INTRODUCTION

Einkorn, domesticated about 10,000 years ago in the Fertile Crescent, along with emmer and barley started the agricultural revolution. From its home in Central Turkey, it spread all over Europe and until the Bronze Age (IV–III millennium a.C.) was the staple food of agricultural populations. Afterwards, durum and bread wheats, free-threshing and better yielding, drastically limited its consumption and food manufacturing. Among the 14 fatty acids detected (Table 1), linoleic (50.9% of total fatty acids), oleic (24.8) and palmitic (16.7) were the most abundant. Lipoxygenase activity was very low (Fig. 2).

RESULTS AND DISCUSSION

On average, the einkorn samples contain high protein (18.2 ± 1.4%) and ash content (2.35 ± 0.16%). Carotenoids, mostly lutein, averaged 8.4 ± 1.3 mg/g (dry matter, dm). Several accessions showed significant amounts of carotenoids (above 25% of total carotenoids), sometimes together with high tocotocols (g/kg; bottom right) content of 65 einkorn accessions and the controls.

Among the technological parameters (Fig. 4), SDS sedimentation volume was low (25.6 ± 8.7 ml), but a few accessions with good values were recorded. The pasting parameters studied were peak viscosity (2426 ± 2029 cP), breakdown (765 ± 109.1 cP), final viscosity (2788 ± 268.2 cP) and setback (1126 ± 153.6 cP). Significant differences from the controls and a broad variation for all the traits analysed were observed.

CONCLUSIONS

The high protein, carotenoids and tococols content, coupled with the low LOX and a favourable fatty acids composition propose einkorn as a cereal particularly indicated for human consumption and food manufacturing.

MATERIALS AND METHODS

Wholemeal flours for most analyses were obtained from 65 T. monococcum, eight T. turgidum (two emmer and six durum) and seven T. aestivum (two spelt and five bread wheat) accessions, cropped in 2006 at S. Angelo L. (Po plain, Italy). LOX determination, instead, was performed on wholemeal flour from 17 T. monococcum, 22 T. turgidum and 18 T. aestivum accessions, cropped in 2008 at S. Angelo L.

Einkorn kernels were dehulled with a M3B micro-thresher (Co.MIL, Rome, Italy) and ground with a Cyclotec 1093 laboratory mill (FOSS Tecator, Denmark) to a particle size < 200 μm. Before analysis, all flours were stored in glass bottles with a screw cap under darkness at -20 °C.

Dry matter and ash content were determined following AACC Official Methods 44-15 and 08-03 (1995), and protein content (Nx5.7, DM) was determined by NIR according to AACC 39-10 (1995). Carotenoids and tococols quantification were performed by NPHLC (Hidalgo et al., 2006), while fatty acids composition was determined by gas chromatography (Hidalgo et al., 2012). SDS sedimentation volume was determined according to Preston et al. (1982), while the viscoelastic parameters were determined with a RVA (Newport Scientific, Australia). LOX activity was determined as described by Hidalgo and Brandolini (2002).