EVALUATION OF DROUGHT RESISTANCE INDICES IN BREAD WHEAT UNDER IRRIGATED AND NON-IRRIGATED CONDITIONS
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ABSTRACT

The objective of this study was to evaluate the ability of several selection indices to identify drought resistant genotypes under a variety of environmental conditions. Twelve bread wheat genotypes differing in yield performance were grown in separate experiments under non-irrigated and irrigated conditions in 2006/2007 and 2007/2008 seasons. Nine selection indices including stress susceptibility index (SSI), yield stability index (YSI), superiority measure (Pi), mean productivity (MP), tolerance (TOL), stress tolerance index (STI), geometric mean productivity (GMP), yield index (YI), and absolute rank (Di) were calculated based on grain yield under non-irrigated and irrigated conditions. The results showed that under stress Pi, MP, STI, GMP and YI were more effective in identifying high yielding genotypes in both non-irrigated and irrigated conditions. It is concluded that the use of different concepts of selection indices will lead to different rankings of genotypes. So, wheat breeders should therefore, take the stress severity of the environment into account in choosing an index.

Key words: Drought; Resistance indices; Bread wheat; Irrigated and non-irrigated conditions, rank correlation.

INTRODUCTION

Under dry areas the major limitation to cereal yield is the amount of available water (Auston 1987). Also, Ashraf and Harris (2005) mentioned that insufficient water is the primary limitation to wheat production world-wide. However, quantification of drought tolerance should be estimated on grain yield under dry conditions in the absence of an understanding of specific mechanisms of tolerance. It is worth while that, relative yield performance of genotypes in drought-stressed and more favorable environments seems to be a common starting point in the identification of traits related to drought tolerance and the selection of genotypes for use in breeding for dry environments (Clarke *et al.*, 1992). According to Fernandez (1992), genotypes can be divided into four groups based on their yield response to stress conditions: (1) genotypes producing high yield under both water stress and non-stress conditions (group A), (2) genotypes with high yield under non-stress (group B) or (3) stress (group C) conditions and (4) genotypes with poor performance under both stress and non-stress conditions (group D). The question is: should breeders do selection under both potential and stress conditions or in either environment alone? Some researchers believe in selection under favorable condition (Richards, 1996; Van Ginkel *et al.*, 1998; Rajaram and Van Ginkle, 2001 and Betran *et al.*, 2003). Selection in the target stress condition has been highly recommended too (Ceccarelli, 1987, Ceccarelli and Grando, 1991 and Rathjen, 1994). Several researchers have chosen the mid-way and believe in selection under both favorable and stress conditions (Fischer and Maurer, 1978, Clarke *et al.*, 1992, Nasir Ud-Din *et al.*, 1992, Fernandez, 1992, Byrne *et al.*, 1995 and Rajaram and Van Ginkle, 2001).