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Introducing water stress tolerance in a public breeding program: criteria and implementation

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INTRODUCTION: In the last decades, increasing resources use efficiency and crop tolerance to different types of abiotic stress has become a hot topic in agricultural systems. In maize, the anthesis-silking interval (ASI, in days) has demonstrated to be a useful secondary trait because it is highly correlated with improved grain yield in drought-prone environments, has high heritability and can be fast and accurately measured in the field. OBJECTIVE: The objective of this work is to introduce this secondary trait in an ongoing public maize breeding program with focus on water stress. MATERIALS AND METHODS: 240 inbred lines of the INTA Pergamino Temperate Maize Breeding Program were field grown during the 2019-20 season at high planting density (14 pl.m^{-2}) in a randomized complete block design with 2 replicates. A subset of 50 inbreds was sown in the same site during the dry 2020-21 growing season (*La Niña* phase of the ENSO phenomenon). Inbreds were characterized for ASI and *defensive* traits, such as root and stalk lodging. RESULTS: High stand density promoted the expression of significant genotypic differences in ASI ($p < 0.05$, mean: 2.3 d, range: -3 to +9 d) (Figure 1). In 2020-21, the 50 inbreds with the lowest ASI values (mean = 0.52) were evaluated again, finding significant differences between inbreds ($p < 0.05$, mean: 1.8, range: -3 to +6 days). As a first step, based on the data obtained in both years, a set of inbreds representative of the different heterotic groups of the breeding program was selected to make biparental crosses and develop new inbreds with shorter ASI. For this, the inbreeding from the S_0 generation and the selection will be carried out at high planting density (14 pl.m^{-2}). CONCLUSIONS: This selection method will allow the development of stress-tolerant germplasm. In the future, it is expected to be able to establish a recurrent selection breeding program.

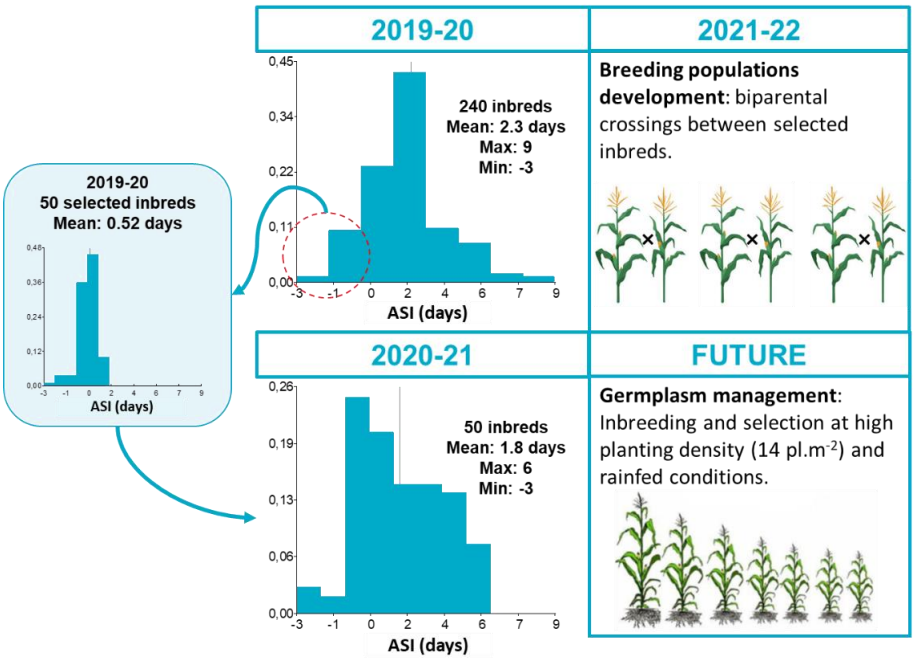

Figure 1: Flow chart of the working procedure and results.