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Trace elements in rye – comparison of organic and conventional cultivation

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Rye is well adapted to organic cultivation and also the quality of the crop is usually good. In Finland the rye is mainly used as whole grain food products. Thus it is important cereal source of trace elements in the diet. In the present work the effect of conventional and organic cultivation on the nutritional quality of rye was studied. The purpose is to find suitable cultivars for different farming conditions and industrial applications.

The trials included comparison of 4 rye cultivars (Anna, Amilo, Bor 7068 and Picasso) grown in organic and conventional farming systems at 3 locations (Pälkäne, Mietoinen and Ylistaro) during 1999-2002. The conventional and organic farming systems were carried out on the same field. Copper, zinc, manganese and iron were determined by ICP method and selenium after extraction by electrothermal atomic absorption method.

No systematic difference were found between organic and conventional cultivation except for selenium. In Ylistaro (1999, 2001 2002) and Pälkäne (2002) organic cultivation resulted slightly higher trace element contents in rye whereas in other experiments trace element contents were higher in conventional cultivation. Mean copper contents of rye were 5.1 and 5.0 mg kg⁻¹, zinc 33 and 34 mg kg⁻¹, manganese 27 and 29 mg kg⁻¹ and iron 42 and 41 mg kg⁻¹ in conventional and organic cultivation, respectively. Se content of rye was significantly lower in organic cultivation. The selenium supplementation of compound fertilisers does not reach organically grown products. Thus the mean selenium content of rye was very low, <0.005 mg kg⁻¹ in organic cultivation. This corresponds to the Se levels of rye in 1970s before the Se fertilisation was started.

Cultivar differences in the trace element contents of rye were detected. The cultivar Picasso resulted systematically lower trace element contents than other cultivars. Picasso is a hybrid cultivar with large grains of high starch content. Thus the amount of bran, aleurone layer and cell membranes of the endosperm where most of the trace elements are located is relatively smaller in large grains. However, cultivars did not respond differently to organic or conventional cultivation.