

Assessing Genomic and Phenomic Prediction in Sorghum Hybrid Performance



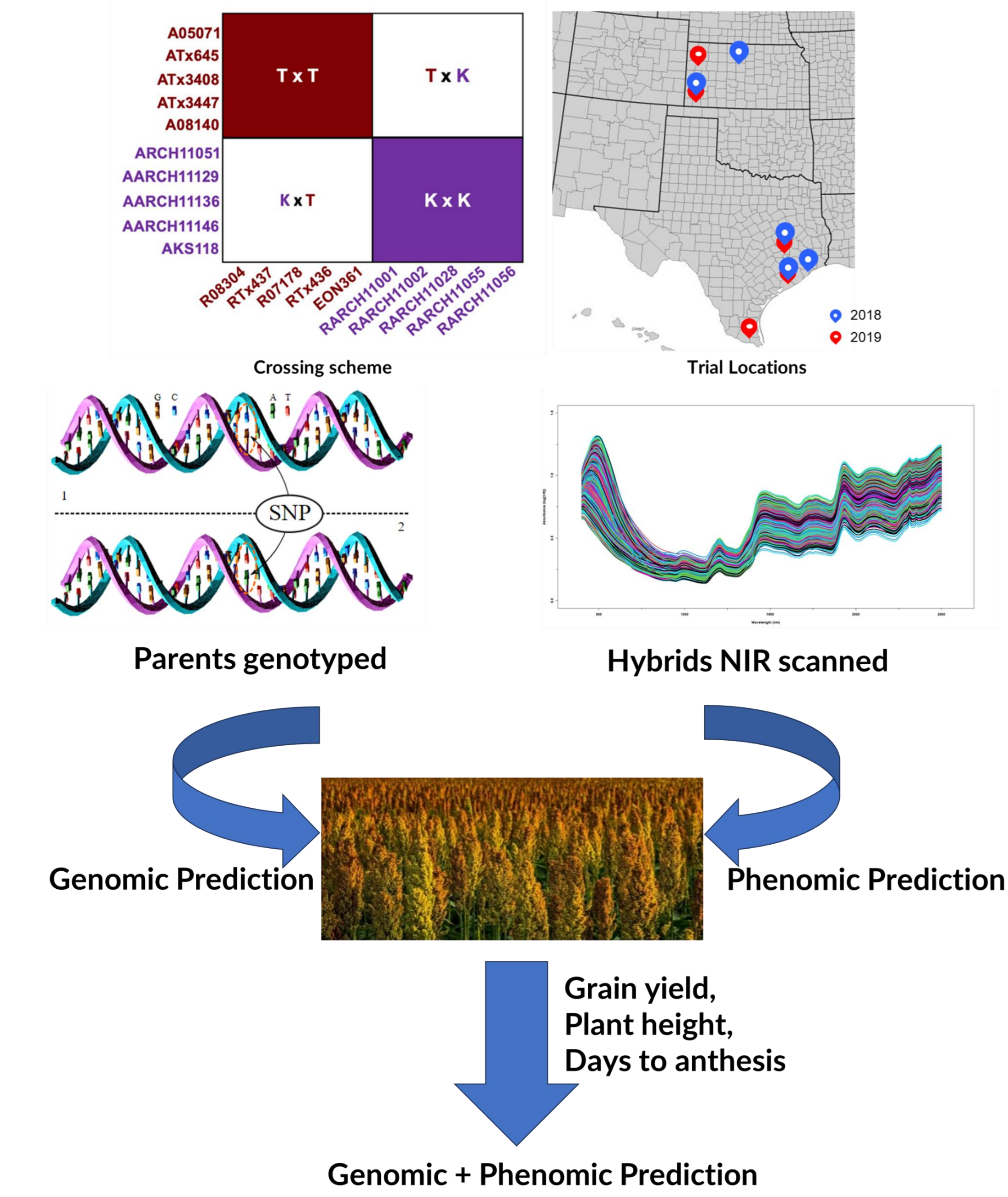
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BACKGROUND: Genomic Prediction (GP) and Phenomic Prediction (PP) could accelerate the rate of genetic gain in sorghum breeding programs. Near Infrared Spectroscopy (NIR) is widely employed to predict composition traits, however, it could be used in the same way as genetic markers to establish relationship between genotypes.

Could NIR effectively predict agronomic traits of sorghum hybrids ?
Can inclusion of NIR improve prediction accuracy of genomic prediction models ?

METHODS



Prediction Models

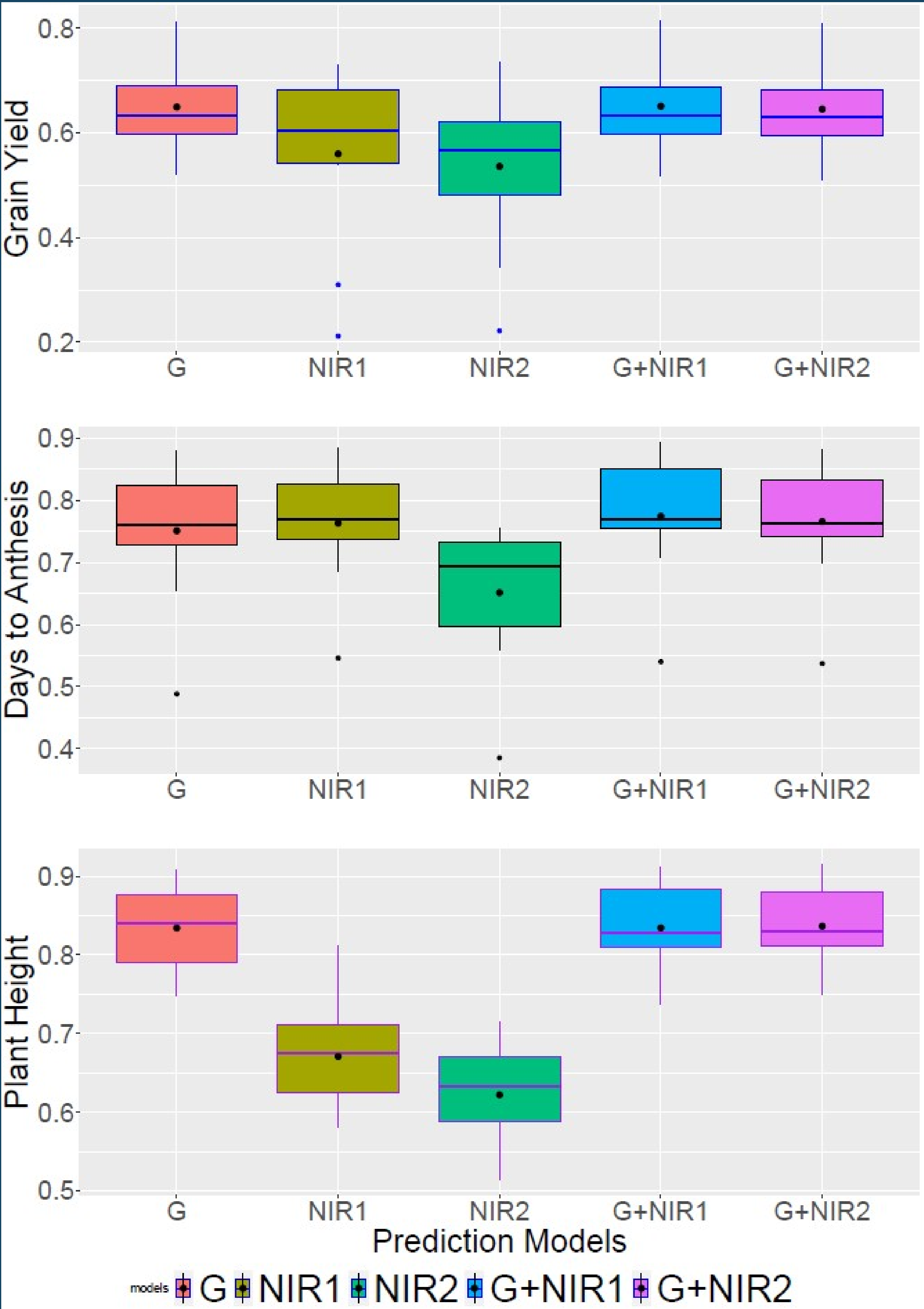
- Model 1: Genomic markers- additive + dominance effects - G
- Model 2: First derivative of NIR- NIR1
- Model 3: Second derivative of NIR – NIR2
- Model 4: G + NIR1
- Model 5: G + NIR2

MAJOR FINDINGS

- ❖ NIR has the potential to predict agronomic traits in sorghum when there are grain samples from a range of environments
- ❖ NIR1 performs better than NIR2 in general showing data smoothing of spectra with first derivative is reliable
- ❖ NIR offers an opportunity to improve prediction accuracy

Phenomic prediction performed statistically as good as genomic prediction for traits related to grain physiochemical properties i.e. grain yield, and days to anthesis

Overall prediction accuracy of prediction models across all the environments

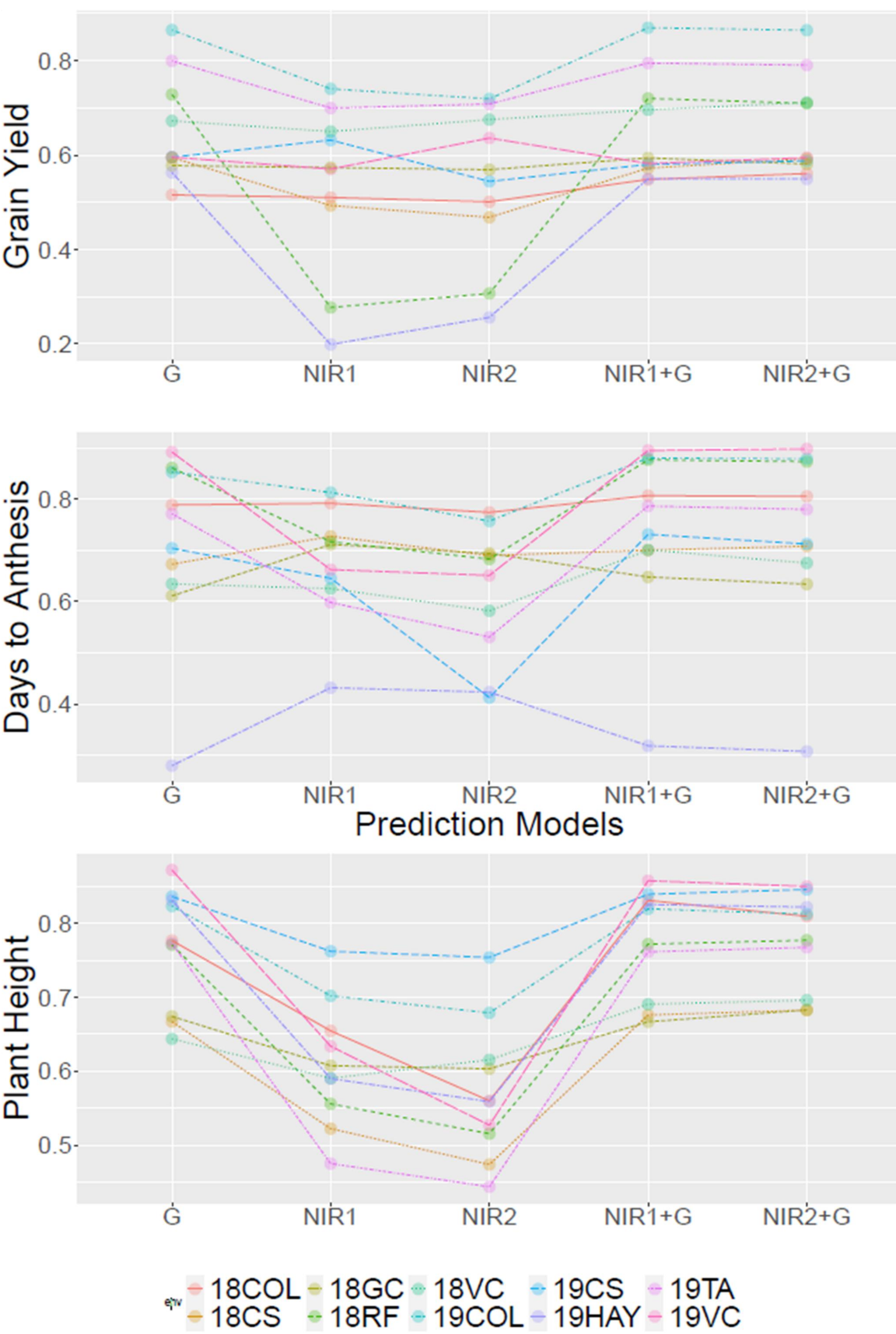


Statistical groupings of models at $\alpha = 0.05$

Models	GY	DA	PH
G	0.649 ^{NS}	0.751 ^a	0.834 ^a
NIR1	0.560 ^{NS}	0.763 ^a	0.671 ^b
NIR2	0.536 ^{NS}	0.651 ^b	0.622 ^b
G+NIR1	0.650 ^{NS}	0.775 ^a	0.835 ^a
G+NIR2	0.645 ^{NS}	0.766 ^a	0.837 ^a

NS: Non-significant; a and b represent different statistical groups
GY: grain yield, DA: Days to Anthesis, PH: Plant Height

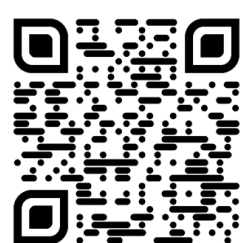
Prediction accuracy of different prediction models within environments



- ❖ NIR could supplement/complement genomic prediction models depending on traits of interest
- ❖ Characterizing environments based on NIRS should be helpful



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