Genetic diversity between CIMMYT bread wheat cultivars and its correlation to heterosis

Diplomarbeit

der Fakultät Agrarwissenschaften

von
Christian Flachenecker

2002

Chapter 1

Abstract

Heterotic groups and patterns are of fundamental importance in hybrid breeding. Genetic distance (GD) has been used in different crop species to group the germplasm. The objectives of our research were (i) to determine the GD based on single sequence repeats (SSRs) and coefficient of parentage (COP) in a set of 23 CIMMYT prospective hybrid wheat (*Triticum aestivum* L.) parents (ii) to examine the relationship between the GD estimates and hybrid performance (iii) to define heterotic groups in these set of lines. Parents plus the F_1 hybrids were grown in Obregon (Mexico) using a factorial design. Grain yield and stomatal conductance were measured. GD was estimated using 113 SSR markers and coefficient of parentage (COP). Midparent heterosis (MPH) averaged 9.13% for grain yield and -0.61% for stomatal conductance. The factorial analyses showed for both traits a clear predominance of general over specific combining ability effects. SSR-based GD estimates and $1-$COP values were low, but significantly correlated ($r = 0.33**$). No significant correlation between both GD estimates and MPH for grain yield and stomatal conductance was detected. We ascribed the missing correlation between SSR-based GD and MPH to the following reasons: (i) missing linkage between SSRs and traits of interest, (ii) low amount of heterosis, and (iii) high experimental error of the field data. Nevertheless, the molecular analyses suggested the existing of three groups. We conclude that SSR-based GD is a valuable tool for grouping of germplasm and could help to increase the efficieny of the CIMMYT hybrid breeding program in wheat.