

## **Abstract**

Drought stress and nutrient element deficiencies are common abiotic stresses in drylands that limit crop production and its quality, especially in rainfed areas. With the aim of evaluation of genotypic variation for Zn, Fe, Cu and Mn efficiency as well as mapping of chromosome regions associated with nutrient efficiency, 121 barley genotypes (including local landraces and varieties, advanced lines) were studied under both irrigated and rainfed conditions. The experiment was conducted in square lattice with two replications. Based on ANOVA, there were significant differences among genotypes for Zn, Fe, Cu and Mn concentration and content in seed, as well as for the measured morpho-physiological traits. Based on correlation analysis, the concentration and content of Zn, Fe, Cu and Mn had significantly positive correlation with the traits that affecting grain yield under both rainfed and irrigated conditions. The existence of great genotypic variation among barley genotypes helped in finding genomic regions associated with Zn, Fe, Cu and Mn concentration and content. Under irrigated conditions, 1, 5 and 1 genomics regions were associated with seed Zn, Fe and Mn concentration and content, respectively. Moreover, under rainfed conditions, some genomic regions were associated with the element concentration and content. In short, the result of this study revealed great genotypic variation as well as QTLs for the seed element concentration and content, which can be used in higher grain yield with Zn, Fe, Cu and Mn -dense grains and biofortification programs in barley. In rainfed conditions, two QTLs on chromosomes 2H and 3H correlated with the iron content, two QTLs on chromosomes 1H and 7H correlated with iron content, and two QTLs were located on the chromosomes 2H and 1H correlated with copper concentration,. Under irrigated conditions, five genomic regions were located on 3H, 5H, 2H and 4H chromosomes in relation to zinc concentration and zinc content. Some of these genomic regions were also shared by other elements.

**Key words:** Genotypic variation, Element efficiency, QTLs, Biofortification, Barley



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**Association mapping of traits associated with improved nutrients efficiency in  
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