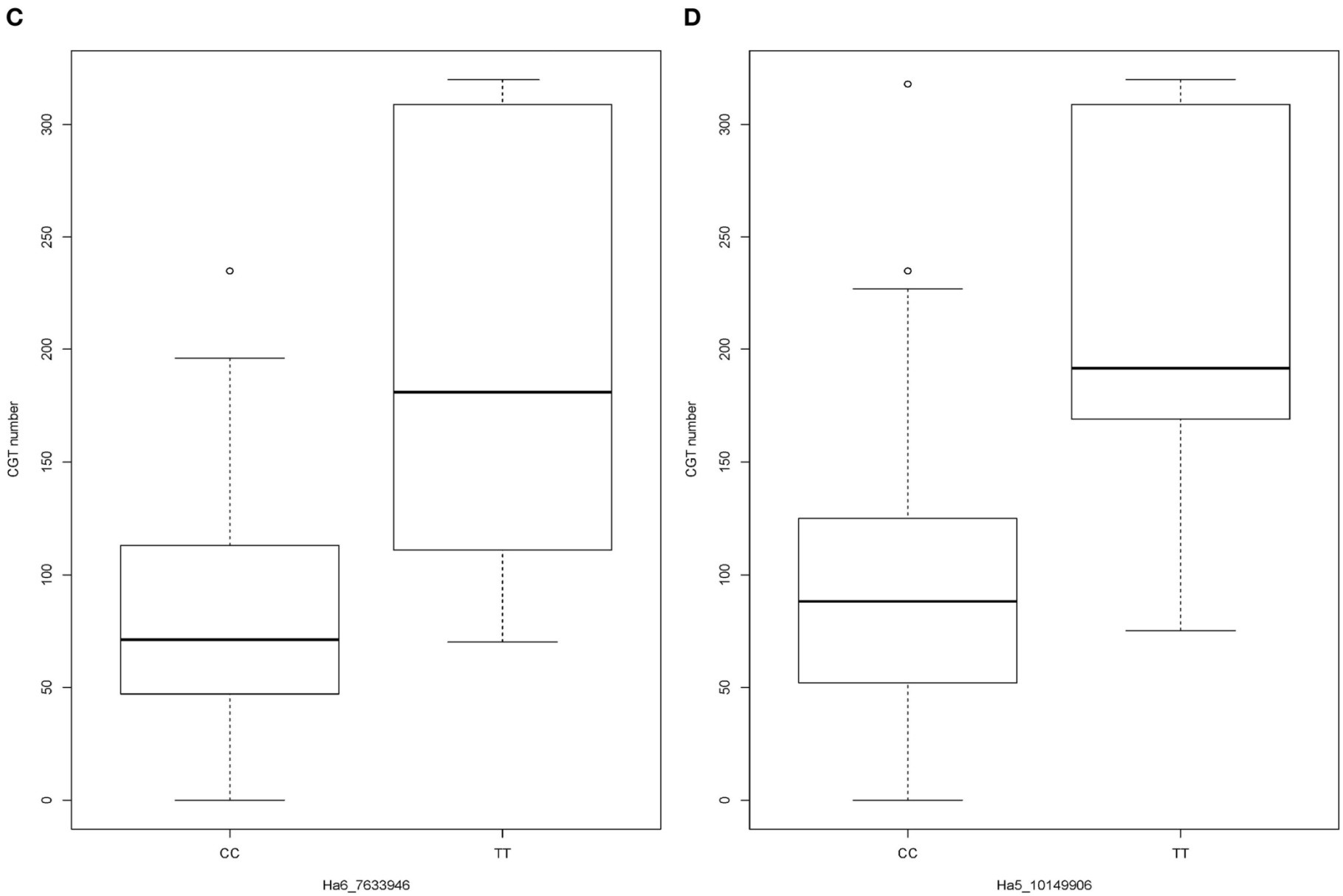
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RSSW mapping

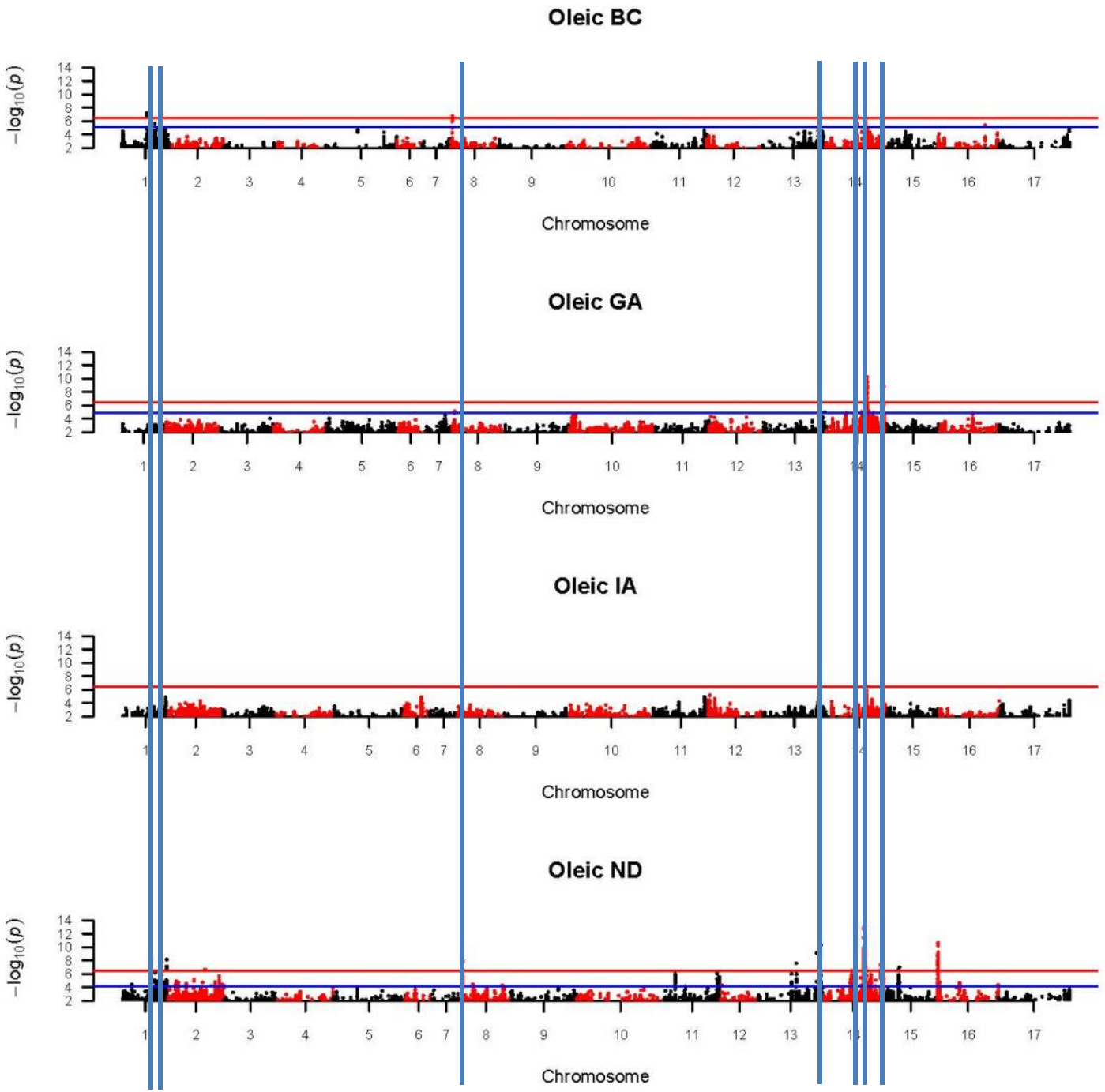
- Biparental population like glandular trichome
- Preliminary analysis shows one gene
- GBS data lacking density so we are adding markers to verify nothing was missed
- Mapped gene will be released with B-line and R-line germplasm

Fatty acid association mapping

- NSA funded project
  - SAM association population + 49 other released inbred lines
  - Evaluated at 6 environments with a range of different temperatures at bloom
  - Analyzed using association mapping analyses, controlled for population structure and kinship
  - Opportunities to study minor effect QTL and their interaction with the environment

Justification

- Phenotyping fatty acids is expensive in resources and time
- Precision in engineering oil profiles may be needed in the near future
- Better understanding of GxE is needed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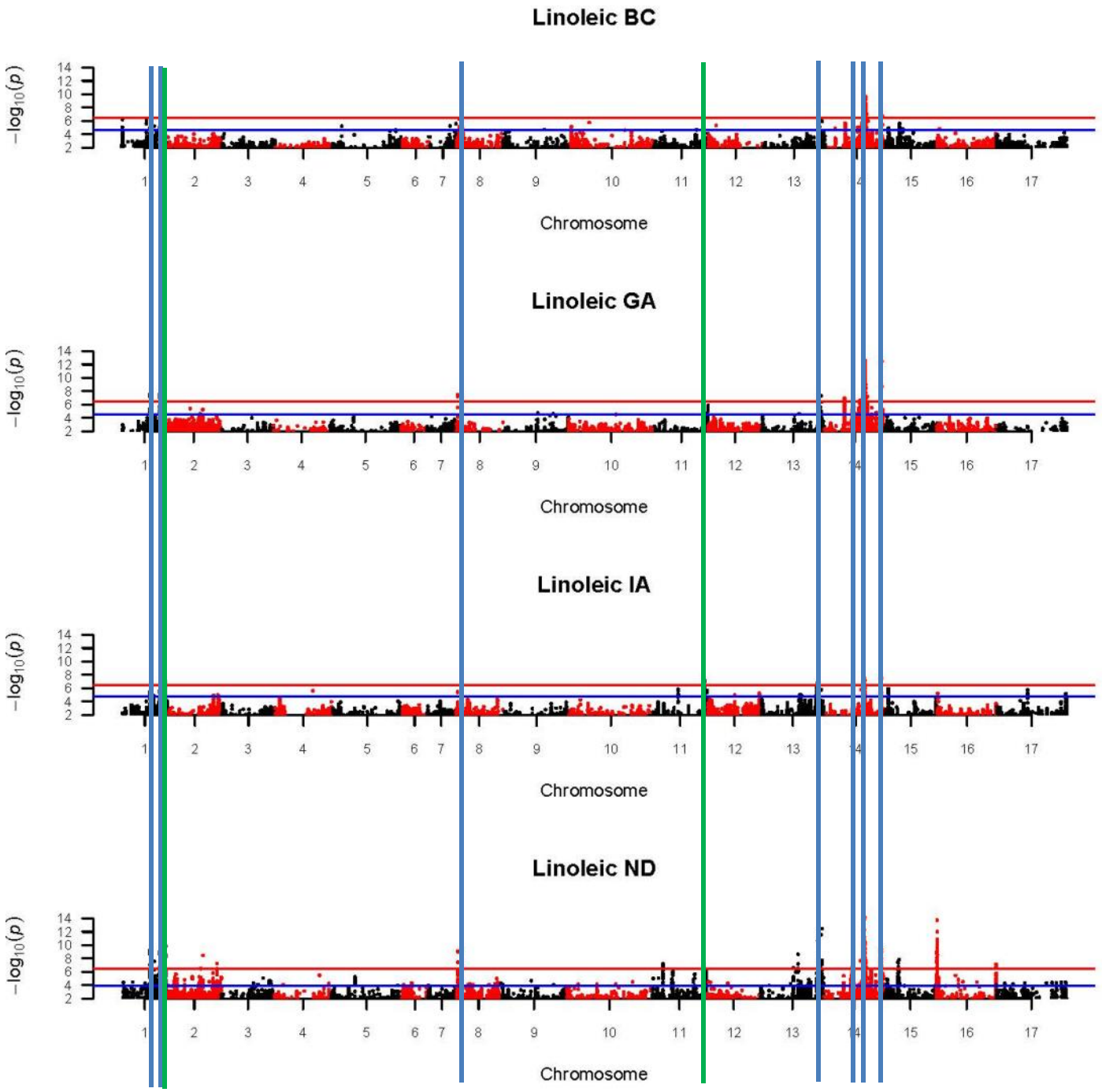
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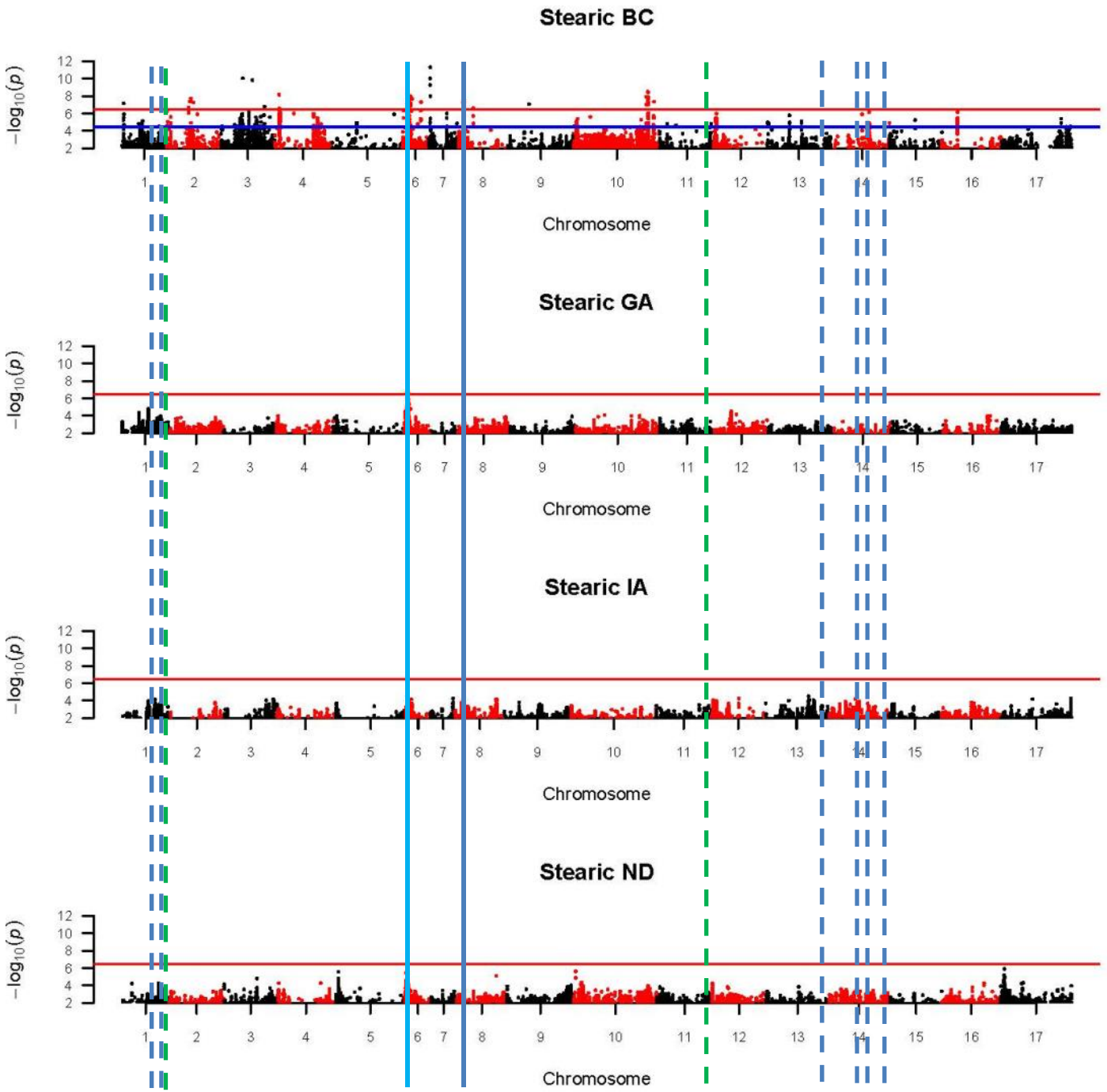
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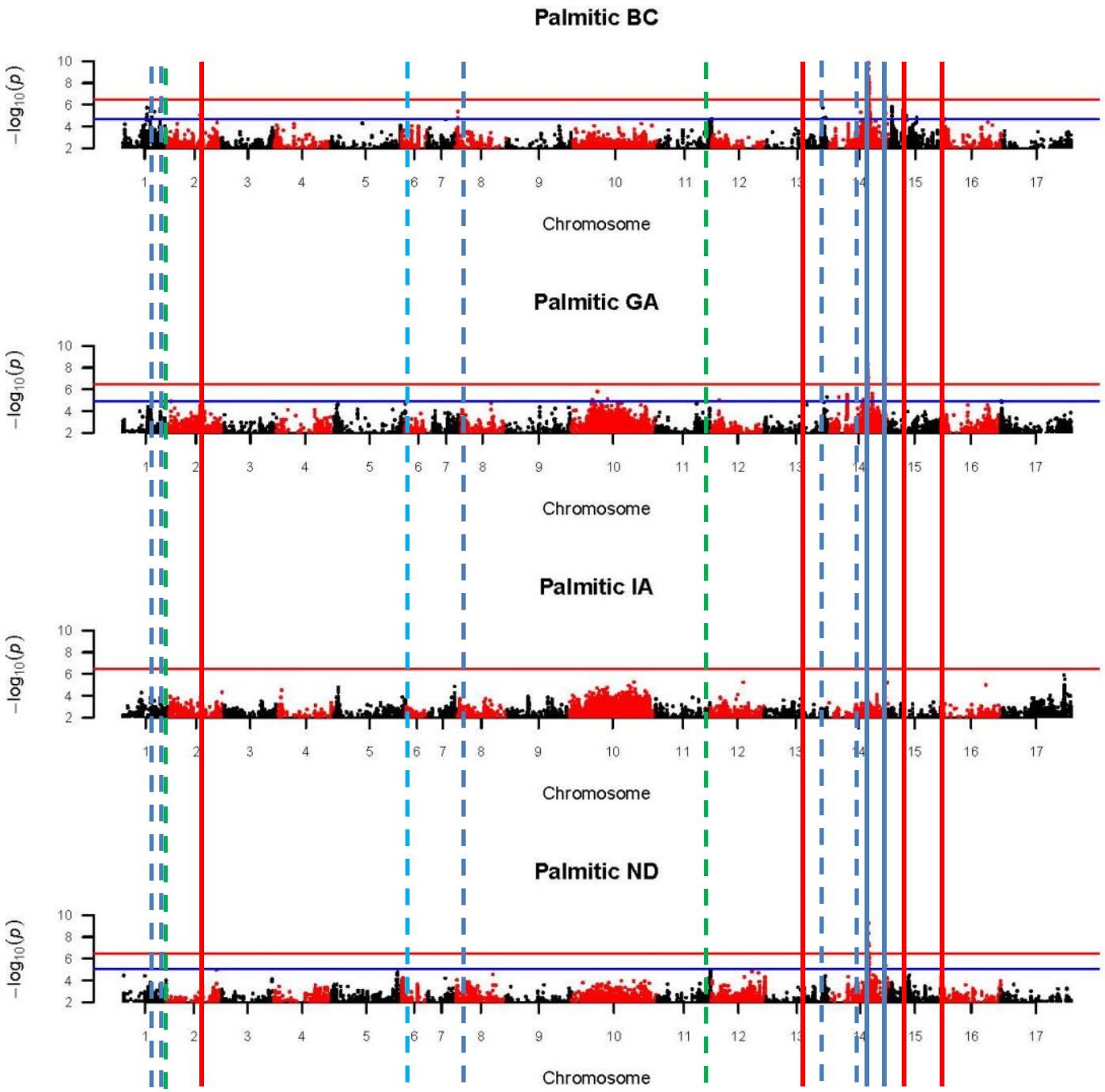
Palmitic BC
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Summary

- Genotype by environment variation for oleic content is real and a moderate number of loci drive it
- Story will be more clear with completion of validation population in the next few months
- We can now drill down and begin candidate gene identification (even small intervals can contain many genes)

Future Steps

- Complete papers on oleic acid modifying loci and genotype by environment interaction
- Complete paper on red sunflower seed weevil resistance

Thanks to our research sponsors!
-National Sunflower Association
-Genome Canada/Genome BC
-USDA Sclerotinia Initiative
-Saskatchewan Ministry of Ag.