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Selection and evaluation of emmer, einkorn and spelta germplasm in Greece for organic farming adaptability and bakery-nutritional quality

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In recent years, greek consumers expressed interest for wheat, quality bakery products, organically produced from traditional varieties and also from "ancient" or "hulled" wheat, particularly einkorn, emmer, or spelta. To meet the growing demand of farmers for seed due to the attractiveness of this new market, it was necessary, using European and Balkan traditional germplasm, to select appropriate hulled wheat varieties with adaptation to organic farming and low-input agriculture. Already selected lines from 2012 and 2013 and some new untested genotypes were sown in 2014 in two locations, under low input and organic conditions for evaluation and organic breeding purposes. Furthermore, it was used a breeding scheme for selection and evaluation of their yield potential and technological seed traits under organic and low input growing conditions. Preliminary results have shown significant differences among genotypes in agronomical performance and also specific traits important for organic breeding and related to grain quality

Keywords: hulled wheat, organic farming, baking quality, low input, *Triticum* spp.

1 Introduction

Health food products have been gaining increasing popularity lately and this has led to a renewed interest in hulled species. Organic agriculture also has an on growing interest on traditional varieties and hulled wheat (Konvalina et al., 2013). Recently, greek consumers expressed interest for wheat quality bakery products, organically produced from traditional varieties, and also from the "ancient" or "hulled" wheat with unique nutritional value, particularly einkorn, emmer, or spelta (*Triticum monococcum* L., *Triticum dicoccum* (Schrank) Schuebl. and *Triticum spelta* L., respectively). Moreover, due to the attractiveness of this new market and trend, massive seed imports of emmer and spelta wheat from Italy and Central Europe were evident the last three years in order to meet the growing demand and need of farmers. Consequently, the selection of appropriate hulled wheat varieties is necessary expected to respond efficiently to organic farming and low-input agriculture, adapted to soil and climatic conditions of Greece with flexible features for solid performance and adaptability to climate change and diverse environments.

Selected genetic traditional material from Greece, Balkans and Central Europe were used for the purpose of this study which mainly focused on:

- (i) characterization of these genotypes according to morphological, agronomical, seed quality and technological traits,
- (ii) evaluation in regional organic and low input environments,
- (iii) identification of promising genotypes with good agronomical and quality traits.

2 Material and Methods

Based on individual plant selection applied in 2012 and 2013 to distinguish the most high yielding plants with better technological traits and also to determine the interpopulation

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ecotypes under assay conditions of the organic environment (Koutis et al, 2014), 4 emmer (*Triticum dicoccum* (Schrank) Schuebl.), 3 eincorn (*Triticum monococcum* L.), and 2 spelta, (*Triticum spelta* L.) genotypes were sown in 2014 under a Randomized Complete Block experimental design with three replications in comparison to commercial varieties of eincorn, emmer, soft and hard wheat under organic and low input conditions in two different locations. During the experiment, measurements were made (Murphy et al., 2008) concerning phenotypic uniformity, tillering, stage and time of maturation, plant height, number of ears and grains per ear and also the total yield. Furthermore, analysis on seed quality and technological traits were to be applied for all traditional and commercial cultivars tested.

3 Results

Preharvest results of the research (plots are currently in harvest period) have shown significant differences among genotypes in various agronomic performance traits and characteristics important for organic breeding (e.g. early vigour, ground covering, staygreen, days to anthesis, height, lodging). Differences are also waited to be observed in baking quality and nutritional characteristics. Preliminary testing revealed already that einkorn wheat has a high protein content and both einkorn and emmer have low gluten index. (Koutis et al., 2014).

4 Conclusions

The preliminary results of the experiments have showed that through the application of a breeding scheme consisted both in self plant selection at early stages and population screening, it is possible to select hulled wheat lines with significantly high quality, technological traits and yield performance in organic environment. These observations are valuable and useful for the direct exploitation of these lines in organic farming (Wolfe et al., 2008) or for their participation or contribution as parents to design an effective organic breeding program for hulled wheat in the near future.

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