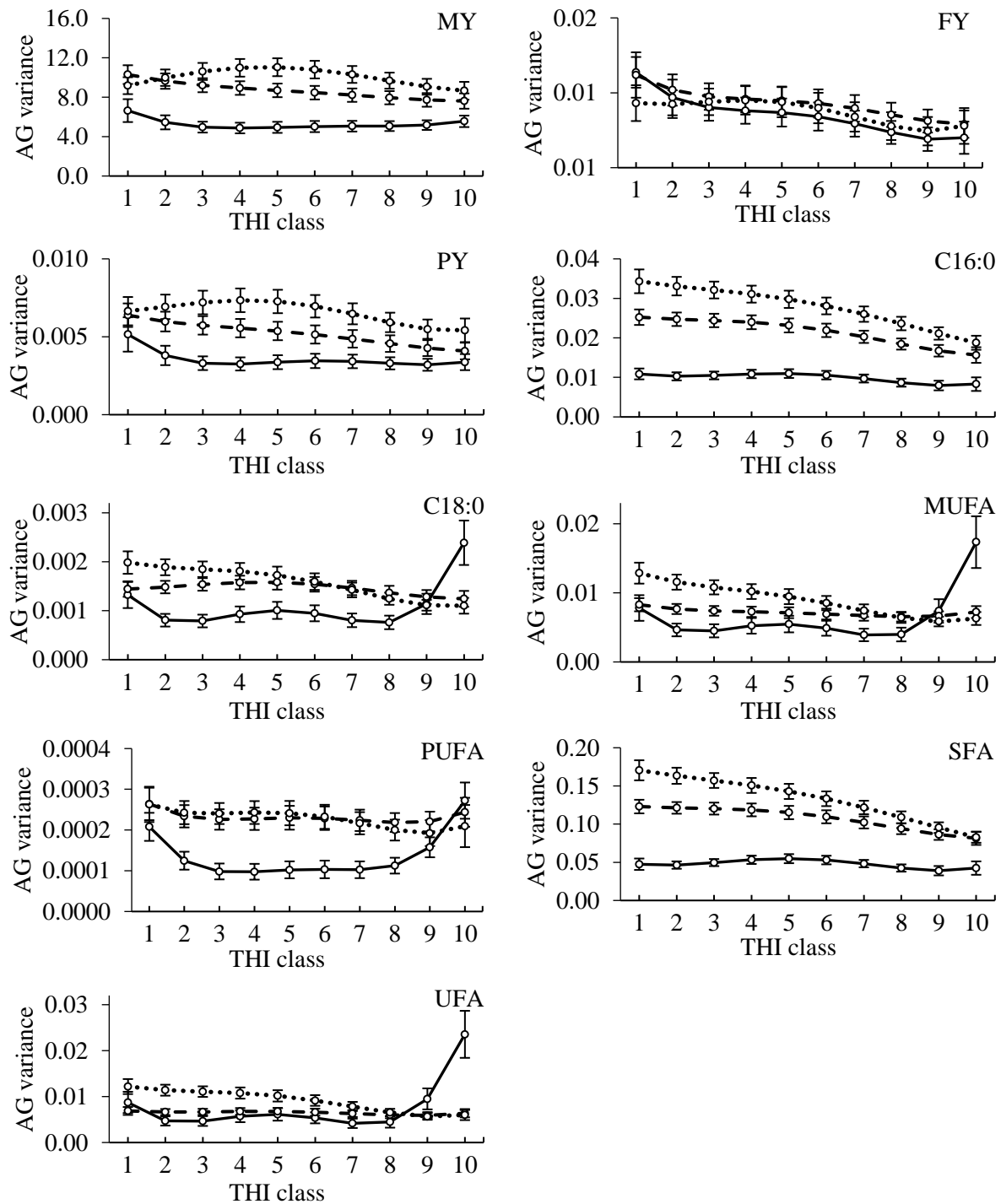


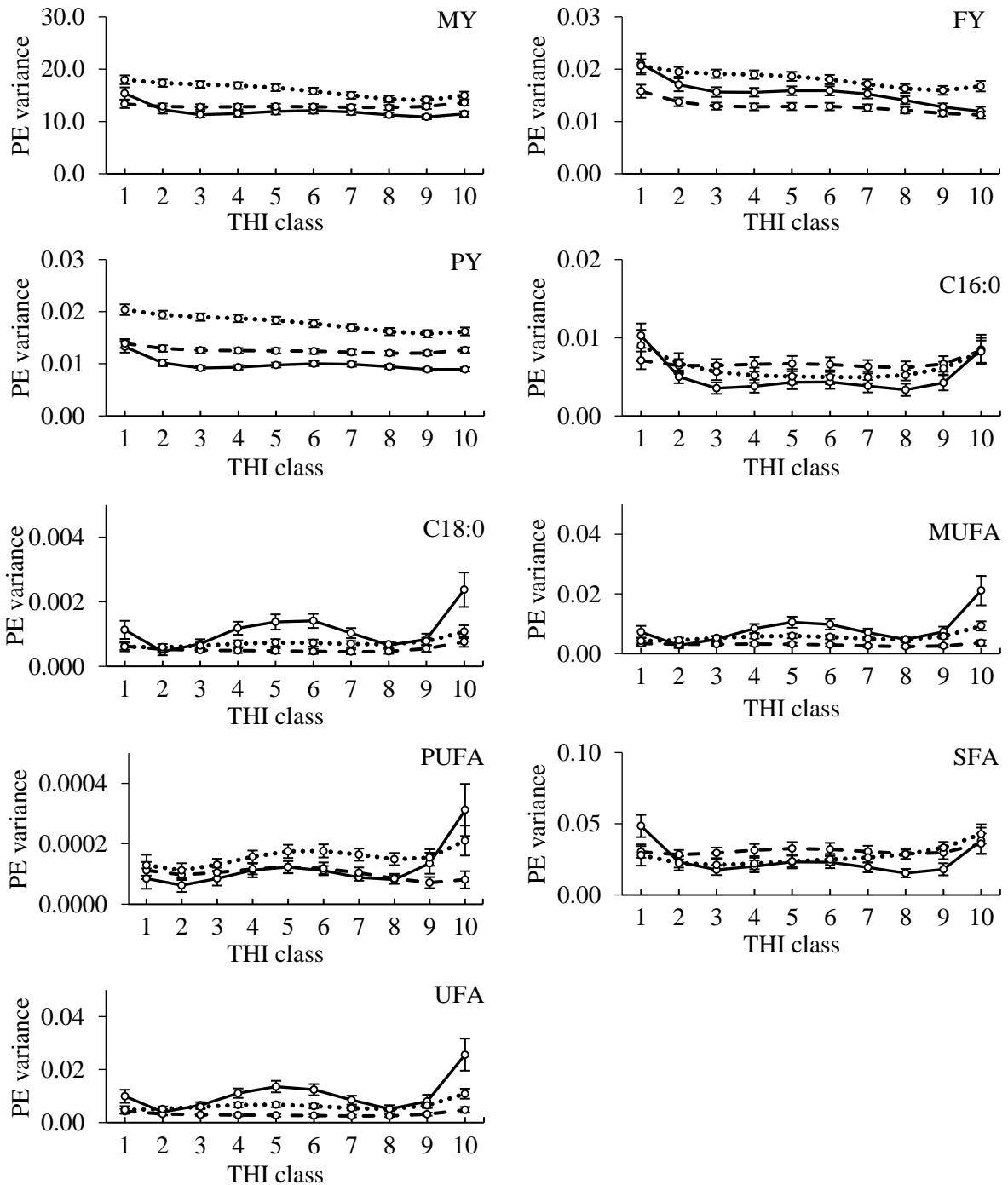
**Supplemental Table S1.** Means and standard deviations (in parentheses) for accuracies of GEBV of new sires in full dataset for test-day milk yield (MY), fat yield (FY), protein yield (PY), C16:0, C18:0, mono-unsaturated (MUFA), poly-unsaturated (PUFA), unsaturated (UFA) and saturated (SFA) fatty acids.

<b>Group<sup>1</sup></b>	<b>S<sup>2</sup></b>	<b>MY</b>	<b>FY</b>	<b>PY</b>	<b>C16:0</b>	<b>C18:0</b>	<b>MUFA</b>	<b>PUFA</b>	<b>SFA</b>	<b>UFA</b>
<b>G1</b>	1	0.66 (0.06)	0.66 (0.04)	0.75 (0.08)	0.72 (0.10)	0.59 (0.20)	0.59 (0.20)	0.64 (0.15)	0.72 (0.10)	0.58 (0.20)
<b>G2</b>	1	0.67 (0.05)	0.67 (0.07)	0.71 (0.13)	0.73 (0.09)	0.64 (0.13)	0.60 (0.17)	0.64 (0.14)	0.73 (0.09)	0.63 (0.14)
<b>G3</b>	1	0.77 (0.03)	0.79 (0.04)	0.85 (0.07)	0.77 (0.14)	0.74 (0.12)	0.72 (0.13)	0.74 (0.15)	0.77 (0.14)	0.73 (0.13)
<b>G4</b>	1	0.85 (0.04)	0.87 (0.04)	0.90 (0.06)	0.80 (0.11)	0.73 (0.15)	0.71 (0.16)	0.75 (0.16)	0.80 (0.12)	0.71 (0.14)
<b>G1</b>	2	0.68 (0.05)	0.68 (0.03)	0.71 (0.10)	0.78 (0.06)	0.74 (0.08)	0.70 (0.08)	0.72 (0.08)	0.78 (0.05)	0.70 (0.10)
<b>G2</b>	2	0.70 (0.05)	0.68 (0.07)	0.71 (0.12)	0.74 (0.12)	0.70 (0.15)	0.67 (0.17)	0.67 (0.17)	0.75 (0.14)	0.66 (0.16)
<b>G3</b>	2	0.80 (0.03)	0.79 (0.04)	0.80 (0.12)	0.77 (0.11)	0.77 (0.13)	0.75 (0.12)	0.74 (0.15)	0.78 (0.11)	0.73 (0.14)
<b>G4</b>	2	0.87 (0.03)	0.88 (0.03)	0.90 (0.06)	0.82 (0.10)	0.80 (0.11)	0.76 (0.14)	0.77 (0.14)	0.82 (0.10)	0.74 (0.16)
<b>G1</b>	3	0.65 (0.04)	0.63 (0.04)	0.68 (0.12)	0.78 (0.05)	0.71 (0.10)	0.70 (0.09)	0.69 (0.10)	0.78 (0.05)	0.66 (0.12)
<b>G2</b>	3	0.67 (0.05)	0.64 (0.08)	0.72 (0.10)	0.74 (0.15)	0.70 (0.13)	0.68 (0.14)	0.67 (0.16)	0.75 (0.15)	0.64 (0.17)
<b>G3</b>	3	0.75 (0.03)	0.72 (0.08)	0.75 (0.13)	0.77 (0.11)	0.76 (0.12)	0.72 (0.16)	0.72 (0.12)	0.78 (0.11)	0.70 (0.17)
<b>G4</b>	3	0.84 (0.05)	0.83 (0.05)	0.84 (0.12)	0.82 (0.09)	0.80 (0.10)	0.77 (0.12)	0.76 (0.16)	0.83 (0.09)	0.75 (0.14)

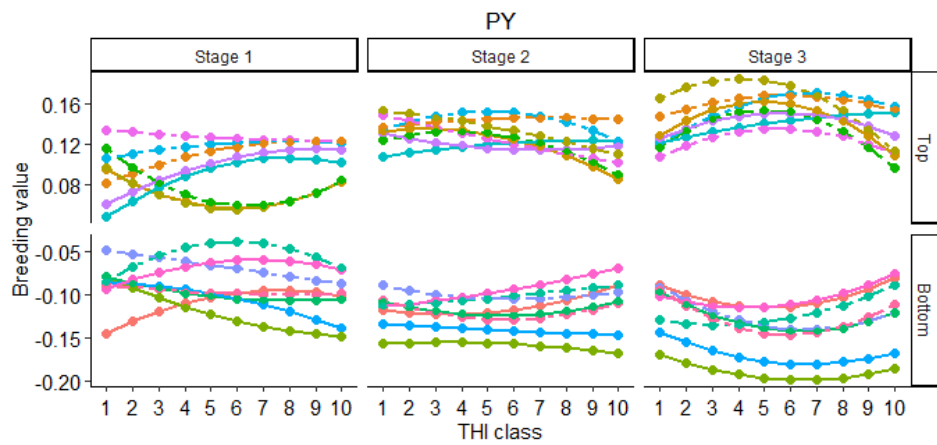
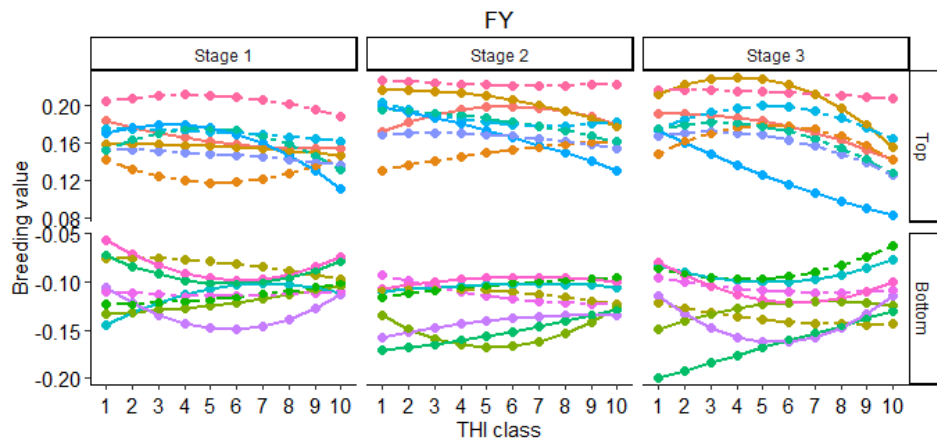
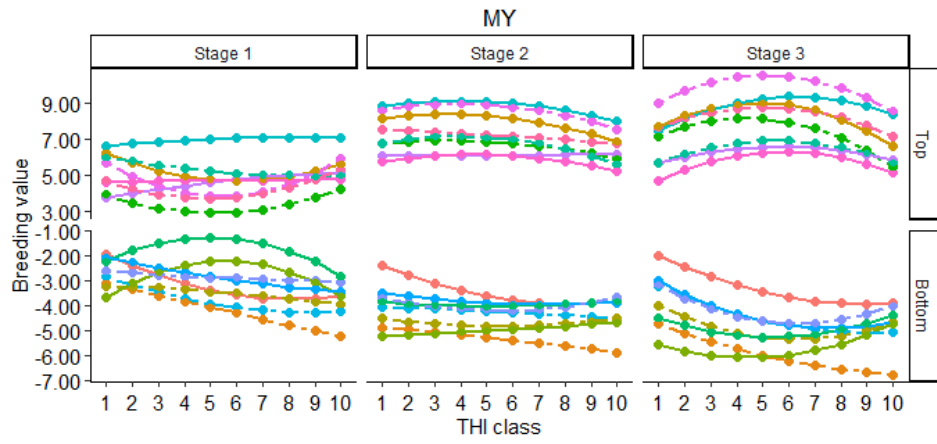
<sup>1</sup> G1, G2, G3 and G4 are sires with one daughter, sires with 2-5 daughters, sires with 6-20 daughters and sires with 21 to 122 daughters, respectively; <sup>2</sup> Stages of lactation

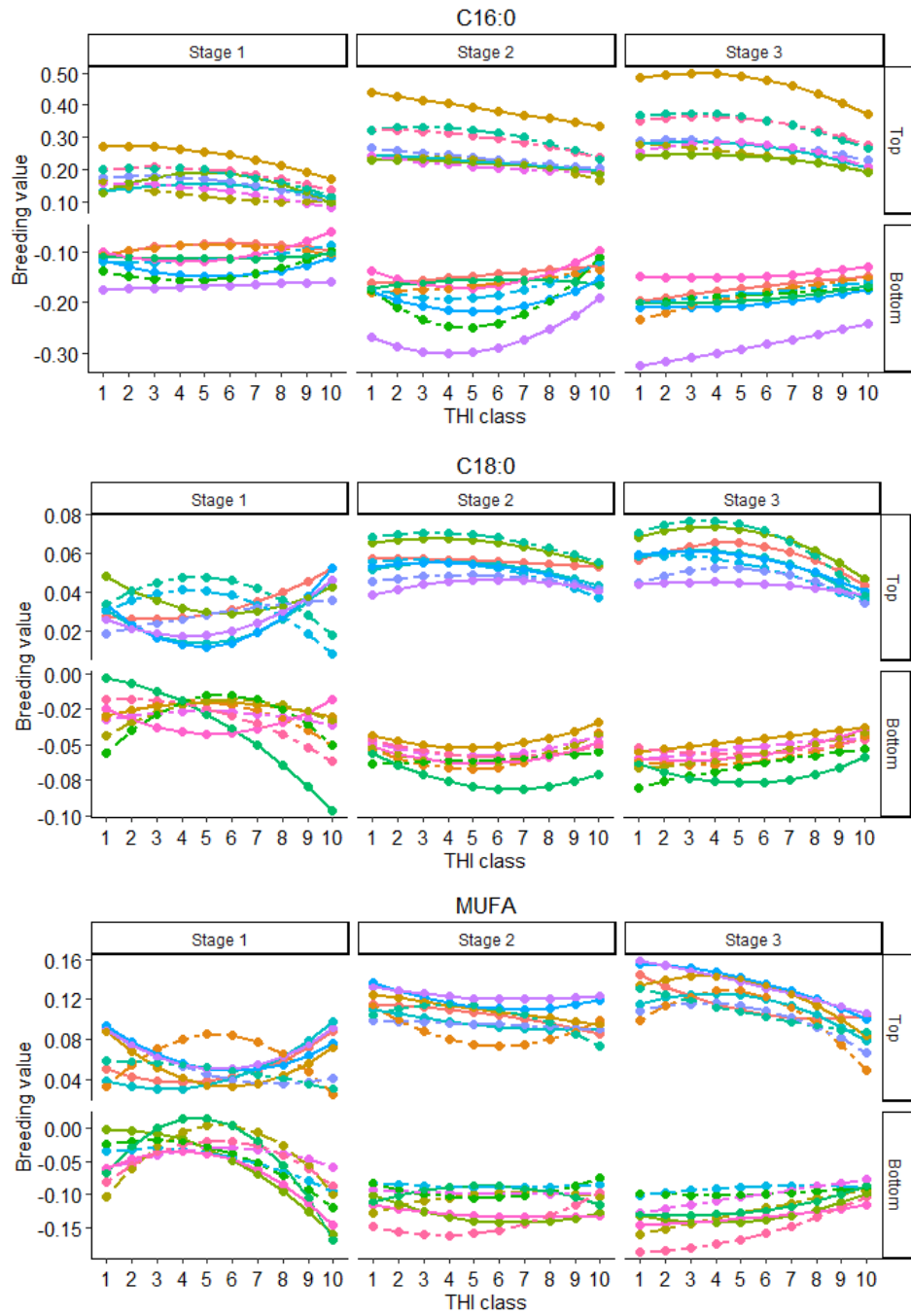


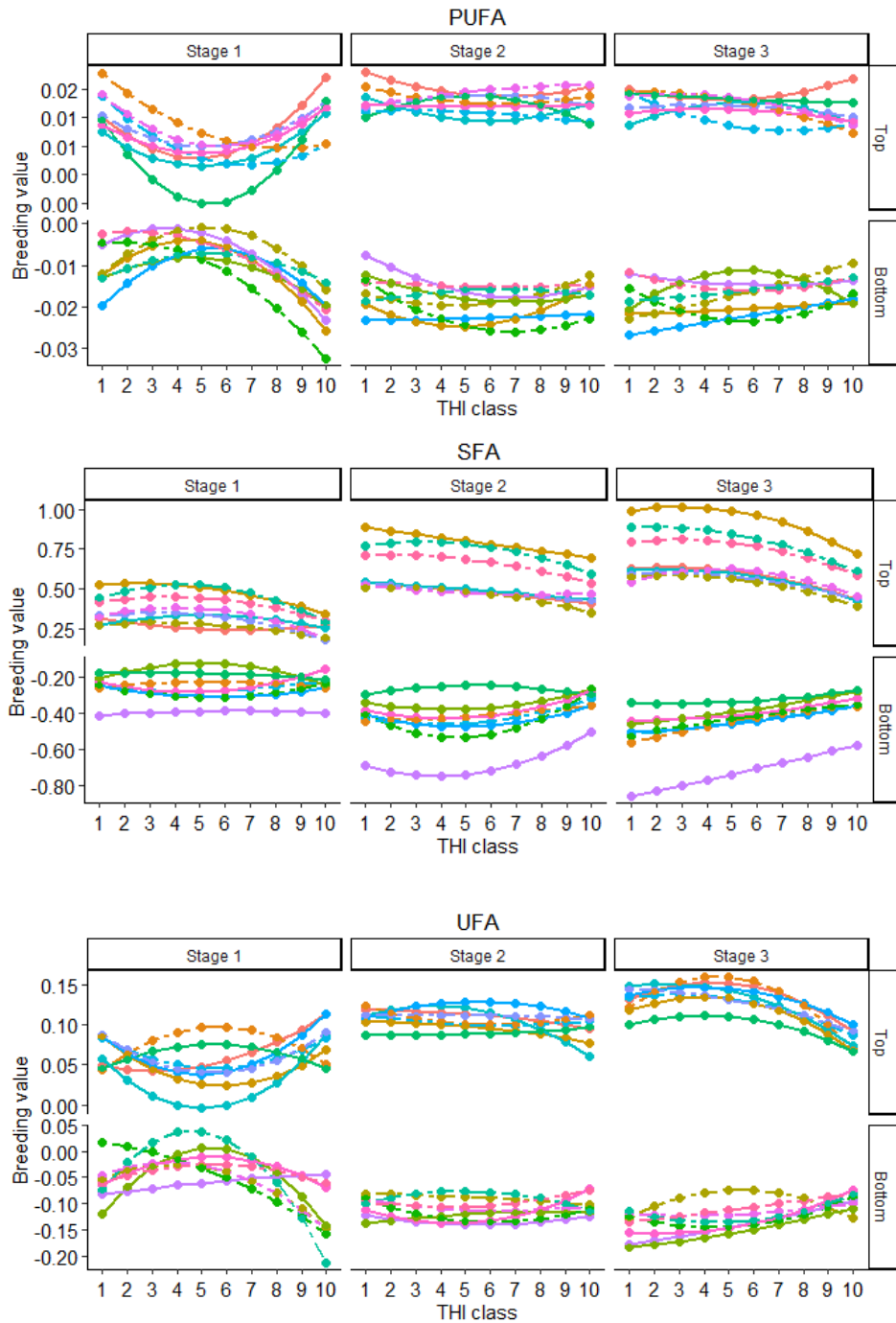
**Supplemental Figure S1.** Posterior estimates of additive genetic variances (AG variances) for test-day milk production and milk composition traits in the first (solid line), the second (dashed line) and the third (dotted line) stage of lactation for distinct THI classes. Error bars represent standard deviation of posterior estimates.



**Supplemental Figure S2.** Posterior estimates of permanent environmental variances (PE variances) for test-day milk production and milk composition traits in the first (solid line), the second (dashed line) and the third (dotted line) stage of lactation for distinct THI classes. Error bars represent standard deviation of posterior estimates.







**Supplemental Figure S3.** Genomic estimated breeding values of top ranking 8 and bottom ranking 8 sires along THI classes for different stages of lactation. Sires had at least 5 genotyped daughters with TD records.