



WILD WHEAT RELATIVES - A UNIQUE SOURCE OF HOST RUST RESISTANCE AND THE INTRODUCTION OF NEW IDEOTYPES IN CURRENT CULTIVATED BREAD WHEAT

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MOTIVATION: The past rust resistance history of Lr28 gene (NIL) derives from *Aegilops speltoides*, (a wild wheat relative species), motivated us to transfer this precious gene (alone or in combination with other rust resistance genes) into the locally adopted high-yielding but rust susceptible bread wheat cultivar i.e. Galaxy-2013.

BACKGROUND

- Wheat is most widely grown and consumed crop and Pakistan is considered as wheat loving country.
- Wheat crop faces many challenges including rust diseases that threaten wheat production around the world.
- The introduction of resistance genes into the host is the most economical, farmer and environmentally friendly strategy to avoid yield loss due to the rust epidemics.
- Wild relatives of wheat especially *Aegilops* species belonging to tertiary gene pool are not only an excellent source of diseases resistance genes but also dynamic resources for unique traits that are mostly absent in cultivated bread wheat.

RESULTS

- The result revealed that beside the rust resistance, the progenies showed some additional traits or modified /altered phenotypes in plant architecture and inflorescences like branched spikes/heads, compact or multiple spikelets in the pyramided progenies.
- Some pyramided progenies also showed extraordinary tillering and re-sprouting ability, broad leaves with high green biomass, more leaves to stem ratio which may favor the commercialization of final selected lines as dual-purpose wheat (green fodder and food grains) as well as can be best suited for low input and organic farming, especially related to chemical less wheat cultivation.

Resultant Progenies with several unique traits



METHODOLOGY



Similarly, other genes like Lr34, WGA & W55 were introgressed for the establishment of multi-parental populations through the crossing of targeted F1 with pyramided F1 ...

- Target Populations:**
- 23 B parental & 28 K parental populations
 - Additive effect
 - 3 ways B of resistance populations
 - 100% resistance to rust
 - 100% resistance to wheat yellowing
 - 100% resistance to wheat streak
 - 100% resistance to wheat mosaic
 - 100% resistance to wheat leafhopper
 - 100% resistance to wheat aphid
 - 100% resistance to wheat mite
 - 100% resistance to wheat nematode
 - 100% resistance to wheat root rot
 - 100% resistance to wheat seed rot
 - 100% resistance to wheat storage rot
 - 100% resistance to wheat insect damage
 - 100% resistance to wheat bird damage
 - 100% resistance to wheat human consumption

CONCLUSION

- The resultant progenies have several unique traits and their performance should be further evaluated in different ecological zones for identification of distribution patterns of these developed lines.
- Undoubtedly, the wild wheat relatives are the unique source of host rust resistance and the introduction of new genetic diversity/ideotypes in the current cultivated bread wheat.
- Progenies showing extra ordinary tillering, broad leaves with green biomass may favor in achieving higher yield potential as well as be best suited for low inputs / organic farming.

FUTURE PLANNING

- Further evaluations of resultant rust resistance progenies having additional unique traits is needed for their performance in different agroecological zones of Pakistan. The identified accidental mutants/recombinants/NPTs/ideotypes, will be used for the revival of lost genetic diversity in wheat.
 - The new ideotypes/NPTs will also be used for the further improvement in plant architecture, biomass, yield, grain quality and incorporation of resistance to multiple diseases, insects pests and abiotic stresses etc and the tentative proposed future breeding schemes is given below:
 - Improved NPTs x Improved NPTs
 - Improved NPTs x Early-maturing
 - Improved NPTs x Dwarf wheat varieties
 - Improved NPTs x Released high yielding varieties
- Future Expectations:** We don't know the exact results of such type of crossing but can hope such type of thinking may lead to achieve higher yield (10000/ha) i.e. 40kg/25m² as well as may be best suited for low inputs /organic farming/animal purpose wheat.

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