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Optimal use of biplots in analysis of multi-location variety test data.

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Abstract : Biplot analysis has been increasingly used in visual analysis of genotype by environment data and other types of two-way data. While many plant breeders and agricultural researchers are enthusiastic about the capacity of biplot analysis

them to understand their research data, some statisticians consider the use a sidetrack to genotype-by-environment interaction analyses. Confusion also exists among statisticians on what is or is not a biplot. Admittedly, some users of biplot analysis are always clear on how to select a proper type of biplot for a particular research purpose and how to interpret a biplot correctly, accurately, and adequately. Some criticisms of biplot analysis may arise from incomplete understanding of the practitioner's research problems as well as of the biplot methodology. In this review, I summarize the author's experiences and understanding in biplot analysis of genotype-by-environment interaction achieved during the last decade and discuss the following issues: (1) how to select a proper biplot; (2) how to choose a proper GGE (genotype+genotype-by-environment interaction) biplot; (3) how to use the key functions of a GGE biplot for genotype evaluation, test-environment evaluation, and mega-environment delineation; (4) how to judge the adequacy of a 2-D biplot; and (5) how to test the statistical significance of a pattern.

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