Evaluating the breeding potential of cultivated lentils for protein and amino acid concentration and quality

unpublished

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10-08-2024

Contents

- Derek Wright, Jiayi Hang, James D House & Kirstin E Bett (2020) **Evaluating the breeding potential of cultivated lentils for protein and amino acid concentration and quality**. *unpublished*

which is follow-up to:

- Jiayi Hang, Da Shi, Jason Neufeld, Kirstin E. Bett & James D. House. **Prediction of protein and amino acid concentration in whole and ground lentils using near-infrared reflectance spectroscopy**. *LWT*. (**2022**) 165: 113669. doi.org/10.1016/j.lwt.2022.113669

&

- Derek M. Wright, Sandesh Neupane, Taryn Heidecker, Teketel A. Haile, Crystal Chan, Clarice J. Coyne, Rebecca J. McGee, Sripada Udupa, Fatima Henkrar, Eleonora Barilli, Diego Rubiales, Tania Gioia, Giuseppina Logozzo, Stefania Marzario, Reena Mehra, Ashutosh Sarker, Rajeev Dhakal, Babul Anwar, Debashish Sarker, Albert Vandenberg & Kirstin E. Bett. **Understanding photothermal interactions can help expand production range and increase genetic diversity of lentil (*Lens culinaris* Medik.)**. *Plants, People, Planet*. (**2020**) 3(2): 171-181. doi.org/10.1002/ppp3.10158

- https://github.com/derekmichaelwright/AGILE_LDP_Protein
- View as pdf
- View as HTML
- Source Code Vignette (LDP_Protein_Vignette.html)

Contents

AGILE

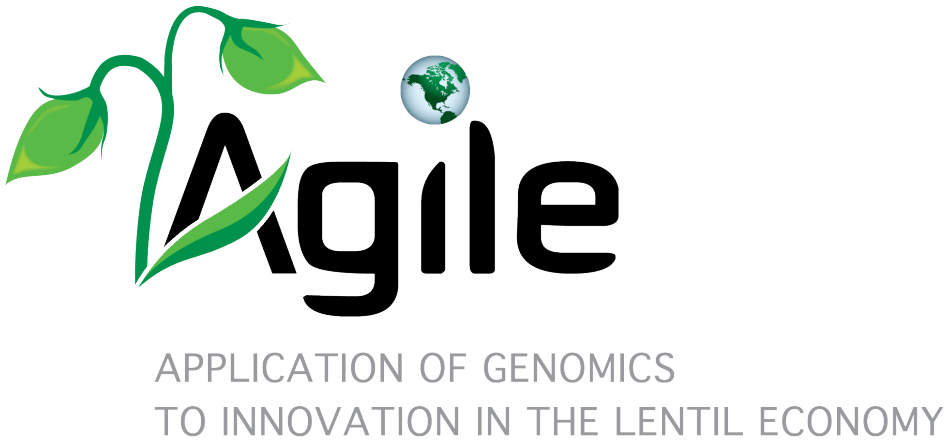

Figure 1: https://knowpulse.usask.ca/study/AGILE-Application-of-Genomic-Innovation-in-the-Lentil-Economy

Figure 2: https://knowpulse.usask.ca/study/EVOLVES-Enhancing-the-Value-of-Lentil-Variation-for-Ecosystem-Survival

Collaborators

- Department of Plant Sciences and Crop Development Centre, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
- Department of Food and Human Nutritional Sciences, Faculty of Agriculture and Food Science, University of Manitoba, Winnipeg, MB, Canada

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Supplemental Table 1

Supplemental_table_01.csv

Supplemental Table 2

Supplemental_table_02.csv

Figures

Figure 1

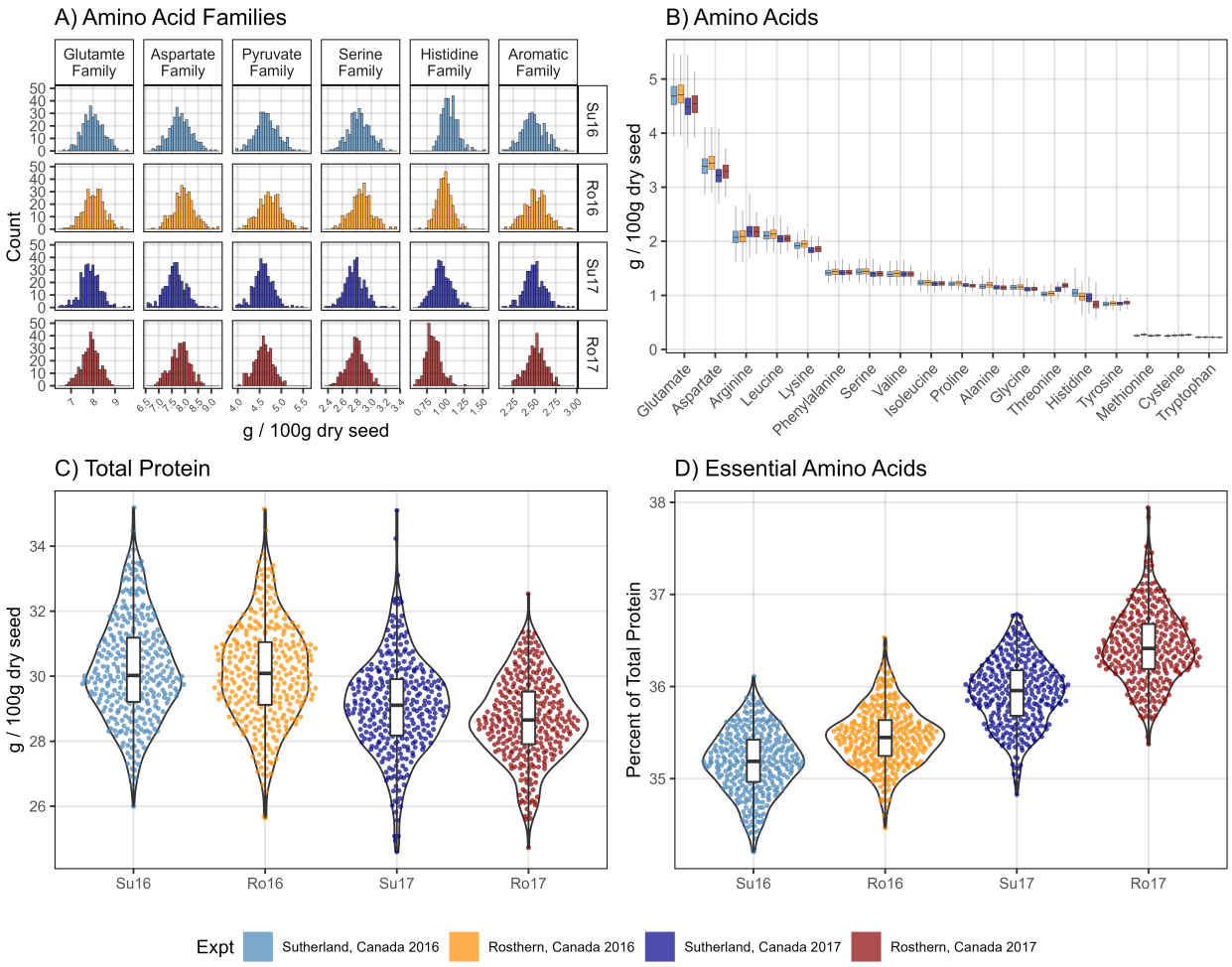


Figure 2

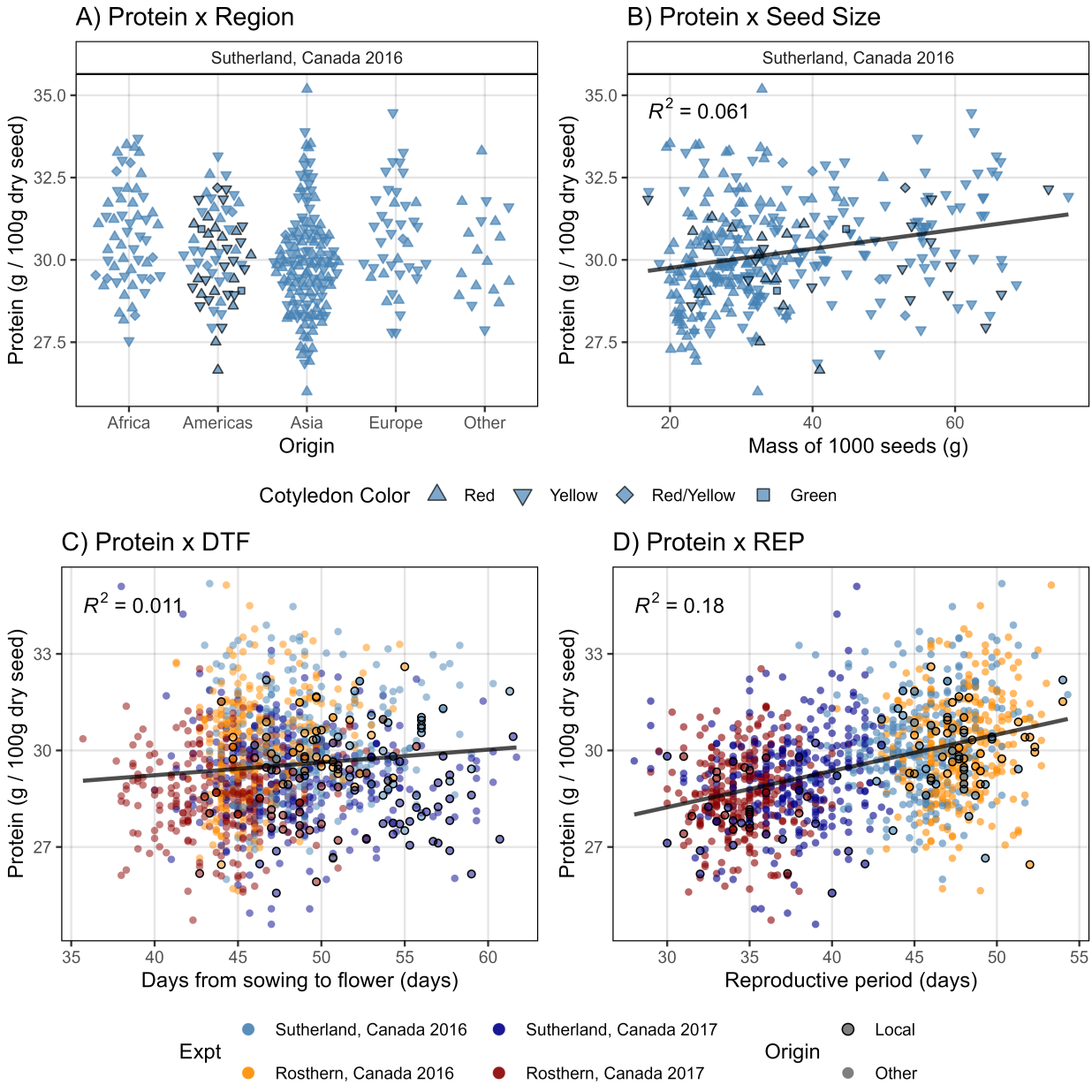

A) Protein x Region
Sutherland, Canada 2016
Protein (g / 100g dry seed)
35.0
32.5
30.0
27.5
Africa
Americas
Asia
Europe
Other
Origin
B) Protein x Seed Size
Sutherland, Canada 2016
R^2 = 0.061
Protein (g / 100g dry seed)
20
40
60
Mass of 1000 seeds (g)
Cotyledon Color
Red
Yellow
Red/Yellow
Green
C) Protein x DTF
R^2 = 0.011
Protein (g / 100g dry seed)
33
30
27
35
40
45
50
55
60
Days from sowing to flower (days)
D) Protein x REP
R^2 = 0.18
Protein (g / 100g dry seed)
30
35
40
45
50
55
Reproductive period (days)
Expt
Sutherland, Canada 2016
Sutherland, Canada 2017
Rosthern, Canada 2016
Rosthern, Canada 2017
Origin
Local
Other

Figure 3

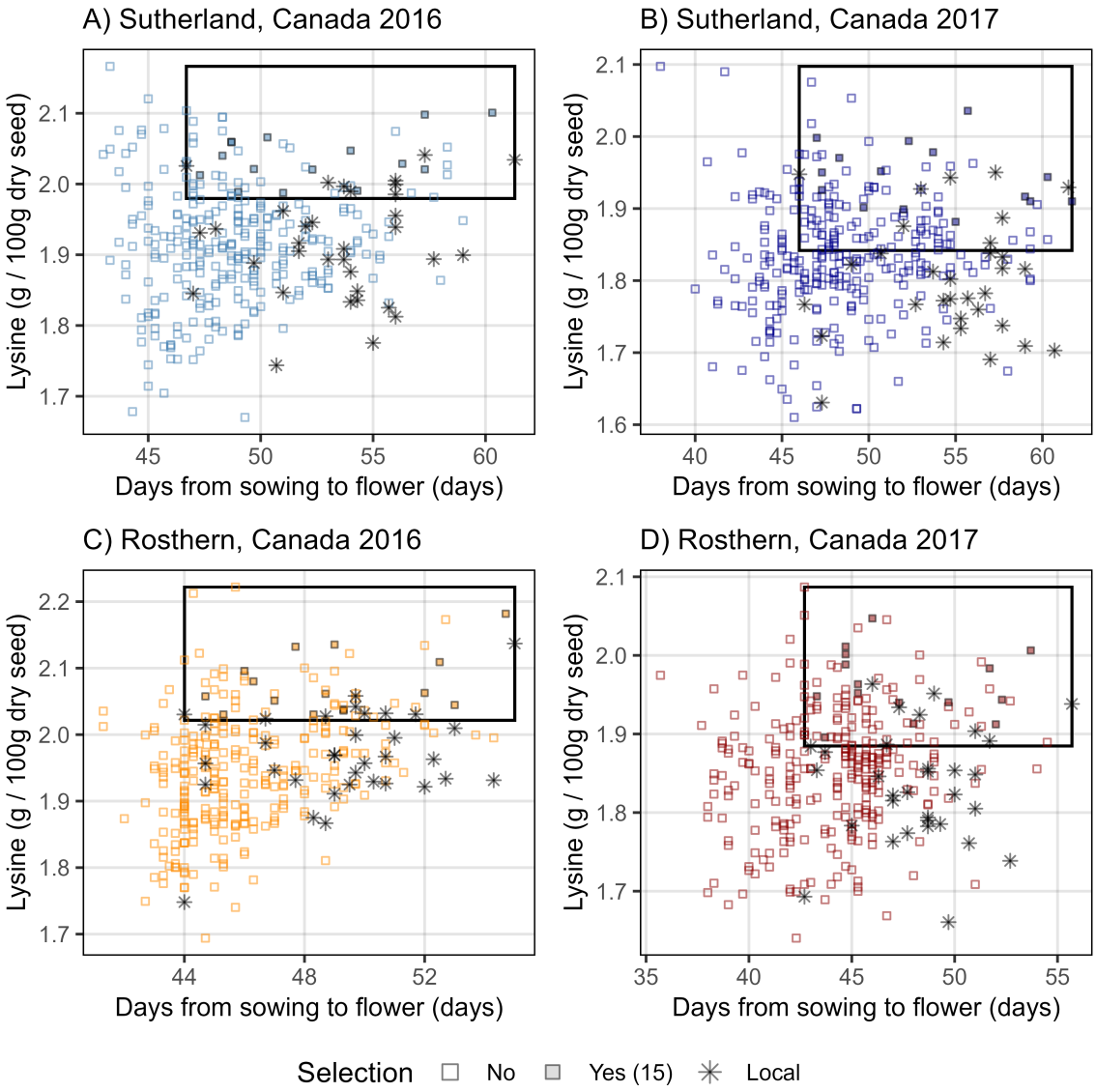
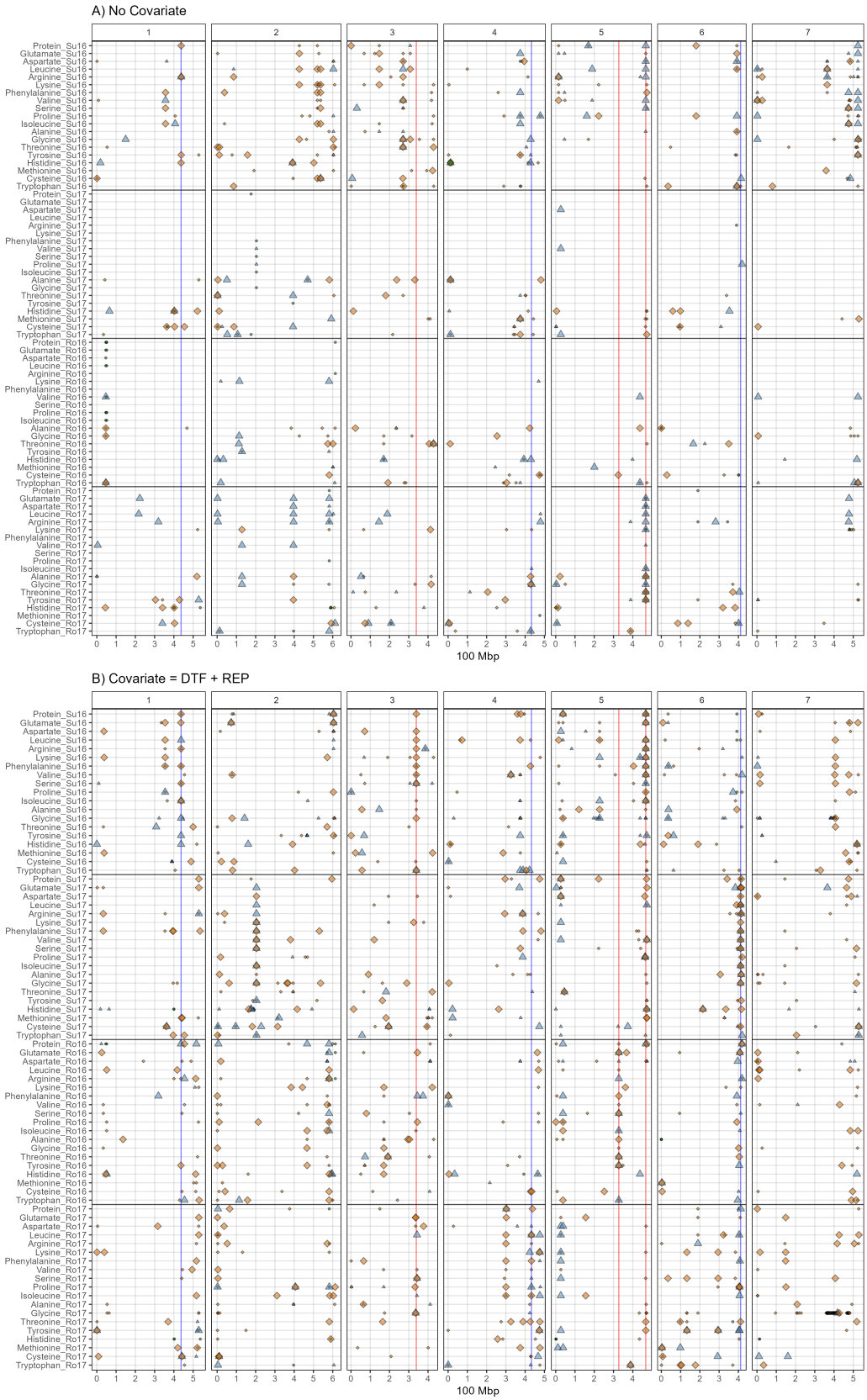

A) Sutherland, Canada 2016
B) Sutherland, Canada 2017
C) Rosthern, Canada 2016
D) Rosthern, Canada 2017
Lysine (g / 100g dry seed)
Days from sowing to flower (days)
Selection
No
Yes (15)
Local

Figure 4


A) No Covariate
B) Covariate = DTF + REP
1
2
3
4
5
6
7
Protein_Su16
Glutamate_Su16
Aspartate_Su16
Leucine_Su16
Arginine_Su16
Lysine_Su16
Phenylalanine_Su16
Valine_Su16
Serine_Su16
Proline_Su16
Isoleucine_Su16
Alanine_Su16
Glycine_Su16
Threonine_Su16
Tyrosine_Su16
Histidine_Su16
Methionine_Su16
Cysteine_Su16
Tryptophan_Su16
Protein_Su17
Glutamate_Su17
Aspartate_Su17
Leucine_Su17
Arginine_Su17
Lysine_Su17
Phenylalanine_Su17
Valine_Su17
Serine_Su17
Proline_Su17
Isoleucine_Su17
Alanine_Su17
Glycine_Su17
Threonine_Su17
Tyrosine_Su17
Histidine_Su17
Methionine_Su17
Cysteine_Su17
Tryptophan_Su17
Protein_Ro16
Glutamate_Ro16
Aspartate_Ro16
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Tryptophan_Ro16
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Glutamate_Ro17
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Methionine_Ro17
Cysteine_Ro17
Tryptophan_Ro17
0 1 2 3 4 5
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100 Mbp
Model
MLM
BLINK
FarmCPU
Marker
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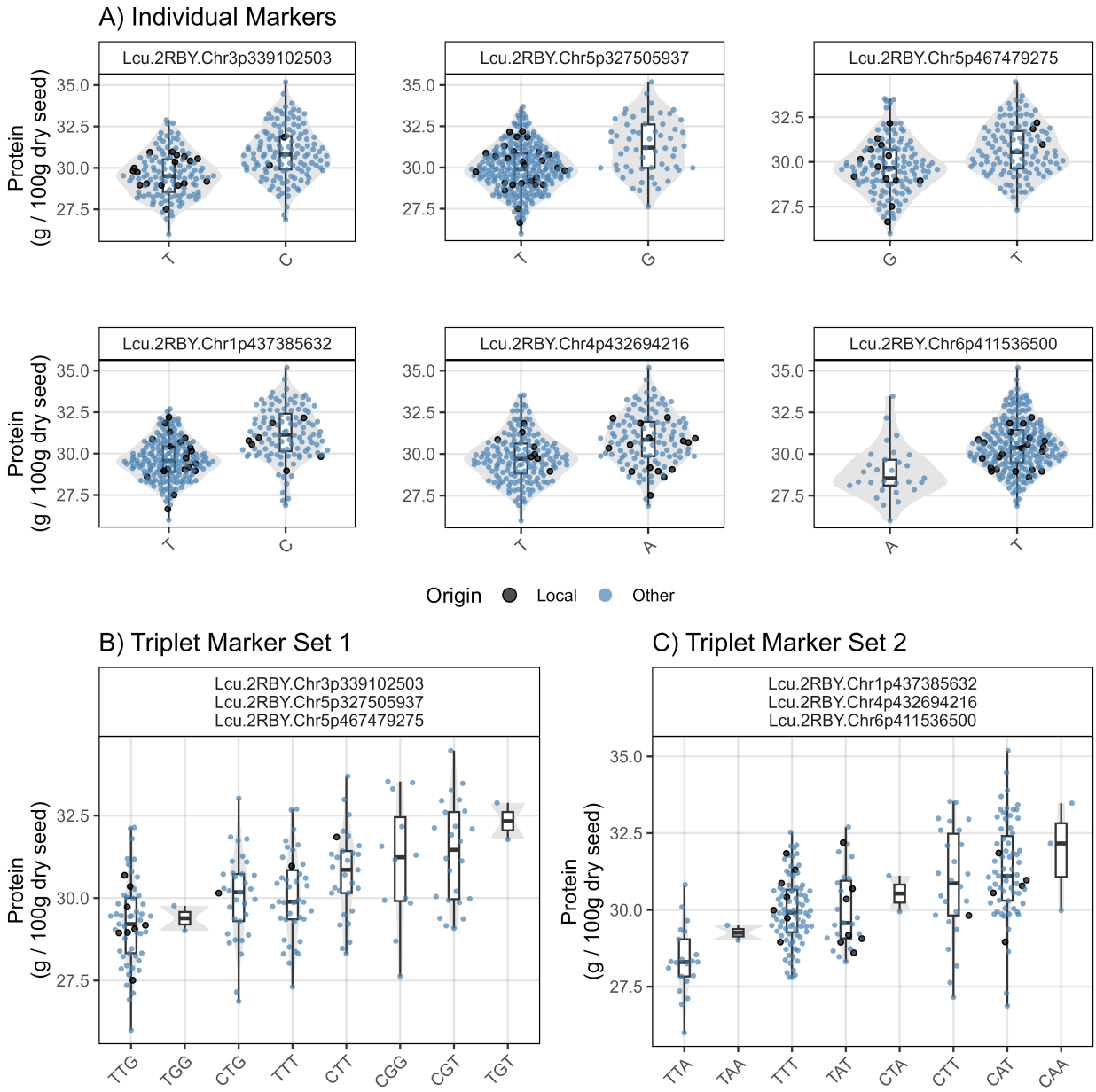
Figure 5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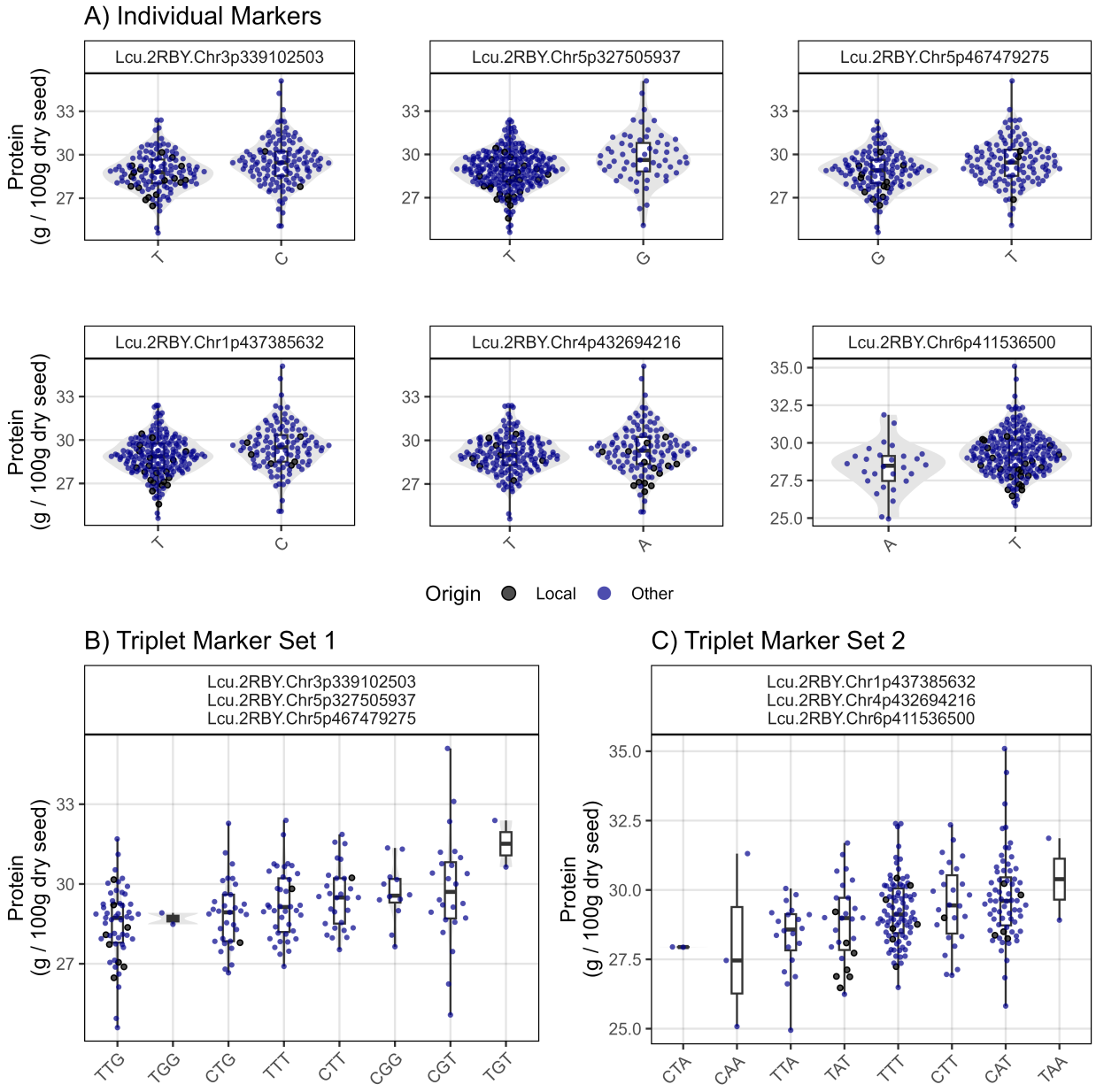
Lcu.2RBY.Chr1p437385632
Lcu.2RBY.Chr4p432694216
Lcu.2RBY.Chr6p411536500
Protein (g / 100g dry seed)
Origin Local Other
B) Triplet Marker Set 1
Lcu.2RBY.Chr3p339102503
Lcu.2RBY.Chr5p327505937
Lcu.2RBY.Chr5p467479275
TTG TGG CTG TTT CTT CGG CGT TGT
C) Triplet Marker Set 2
Lcu.2RBY.Chr1p437385632
Lcu.2RBY.Chr4p432694216
Lcu.2RBY.Chr6p411536500
TTA TAA TTT TAT CTA CTT CAT CAA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Lcu.2RBY.Chr4p432694216
Lcu.2RBY.Chr6p411536500
Protein (g / 100g dry seed)
Origin
Local
Other
B) Triplet Marker Set 1
Lcu.2RBY.Chr3p339102503
Lcu.2RBY.Chr5p327505937
Lcu.2RBY.Chr5p467479275
TTG
TGG
CTG
TTT
CTT
CGG
CGT
TGT
C) Triplet Marker Set 2
Lcu.2RBY.Chr1p437385632
Lcu.2RBY.Chr4p432694216
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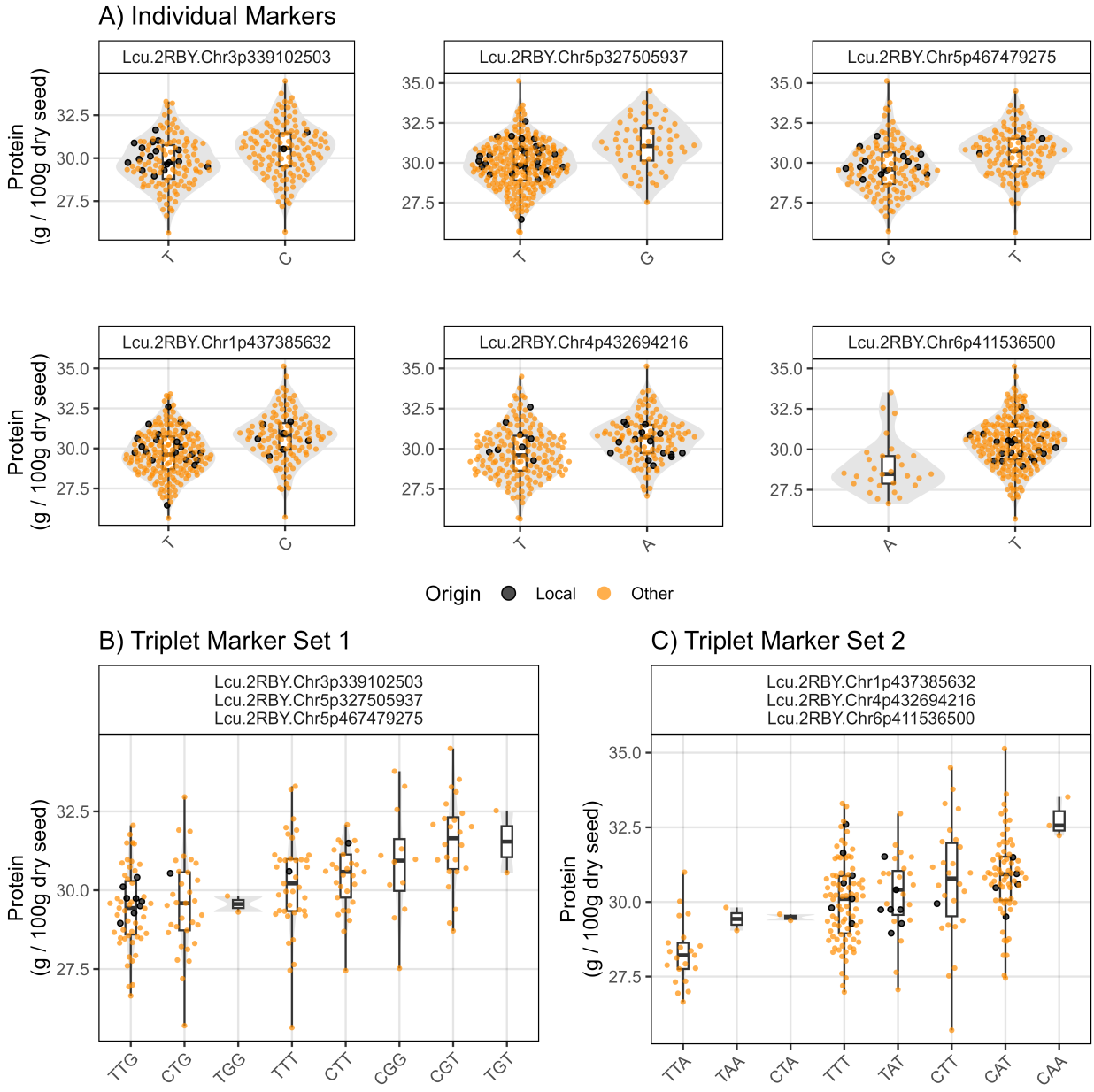
CTA
CAA
TTA
TAT
TTT
CTT
CAT
TAA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Lcu.2RBY.Chr4p432694216
Lcu.2RBY.Chr6p411536500
Protein (g / 100g dry seed)
Origin
Local
Other
B) Triplet Marker Set 1
Lcu.2RBY.Chr3p339102503
Lcu.2RBY.Chr5p327505937
Lcu.2RBY.Chr5p467479275
TTG
CTG
TGG
TTT
CTT
CGG
CGT
TGT
C) Triplet Marker Set 2
Lcu.2RBY.Chr1p437385632
Lcu.2RBY.Chr4p432694216
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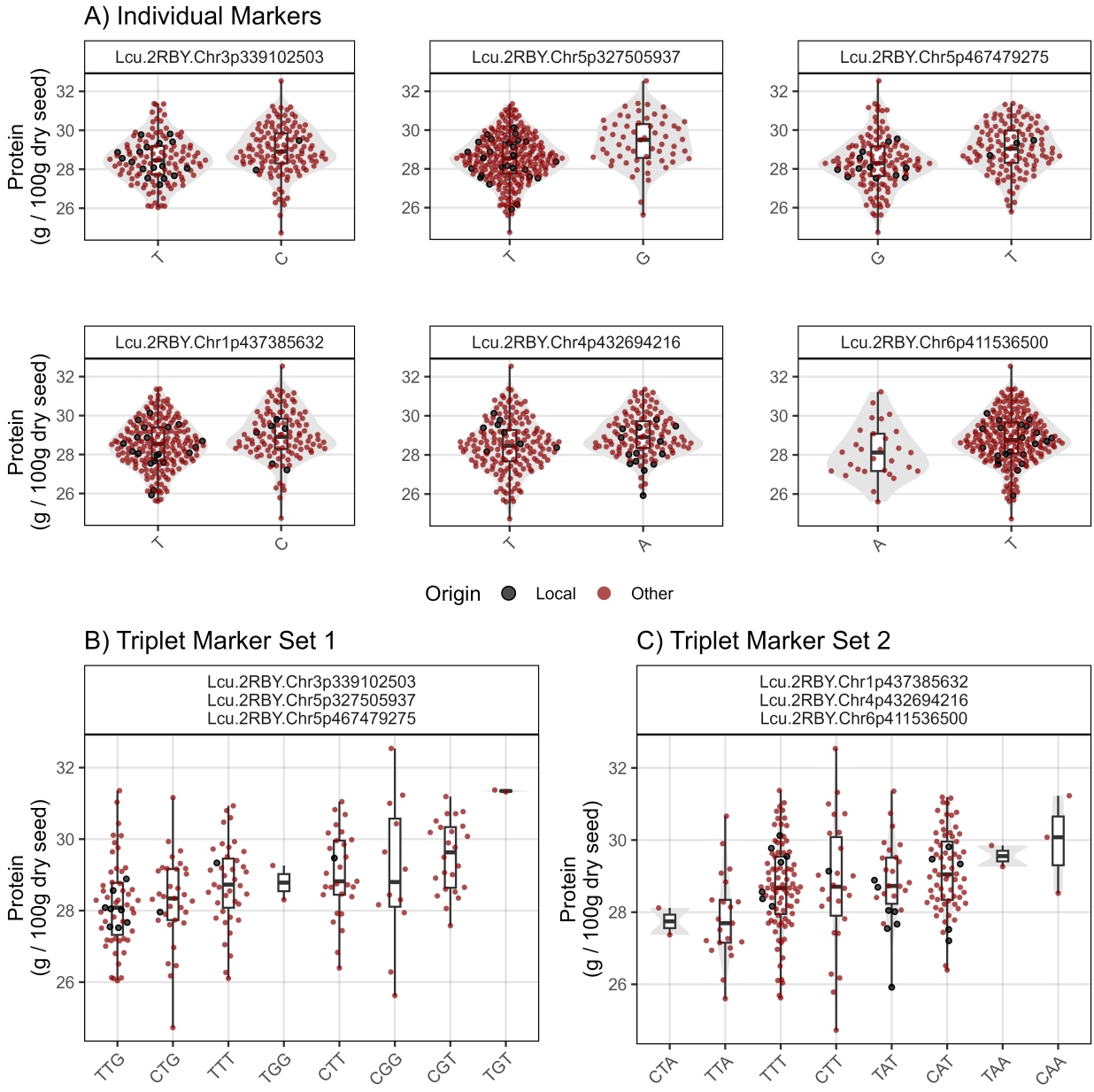
TTA
TAA
CTA
TTT
TAT
CTT
CAT
CAA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Lcu.2RBY.Chr4p432694216
Lcu.2RBY.Chr6p411536500
Protein (g / 100g dry seed)
Origin
Local
Other
B) Triplet Marker Set 1
Lcu.2RBY.Chr3p339102503
Lcu.2RBY.Chr5p327505937
Lcu.2RBY.Chr5p467479275
TTG
CTG
TTT
TGG
CTT
CGG
CGT
TGT
C) Triplet Marker Set 2
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Lcu.2RBY.Chr4p432694216
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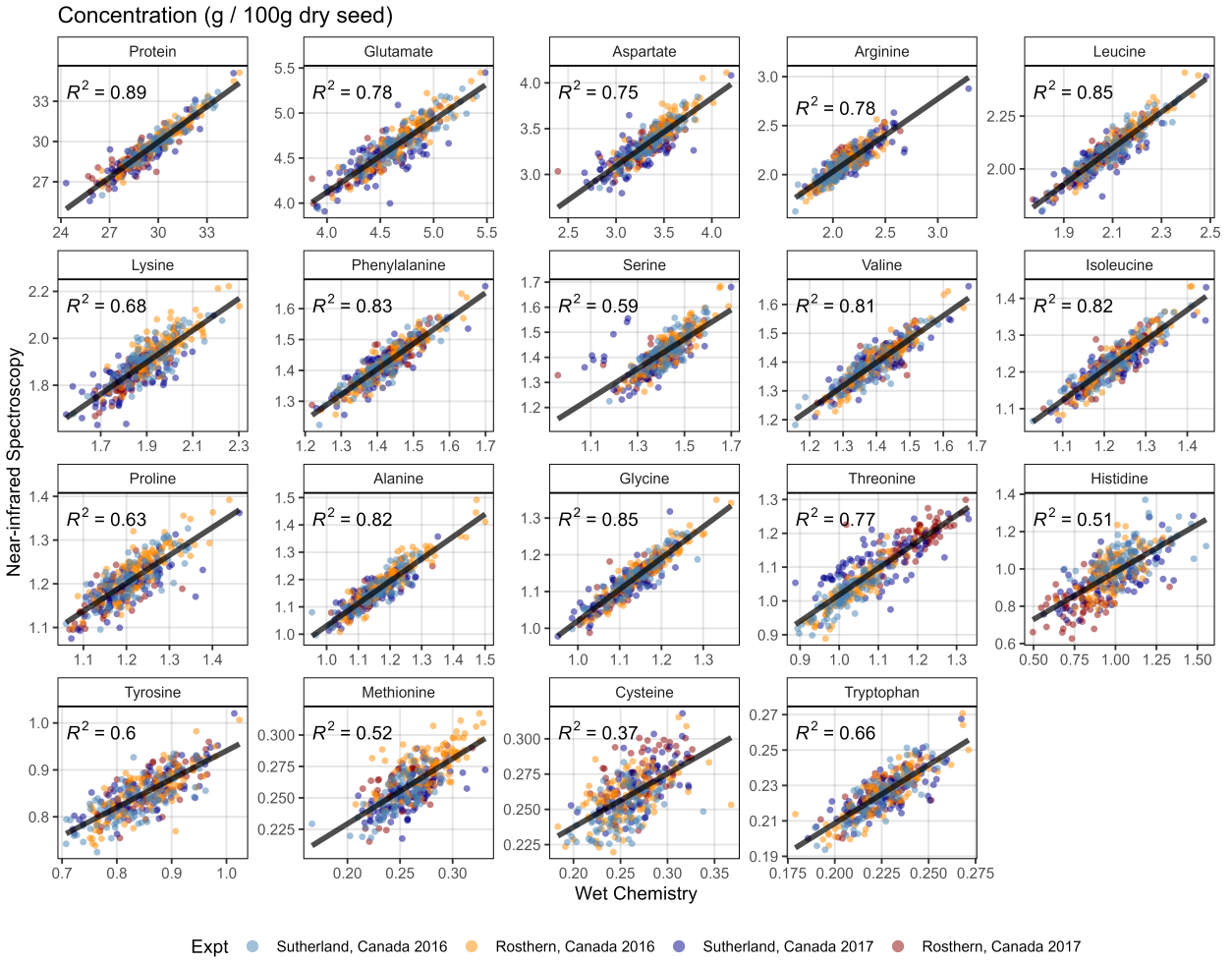
CAA

Supplemental Figures

Supplemental Figure 1



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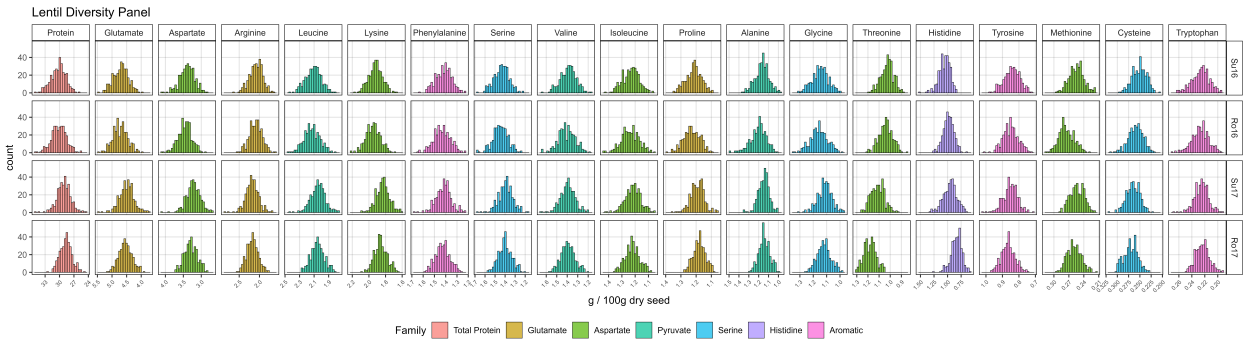

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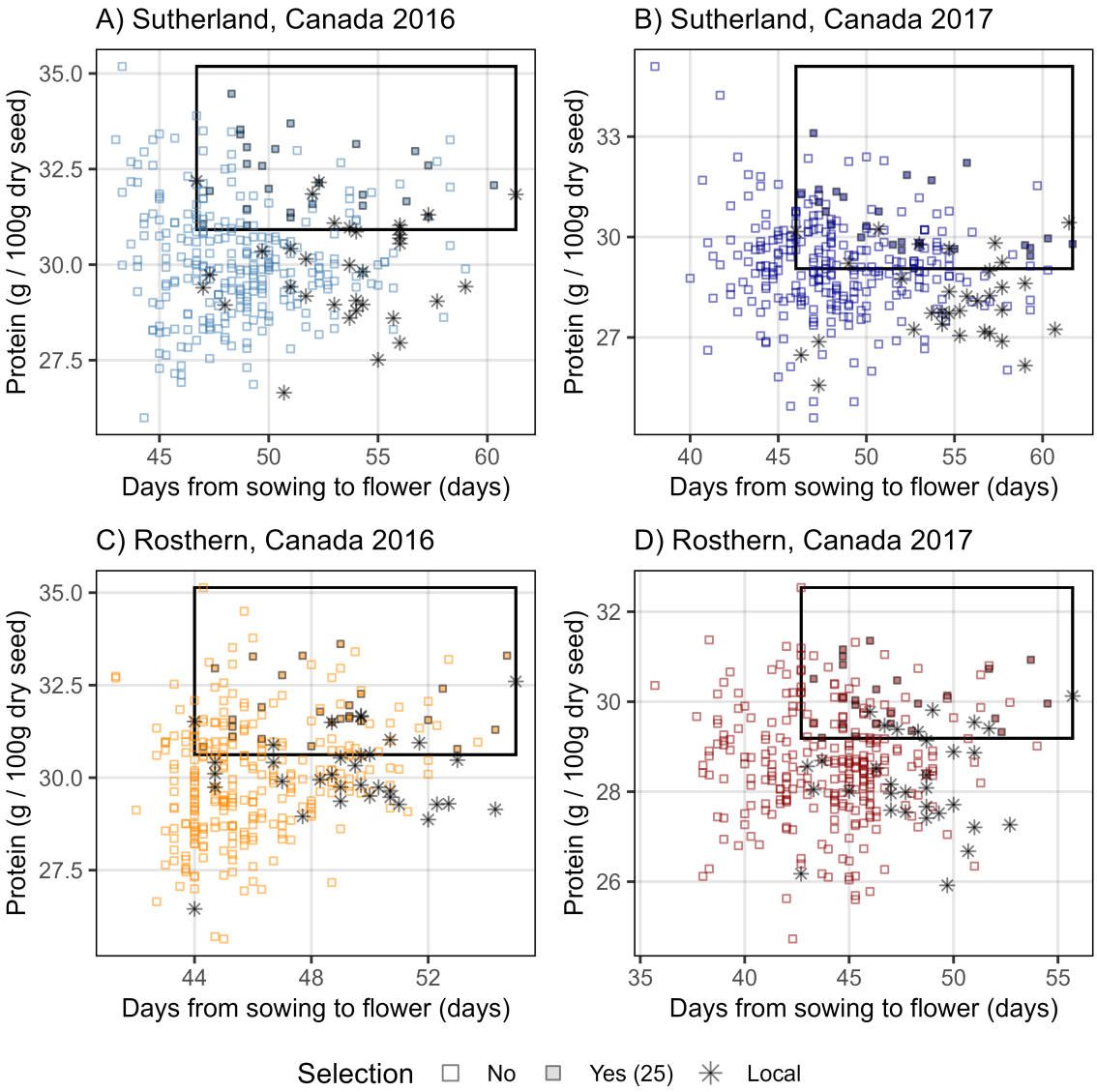

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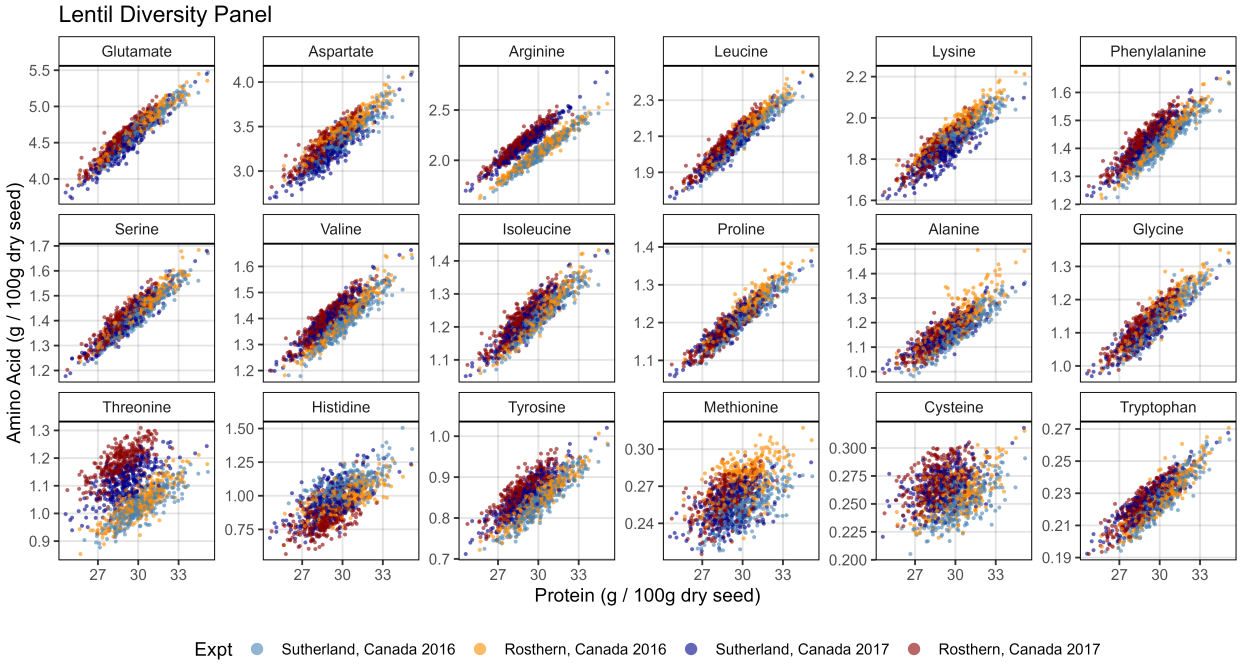

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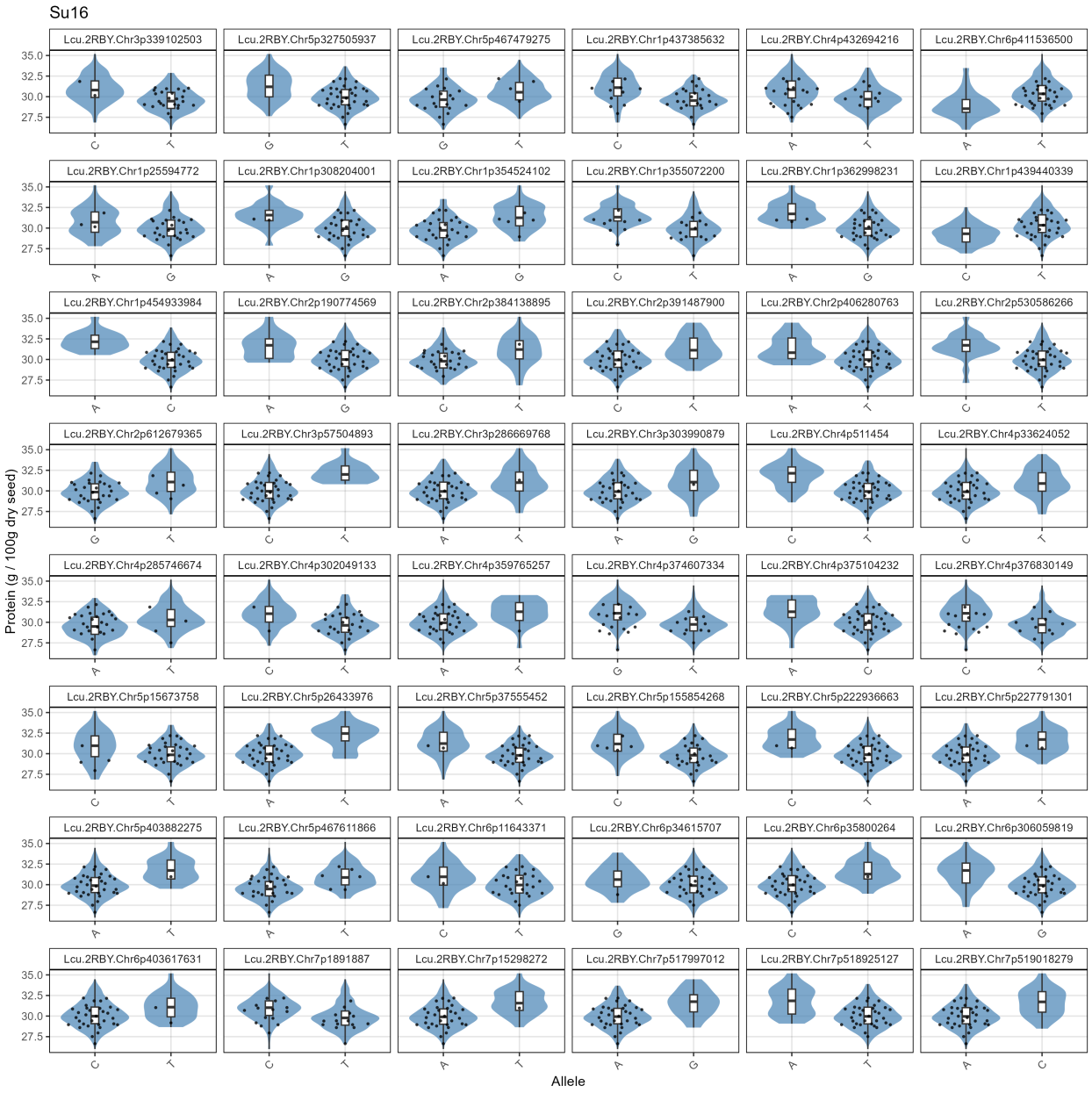

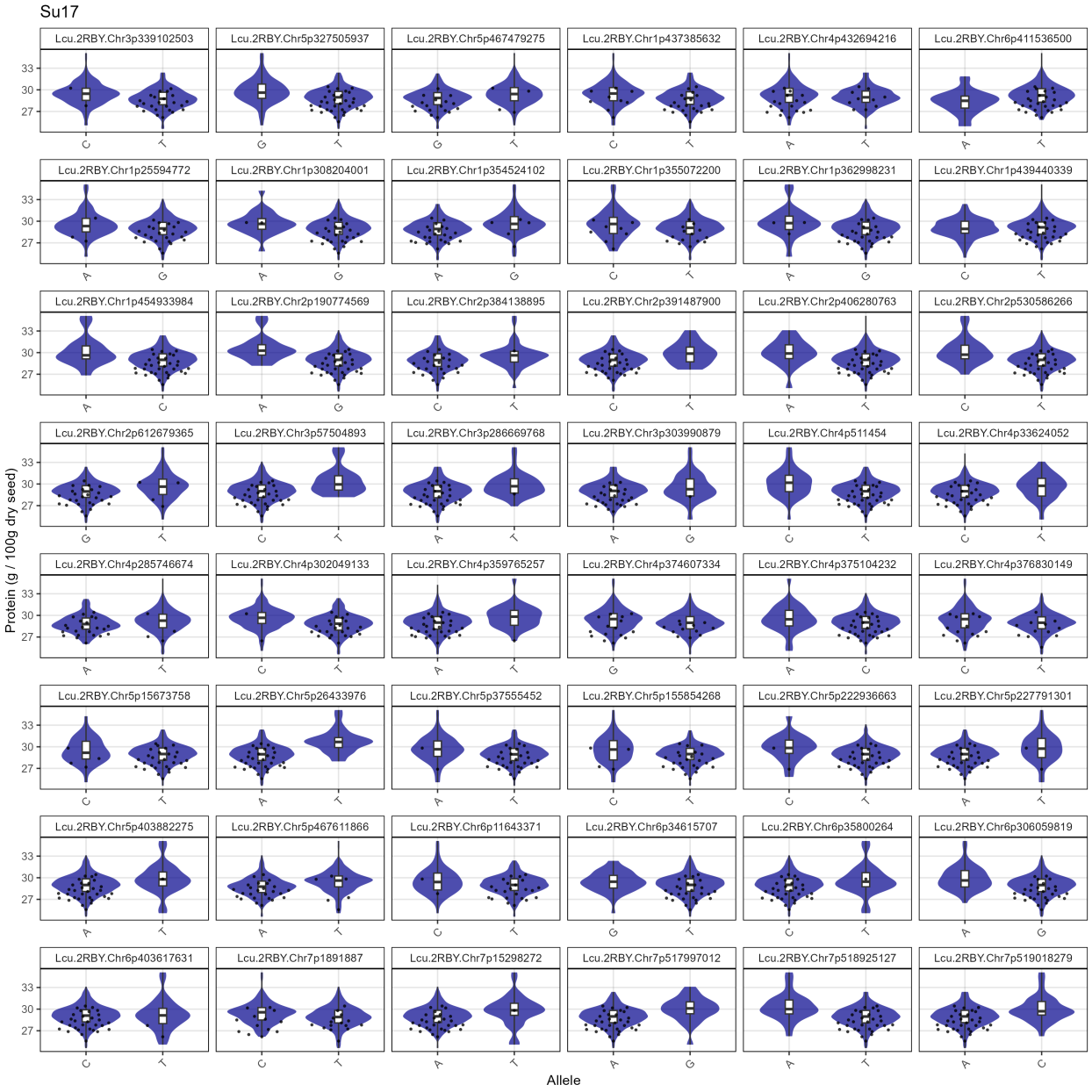
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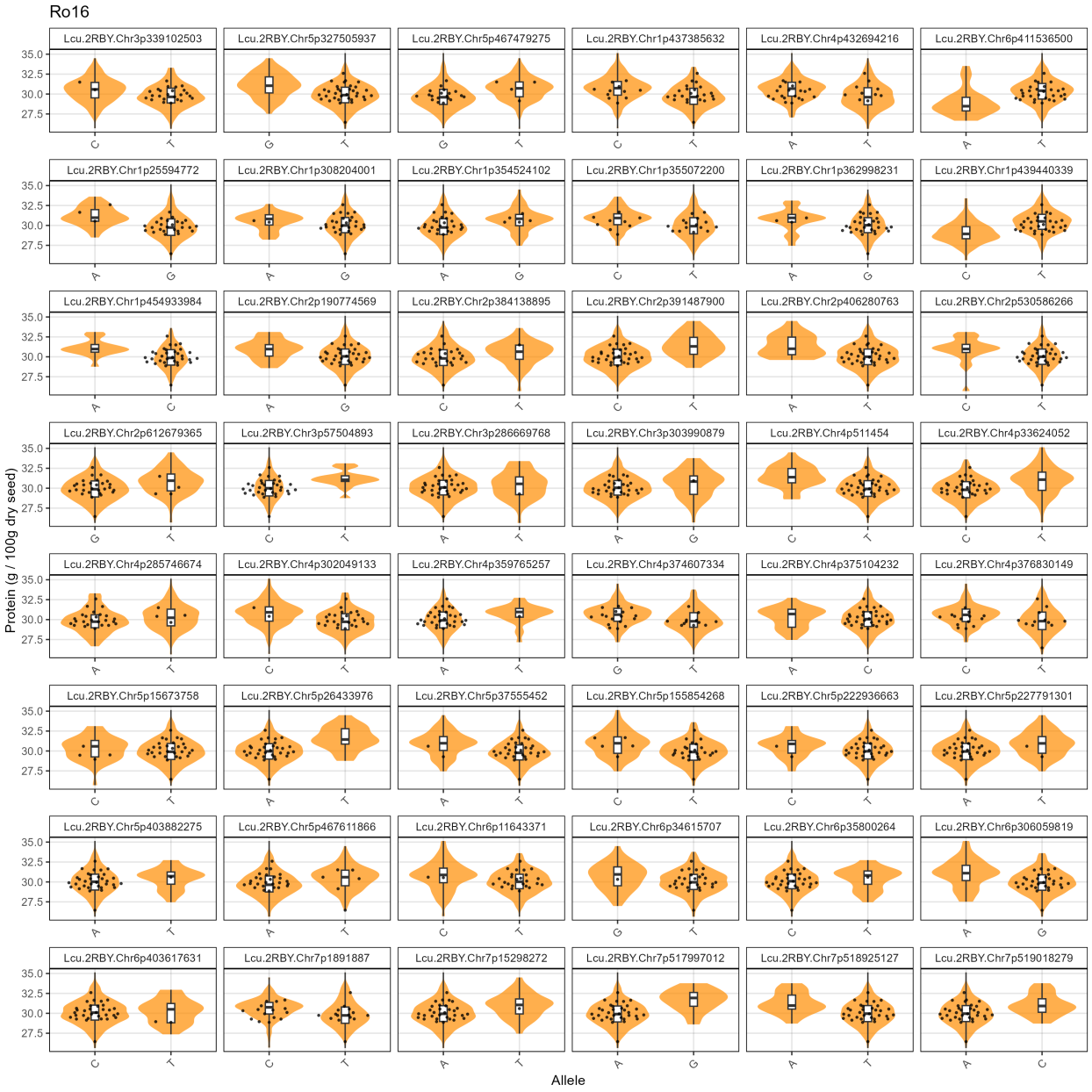
Protein (g / 100g dry seed)
33
30
27
Allele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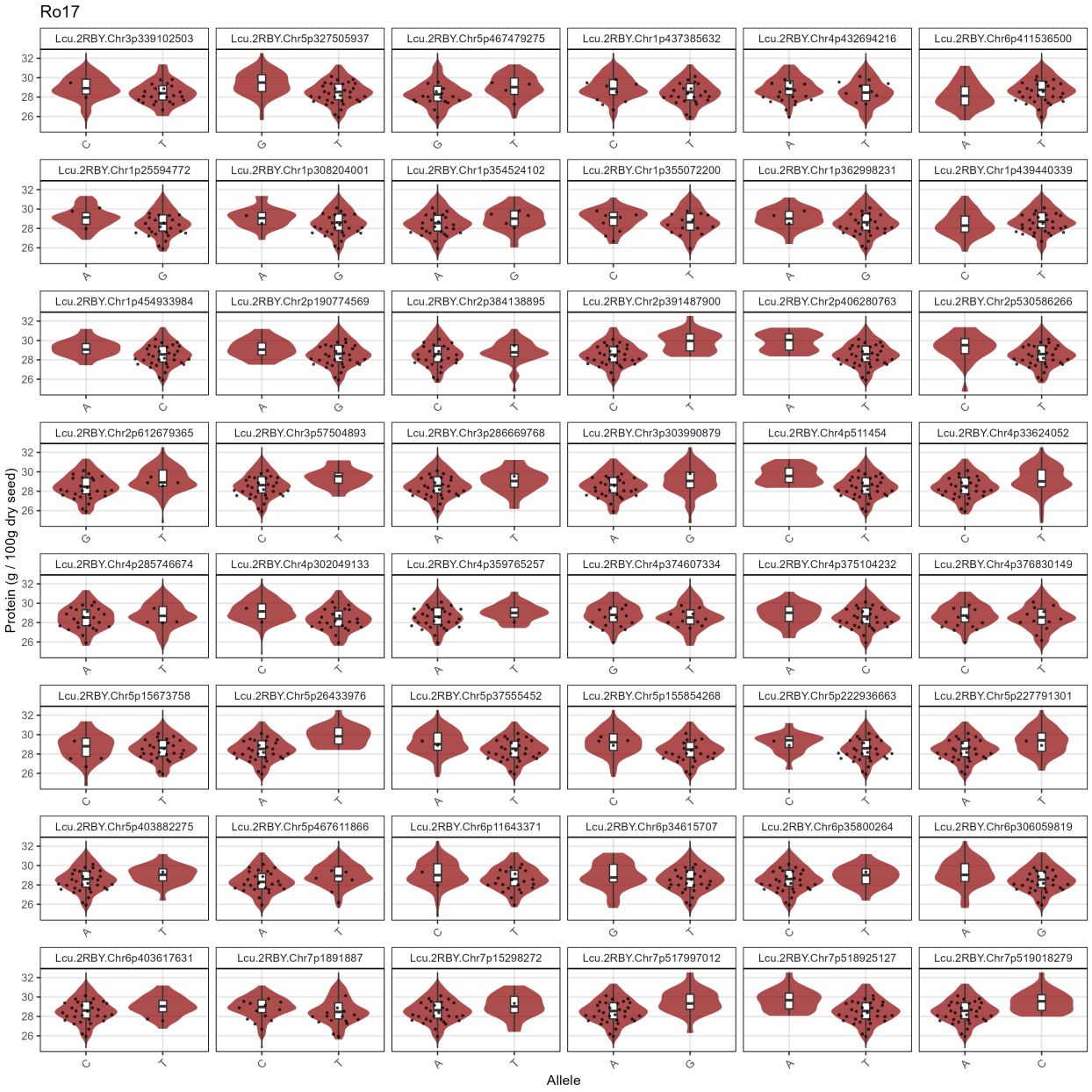
Protein (g / 100g dry seed)
35.0
32.5
30.0
27.5
Allele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Protein (g / 100g dry seed)
Allele

Additional Figures

Amino Acid Selections

- Additional/AA_Selections/

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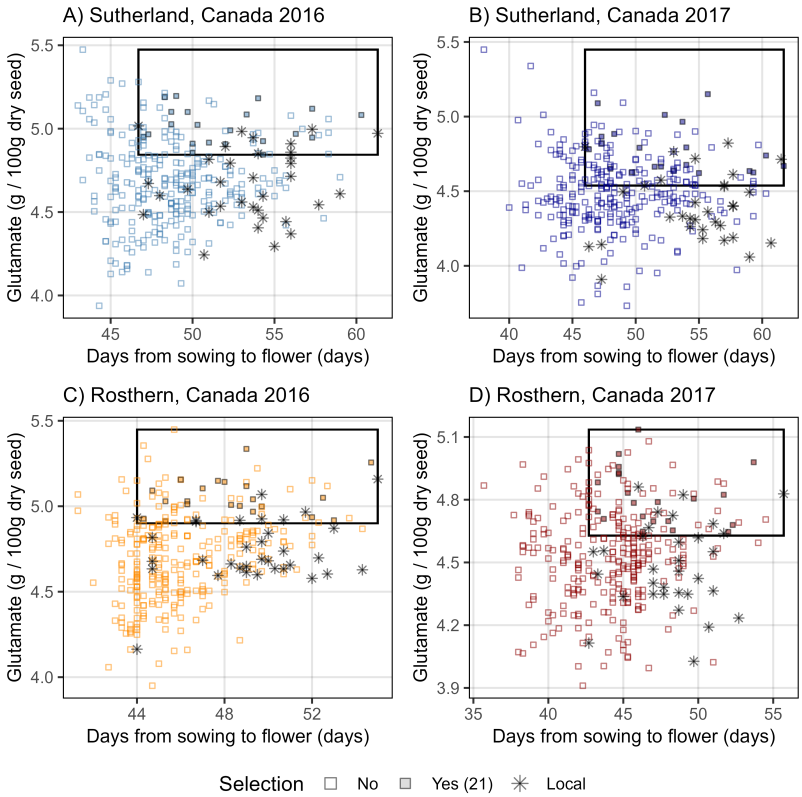
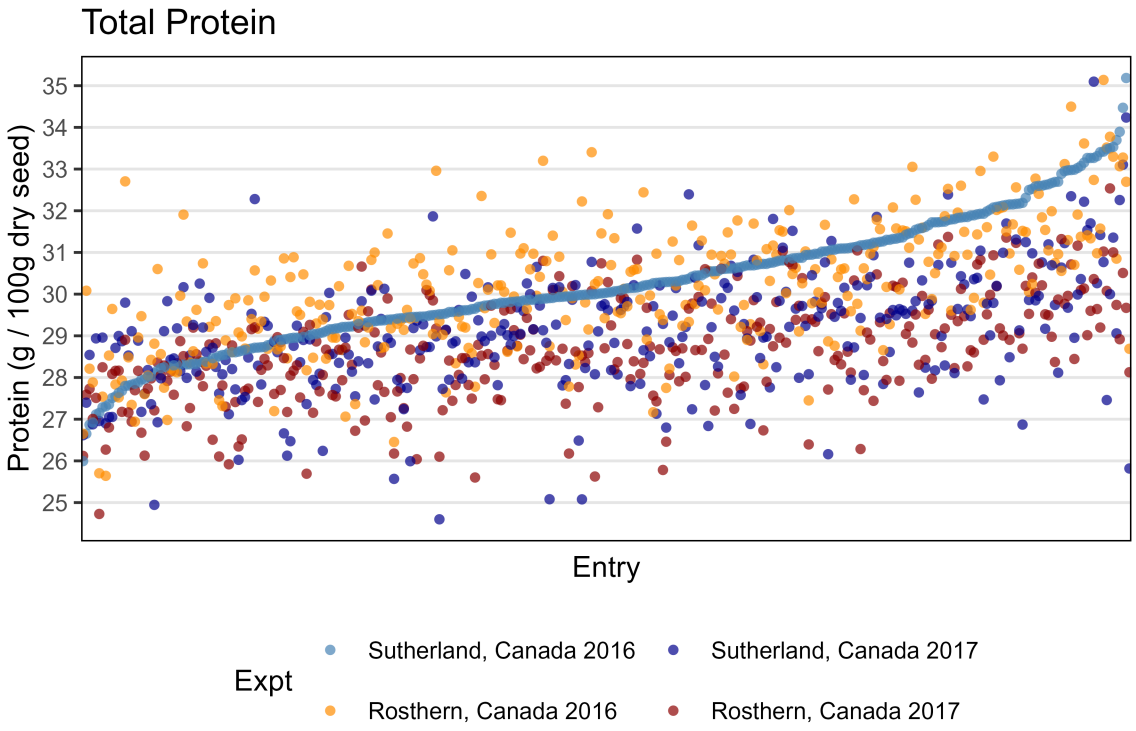
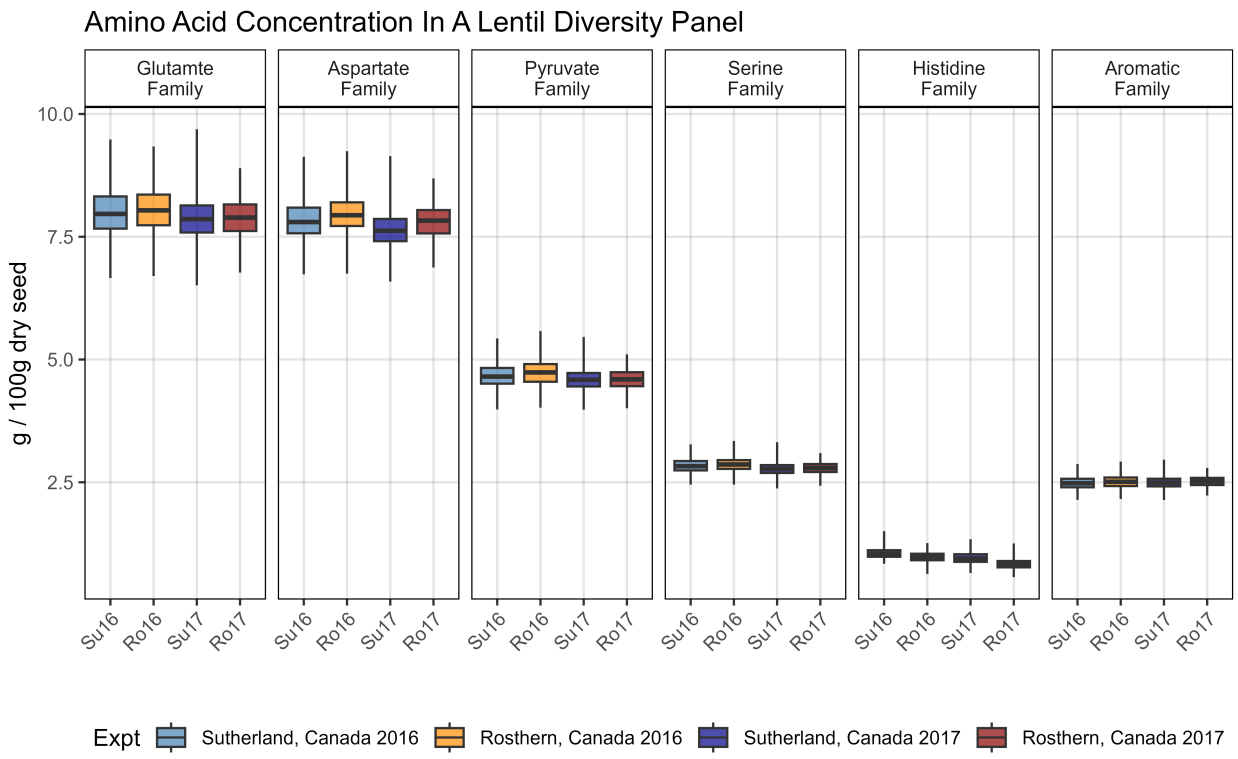
- Additional/AA_Selections/Figure_03_17_Methionine_Su16.html
- Additional/AA_Selections/Figure_03_18_Cysteine_Su16.html
- Additional/AA_Selections/Figure_03_19_Tryptophan_Su16.html



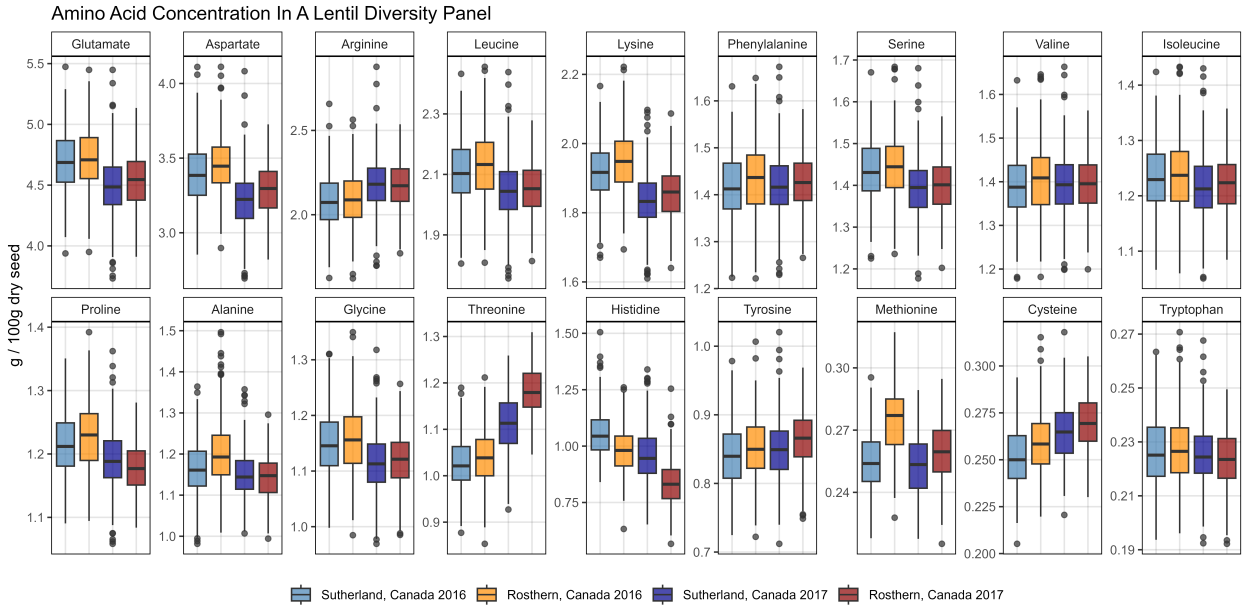
Additional Figure 1



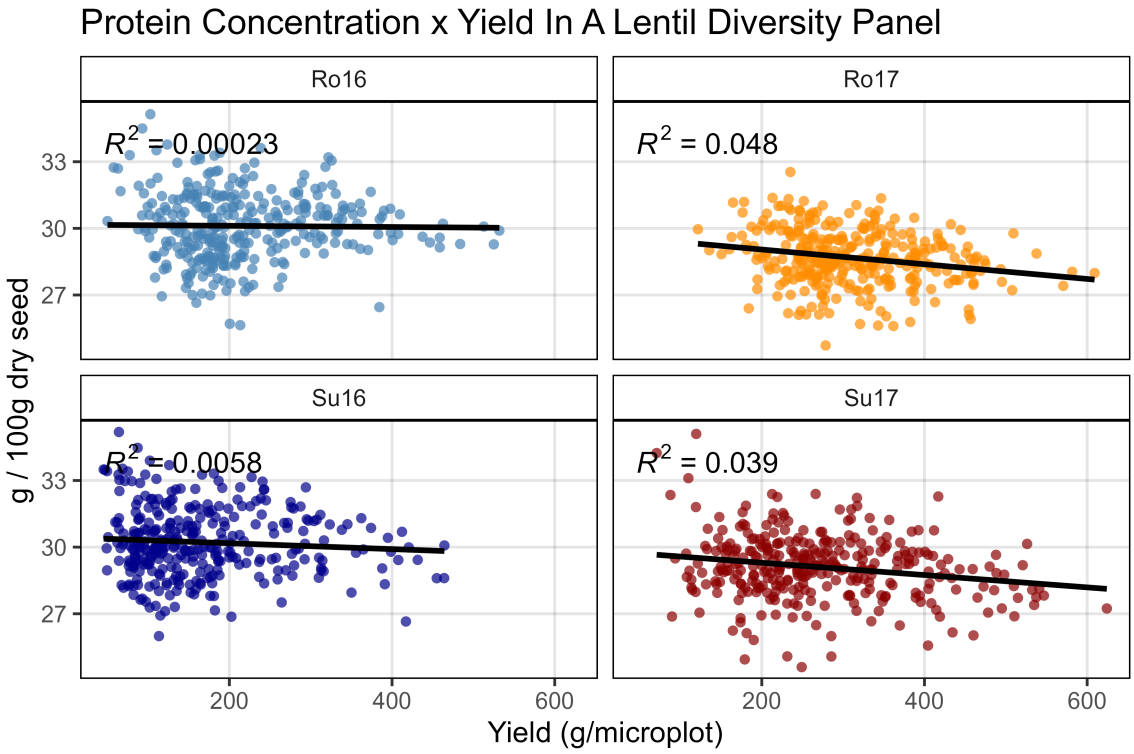
Additional Figure 2



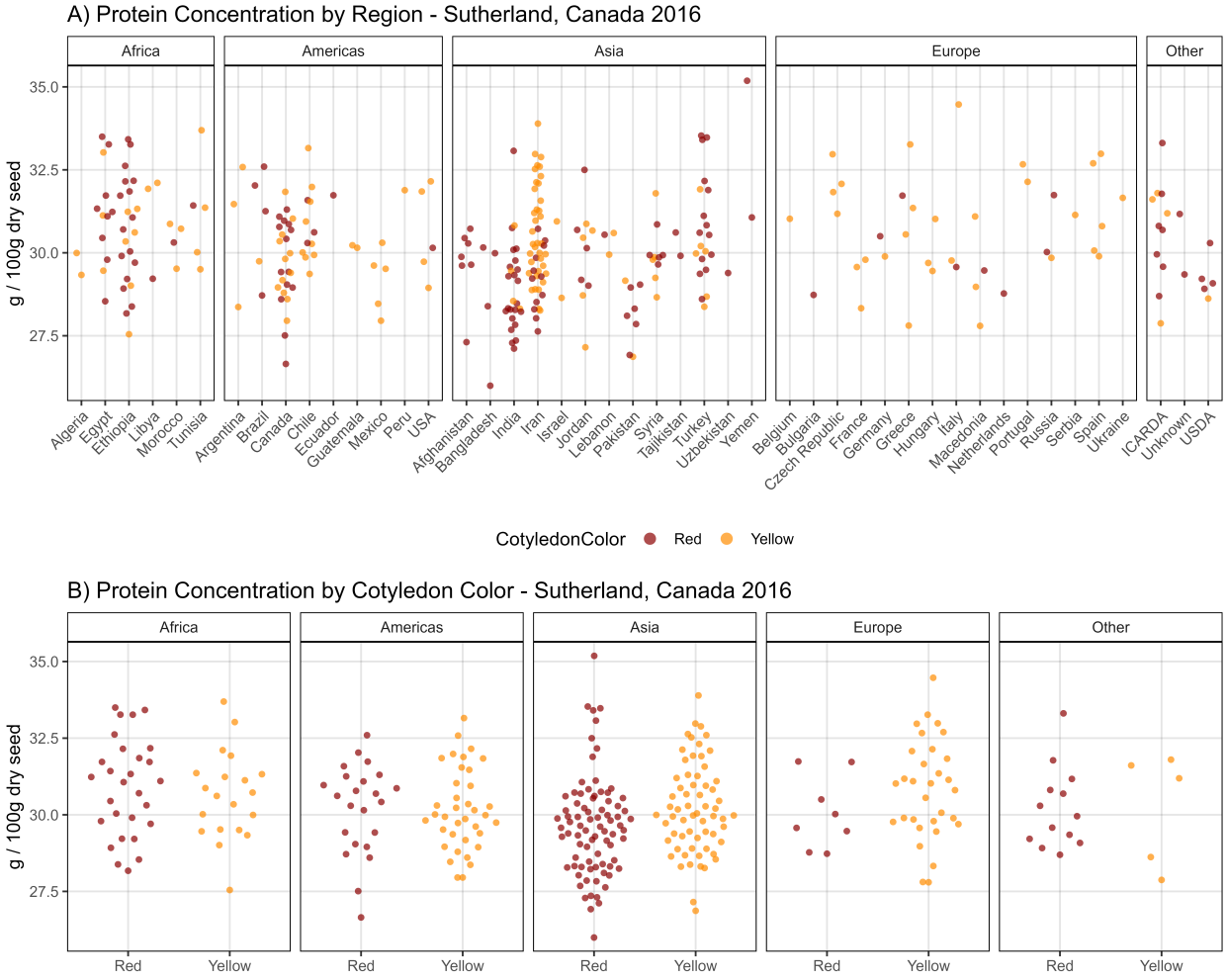
Additional Figure 3



Additional Figure 4

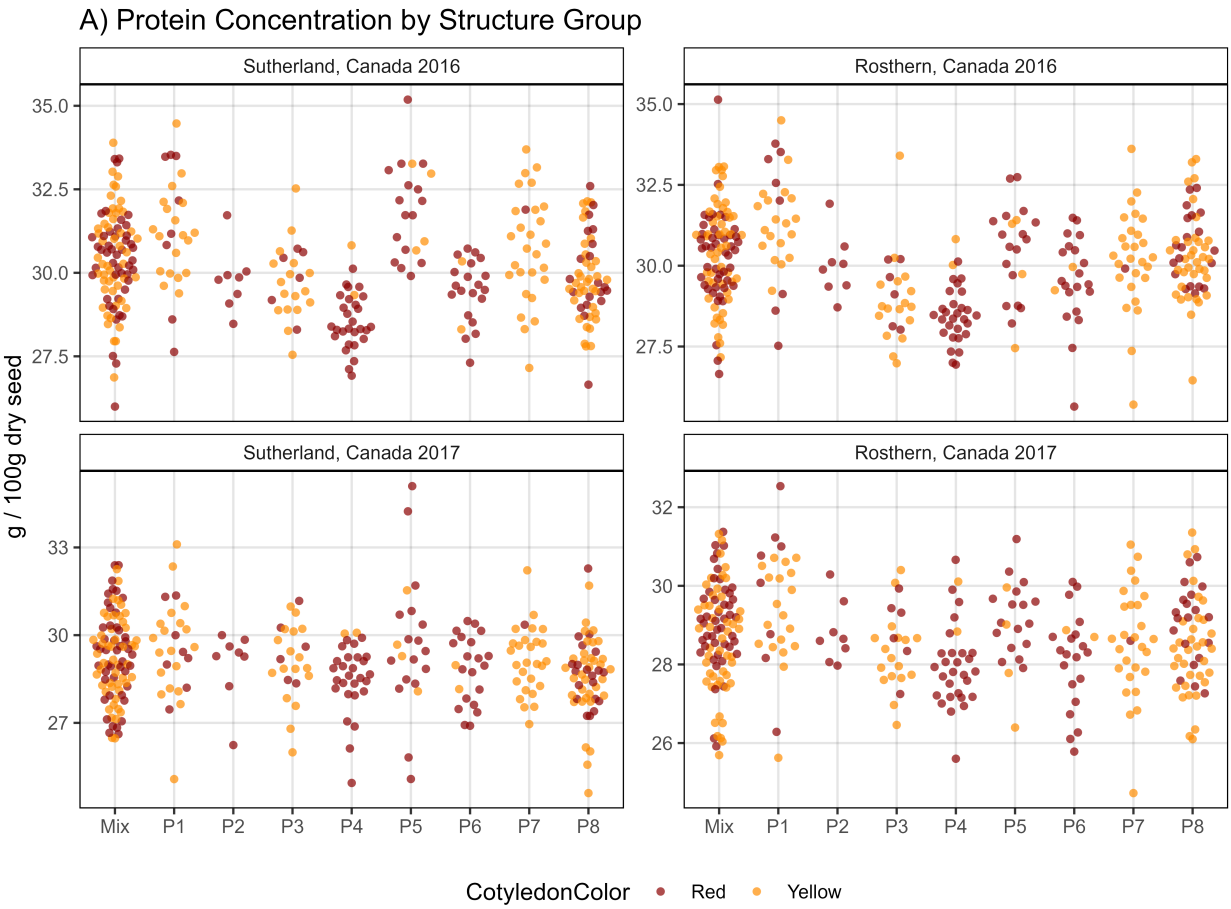


Additional Figure 5

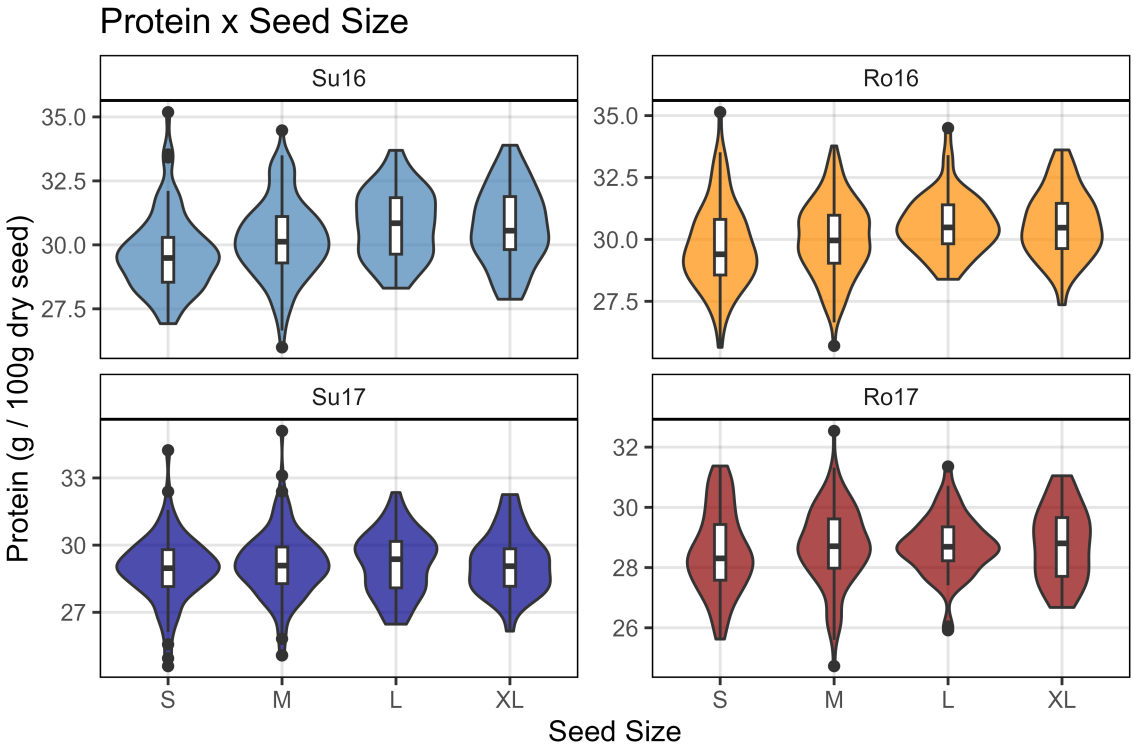


Additional Figure 6

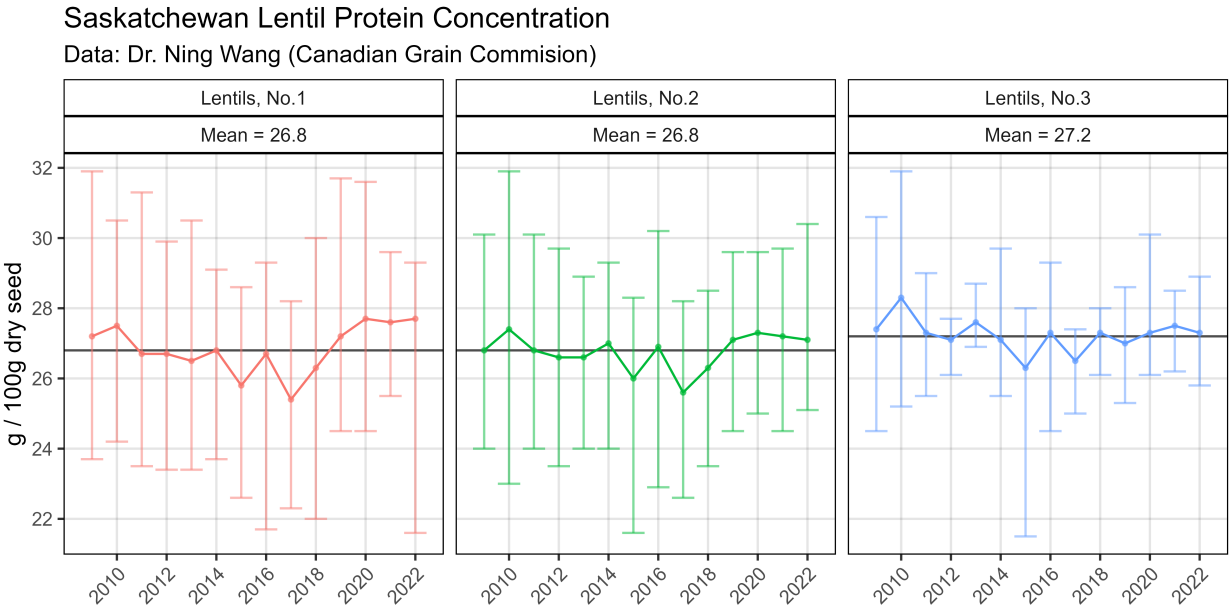
Additional/Additional_Figure_06.html


A) Protein Concentration by Structure Group
Sutherland, Canada 2016
Rosthern, Canada 2016
Sutherland, Canada 2017
Rosthern, Canada 2017
g / 100g dry seed
35.0
32.5
30.0
27.5
33
30
27
32
28
26
Mix
P1
P2
P3
P4
P5
P6
P7
P8
CotyledonColor
Red
Yellow

Additional Figure 7



Additional Figure 8



Additional Figure 9