# Assessment of the reactions of pure lines selected from Turkish bread wheat landraces against bunt disease (*Tilletia foetida*) with the GGE-biplot method

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## Abstract

The present research was conducted to determine the reactions of 200 pure lines selected from bread wheat landraces collected from 18 provinces and seven regions of Turkey against bunt disease (*Tilletia foetida*) under field conditions for 3 years. Bunt disease reactions of pure lines were assessed based on the infected spike/total spike ratio. For visually assessed materials, the GGE-biplot method, where G = genotype effect and GE = genotype-by-environment effect, was used to group the reactions against bunt disease. Fifty-nine pure lines showed high resistance (with infection rates ranging from 0.1 to 10%); 24 in the moderate resistance (with infection rates ranging from 10.1 to 25%); 75 in the moderate susceptibility (with infection rates ranging from 25.1 to 45%); 38 in the susceptibility (with infection rates ranging from 45.1 to 70%) and finally four in the highly susceptibility (with infection rates of >70.1%). PC1 and PC2 of the GGE-biplot graph created over the years explained 76.49% of the total variation. The GGE-biplot graph provided efficient identification of resistant genotypes. The lowest PC1 values and PC2 values close to 0.0 explained the resistance of pure line to bunt disease best. The resistance of pure lines to bunt disease over the biplot decreased from the first section through the last section. Based on the results of present study, 19 pure lines (located within the first circle of the biplot graph) were selected for resistance breeding programmes against the diseases.

**Keywords:** bunt (*Tilletia foetida*), GGE-biplot, landraces, pure line, Turkey

## Introduction

Bread wheat landraces grown in Turkey exhibit great variation. Gen-Banks were established to preserve this diversity and several wheat cultivars have been collected and preserved for years (Akcura *et al*., 2016).

Mamluk *et al*. (1997) and Mamluk and Nachit (1994) assessed a series of genotypes composed of Turkey-originated local wheat cultivars through cluster and PCA analyses to find out new resistance sources against bunt disease (*Tilletia foetida* and *Tilletia caries*) in durum

wheat and identified 26 new resistance sources against bunt disease. In another study investigating worldwide distributions of resistance sources against bunt disease based on geographical regions, Turkey-originated local wheat cultivars were found to have significant variation with regard to resistance to common and dwarf bunt diseases (Bonman *et al*., 2006).

Biplot method originated by Gabriel (1971), and uses were subsequently expanded by Kempton (1984) and Zobel *et al*. (1988). The extensive usefulness of GGE biplot, where G = genotype effect and GE = genotype-by-environment effect, has been clarified (Yan *et al*., 2000). The GGE biplot is a versatile tool for in plant breeding and quantitative genetic. Additionally, GGE biplot helps analyse different types of

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