Nutrient use efficiency and arbuscular mycorrhizal root colonisation of winter wheat cultivars in different farming systems of the DOK long-term trial

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BACKGROUND: For organic farming, cultivars are required with high nutrient use efficiency under nutrient limited conditions. Arbuscular mycorrhizal fungi (AMF) are known to contribute to nutrient uptake under low input conditions. We compared nutrient use efficiency (NUE) of old and modern organically and conventionally bred cultivars in organic and conventional systems and assessed AMF-root colonisation (AMF-RC) in relation to nutrient concentrations. RESULTS: Cultivars and systems had a statistically significant effect on nitrogen (N) and phosphorus (P) concentrations and NUE parameters, whereas no genotype x environment interactions appeared. In contrast to N and P uptake, the NUE parameters were higher under organic than under conventional conditions. NUE for N increased with the year of release of cultivars. In the organic systems, the organically bred cultivars could not outperform the conventionally bred cultivars in grain yield and NUE parameters. AMF-RC was higher in the organic than in the conventional system, but did not differ among cultivars. CONCLUSION: Cultivars achieving high NUE in the organic systems were found among modern cultivars, irrespective of the breeding programme. Nutrient conditions during the breeding programme did not affect AMF-RC. No clear evidence was found that AMF symbiosis contributed more to nutrient concentrations under low input than under high input conditions.

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