

# Unlocking Barley's Potential: Improving the Bioavailability of Barley with *lpa* Mutants



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## Introduction

- Micronutrient deficiency cases are growing in both developing and developed countries<sup>1</sup>
- Barley, a staple food in many regions, contains essential micronutrients that have many health benefits
- Barley seeds contain phytic acid, which decreases bioavailability<sup>2</sup>
- *Lpa1-1* mutant has lower phytic acid

Objectives: i. To genetically characterize the *lpa 1-1* mutant gene. ii. Identify F<sub>2</sub> lines with the *lpa1-1* mutation.

## Materials & Methods

Barley Parents (*lpa1-1* mutant, Meg's Song, Havener, Golden Promise, and Merlin)

Validating the presence of *lpa-1-1* mutation



Figure 1: Methods for validating presence of *lpa 1-1* mutation

- F<sub>2</sub> seeds (*lpa1-1* × Meg's Song)  
Selection of *lpa* F<sub>2</sub> line

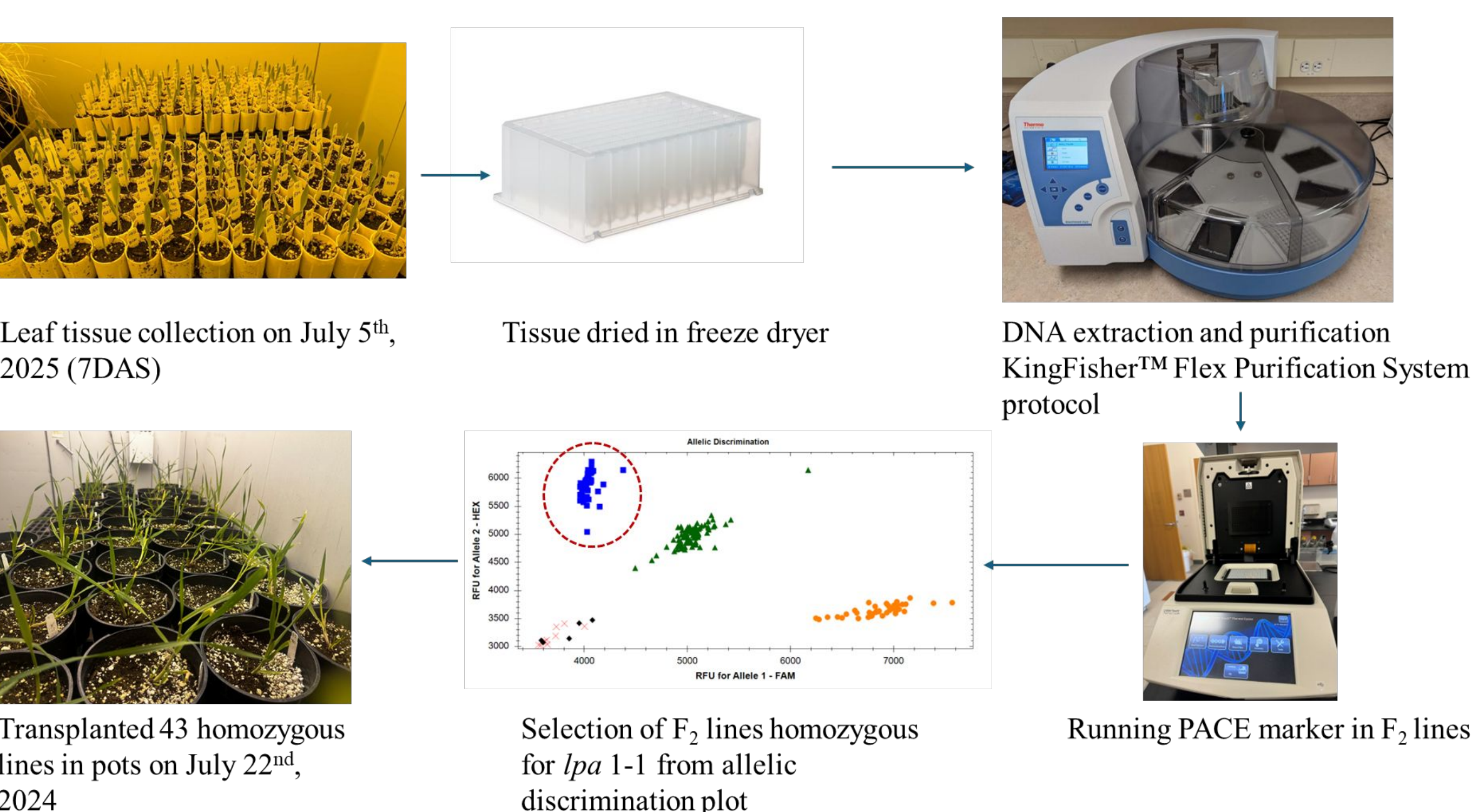


Figure 2: Methods for selection of F<sub>2</sub> lines

## Results

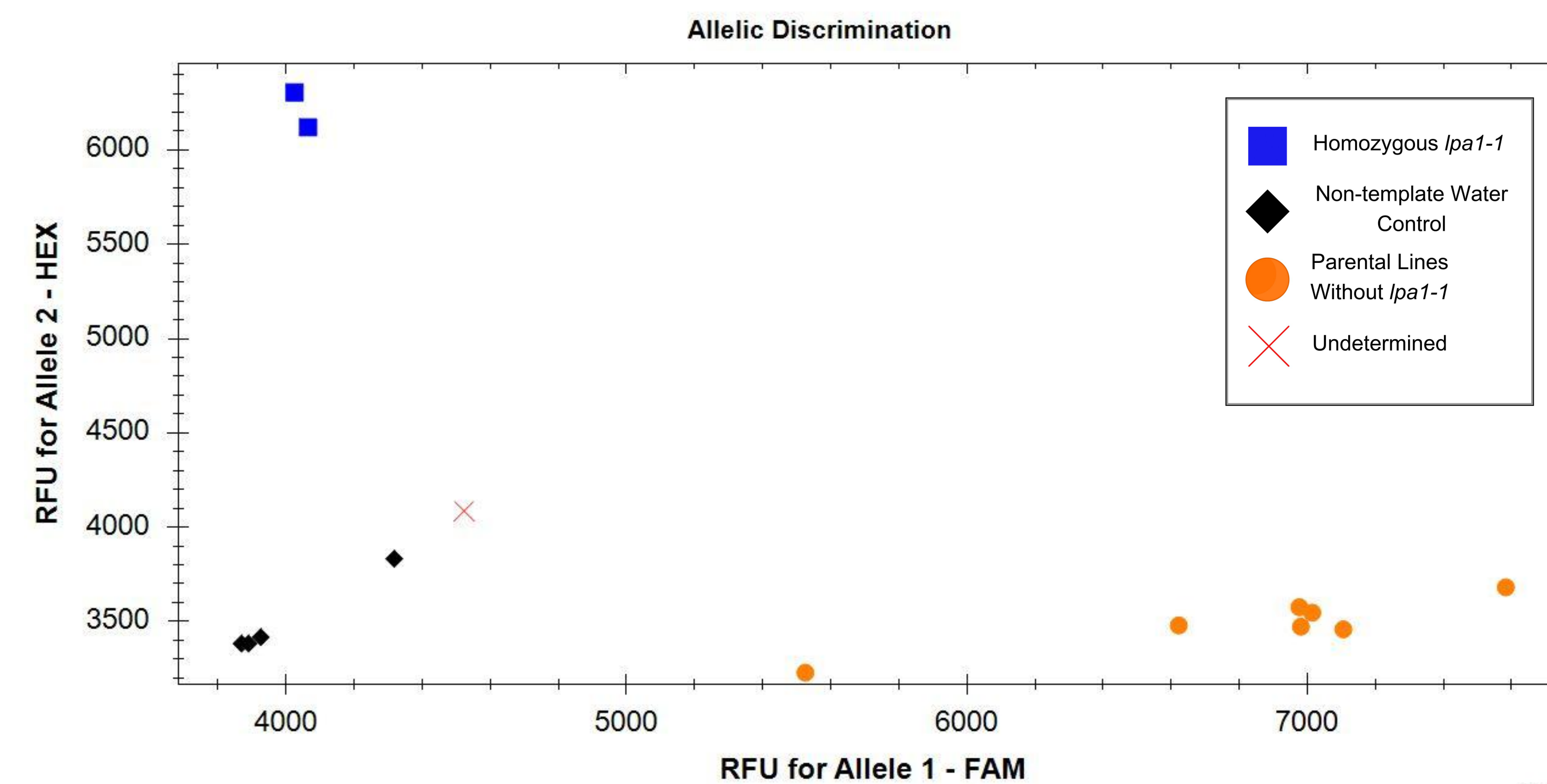


Figure 3: Parental lines PACE Results

- The allelic discrimination plot validated the presence of *lpa 1-1* mutant gene in the *lpa 1-1* parental line (Fig 3)

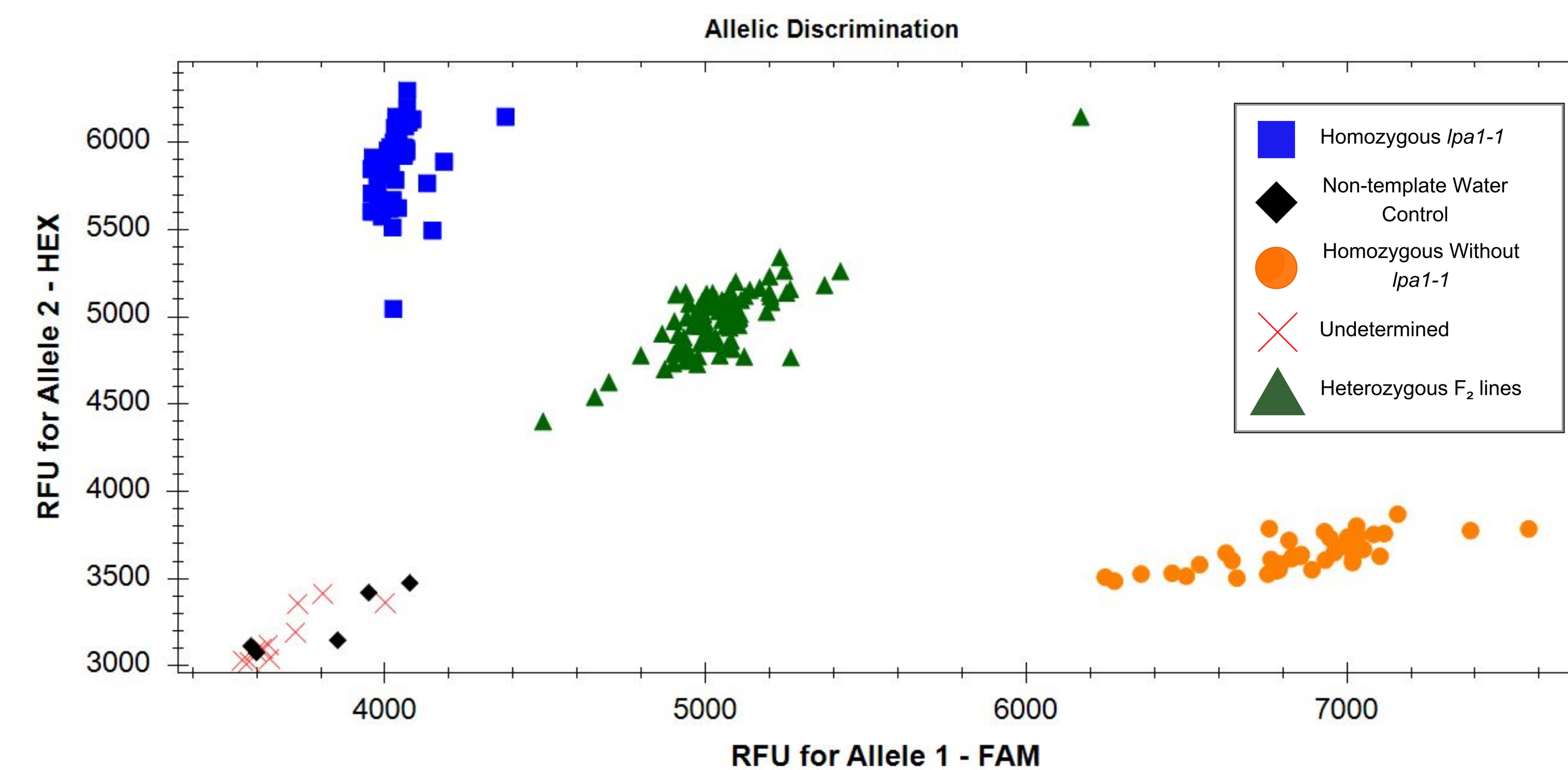


Figure 4: Meg's Song and *lpa1-1* PACE Results

- The homozygous *lpa1-1* plants, clustered in blue squares were selected (Fig 4)

Category	Observed	Expected
Allele 1	41	43.25
Heterozygotes	89	86.5
Allele 2	43	43.25

Table 1: Chi-square Goodness-of-Fit values

- Failed to reject the null hypothesis (Table 1)
- Ratio is 1:2:1 (A1, H, A2), *p-value* = 0.9090, Chi-squared value = 0.191

## Conclusion

- The presence of *lpa 1-1* mutation was validated in *lpa 1-1* mutant line
- Successful identification of F<sub>2</sub> lines progeny with the *lpa1-1* mutation for further development into low-phytic acid lines.



Figure 5: 43 F<sub>2</sub> progeny homozygous for *lpa 1-1* in the green house

## Recommendations

- Future research can use this result to create a barley variety with improved nutrient content, higher yield, and better seed quality

## Implications

- 1/3 of the world's population has micronutrient deficiency<sup>3</sup>
- This study contributes to addressing nutrient deficiencies and promoting healthier lives

## References

<sup>1</sup>Ritchie, H., & Roser, M. (2024). Micronutrient deficiency. Our World in Data. [https://ourworldindata.org/micronutrient-deficiency?utm\\_medium=syndication&utm\\_source=scribd](https://ourworldindata.org/micronutrient-deficiency?utm_medium=syndication&utm_source=scribd).  
<sup>2</sup>Nissar, J., Ahad, T., Naik, H. R., & Hussain, S. Z. (2017). A review phytic acid: As antinutrient or nutraceutical. Journal of Pharmacognosy and Phytochemistry, 6(6), 1554-1560.  
<sup>3</sup>Han, X., Ding, S., Lu, J., & Li, Y. (2022). Global, regional, and national burdens of common micronutrient deficiencies from 1990 to 2019: A secondary trend analysis based on the Global Burden of Disease 2019 study. EClinicalMedicine, 44. <https://doi.org/10.1016/j.eclinm.2022.101299>