**INTRODUCTION**

- Bread wheat (BW) is the main crop produced and consumed in the world, accounting for 95% of all wheat grown [1].
- Early-stage leaf rust infections can lead to yield losses exceeding 50% [2].
- The genetic resources mainly wild relative species conserved in gene banks are important reservoirs of genes for breeding programs. However, they require pre-breeding efforts to meet breeders’ objectives [3].

**Objectives:**
1. Evaluate the resistance of 480 pre-selected BW lines to leaf rust at seedling stage.
2. Identify genetic markers associated with leaf rust resistance through GWAS analysis.

**METHODS AND MATERIALS**

- **Plant material:** Genotypes: 480 BW pre-breeding lines
- **Checks:** Achtar and Atlas
- **Design:** Augmented design
- **Blocks:** five blocks
- **Fungal material:** mixture of three leaf rust isolates (*Puccinia triticina*)
- **Scoring:** Stakman scale from 0 to 4 [4]

**Analysis:**
- MLM: Lme4 R package
- GWAS: GAPIT R package

**RESULTS**

- Approximately 34% of the lines showed resistance or immunity to leaf rust, 22% exhibited moderate resistance, and 43.54% displayed moderate susceptibility to susceptibility (Fig1).
- The highest number of lines expressing an Immune (I) and resistant (R) type of disease reaction was recorded in lines crossed with *Aegilops bicornis* var. *bicornis* (AB), *Aegilops ovata* (AO) and those crossed with *Triticum aestivum subsp. oestivum* + *Triticum aestivum subsp. compactum* (TEE+TEC) (Fig2).
- The effect of genotype explained a large proportion of the total variance (90%). The contribution of parent type is almost the same for all parents (P1 (30%), P2 (30%) and P3 (34%). While 34% of the genetic variance is expressed by the species of the first parent (Tab1).
- GWAS analysis revealed a remarkable set of 4 significant DarTag markers spread over chromosomes 3A, 5A, 1D and 6D (Tab2).

**CONCLUSIONS**

- Crop wild relatives (CWR) play a vital role in providing valuable traits, notably resistance to leaf rust, in the development of new bread wheat varieties.
- The associated markers presented here can improve the efficiency of breeding new resistant bread wheat varieties.
- To unlock the potential of crop wild relatives, pre-breeding efforts must connect with gene bank collections, focusing on economically important traits and targeted gene mobilization.

**REFERENCES**


