

Molecular Genetic Diversity and Population Structure of Ethiopian White Lupin Landraces: Implications for Breeding and Conservation

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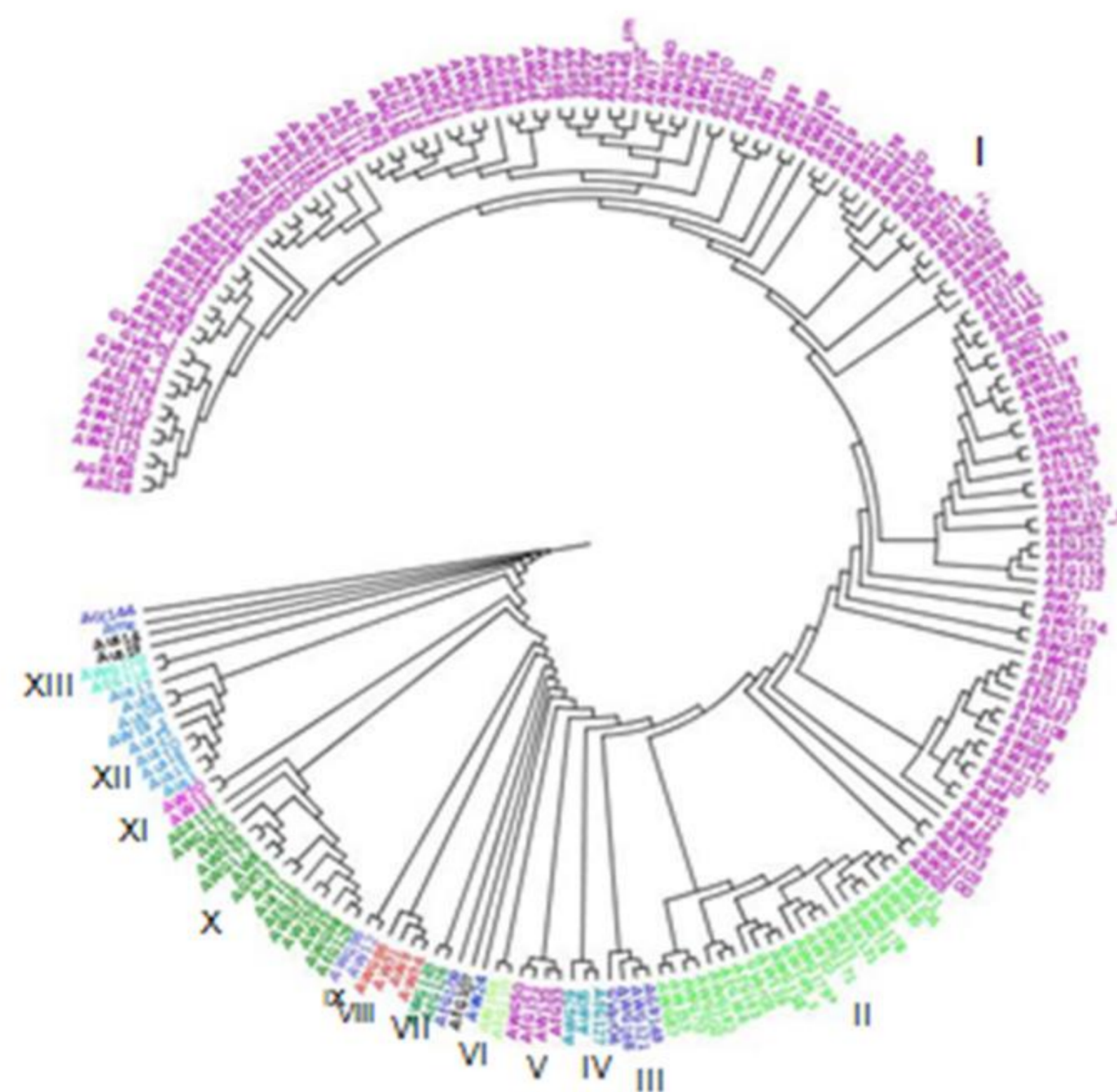
Project summary

White lupin has been traditionally cultivated for several thousand years along the Nile valley, including in Ethiopia, and offers a wide range of functions. However, farmers production has not yet been supported by research and/or technology interventions under Ethiopian condition. Hence, this project is aiming to uncover and document crucial genetic information on Ethiopian white lupin landraces. These include: 1) molecular genetic diversity and relationship, 2) population structure; and 3) biodiversity conservation, all aiming at setting up practical national breeding programs to develop improved white lupin varieties to impact smallholders livelihood.

Outputs

A total of 15 SSR markers revealed 108 alleles among the 214 white lupin landrace accessions studied. Thirty landraces and the two control genotypes harbored one or more private alleles (from the total of 39 private alleles). AMOVA showed that 89% of allelic diversity was attributed to individuals within populations ($P < 0.001$) while only 11% was distributed among populations.

At 70% similarity level, the dendrogram generated based on the UPGMA displayed 13 clusters comprising 2-136 landraces, with the two control genotypes and five landraces remaining distinct and ungrouped.



Genetic relationships among the Ethiopian white lupin landraces



White lupin phenotyping experiment in Ethiopia

Outcomes

The information generated from this project would be used to advise national breeding programs and will lead to variety development and biodiversity conservation. Improved white lupin varieties will contribute to increase production and ultimately improve livelihoods.

Meanwhile, improving production level will especially target the less resourced people, women and youth for consumption, and income generation particularly through marketing of lupin grains and products.

Deploying more lupin production in the farming system has a paramount importance at the farm level and the ecology at large scale, specially in marginal growing environments and under climate change constraints where other crops do not thrive well.

Partnerships

1. Ethiopian Institute of Agricultural Research: Home institution of the senior author
2. BecA-ILRI Hub: Hosts and funds the molecular research activities
3. Addis Ababa University (AAU): Enrolling the senior author as PhD student

Potential to scale-up

- Long time cultivation experience by Ethiopian smallholder farmers and low production input requirement of lupin could significantly contribute in scaling up of an improved technology/variety that could be developed based on the basic information generated by this project.
- Its high social value among smallholders, consumption in bad crop harvest years by less resourced communities; coupled with significant involvement of women and youth in the marketing of lupin processed products and grains, would facilitate adoption and positively impact livelihood.

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