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Sensory Difference of Bio-Dynamically, Organically and Conventionally Produced Wheat from the DOK Long-Term Field Trial

Introduction

There is a need of scientific evidence on the differentiation of organic from conventional produce concerning health, nutrition and sensory related qualities (Leifert et al., 2007). Analysis of wheat from the DOK long-term system comparison trial near Basel, Switzerland (Mäder et al., 2002) showed that organic wheat differed in contents of 16 "diagnostic" proteins from conventional wheat (Zörb et al., 2009a), had higher concentrations of K^+ and Mg^{2+} cations and lower concentrations of six amino acids, and a different seed ripening metabolism (Zörb et al., 2009b). In a previous sensory test with cooked porridge of wheat (cv. Tamaro) from the DOK trial (harvest 1999), the biodynamic samples had been preferred (Arncken et al., 2007). In the present work we aimed to corroborate these results with dry samples of three harvest years.

Fig. 1 Preparation of double-blinded samples for the triangle tests in a balanced serving plan.

Fig. 2 Triangle tests in individual, mobile sensory booths at FiBL.

Material and Methods

Wheat (cv. Runal) from the "DOK" trial was used for sensory triangle tests in 2009 with double-blinded samples of dry whole-wheat flour (Fig. 1). Two 30-person panels (SAM with a majority of conventional consumers; FIBL with a majority of organic consumers) performed in total 24 pairwise comparisons of flour from the three farming systems BIODYN (biodynamic), BIOORG (organic) and CONFYM (conventional with farmyard manure) derived from two different field replicates (East, West) and two different years (SAM: 2006 and 2007, FiBL: 2007 and 2009). In each triangle test, panellists were given three coded samples, two of which were identical. They were asked to indicate the different sample (Fig. 2). Significance of a sensory difference is reached when at least half of the given answers are correct (guessing probability is at one third of given answers).

Triangle tests were followed by a preference question. Preference data were only analysed where triangle test answers were correct. Each triangle test, extended with a preference question, was analysed separately, but data were also aggregated in order to test factor and interaction effects.

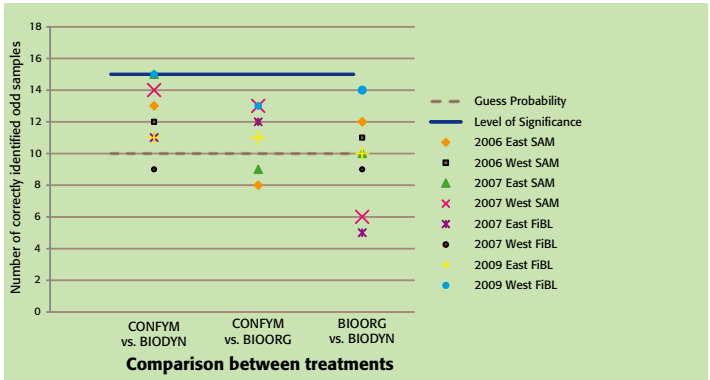

Fig. 3 Sensory differences between DOK treatments: number of panellists (out of 30 in total per panel) who correctly identified odd samples in triangle tests, differentiated by harvest year, field repetition (East, West) and sensory panel (SAM, FiBL). Indicated are also levels for guess probability and statistical significance.

Results

Considering each of the 24 single comparisons separately, in only two cases sensory difference was significant ($P \leq 0.05$) (BIODYN vs. CONFYM for 2009 West, FiBL and BIODYN vs. CONFYM for 2007 West, SAM, Fig.3).

Analysing all data for all possible factor and interaction influences, the factor "farming systems' pair" was the only one that had a significant influence on the proportion of correct answers. This was highest (41 %) when CONFYM and BIODYN were compared (Fig. 3.)

Hedonic answers revealed significant preference only in one out of the 24 comparisons (BIOORG preferred to CONFYM). Calculating the CONFYM vs. BIOORG comparison across all years, a highly significant interaction ($P = 0.002$) showed that the panel of conventional consumers preferred CONFYM wheat and the panel of organic consumers preferred BIOORG wheat. The same interaction was observed for the CONFYM vs. BIODYN comparison as a tendency ($P = 0.08$; Fig. 4).

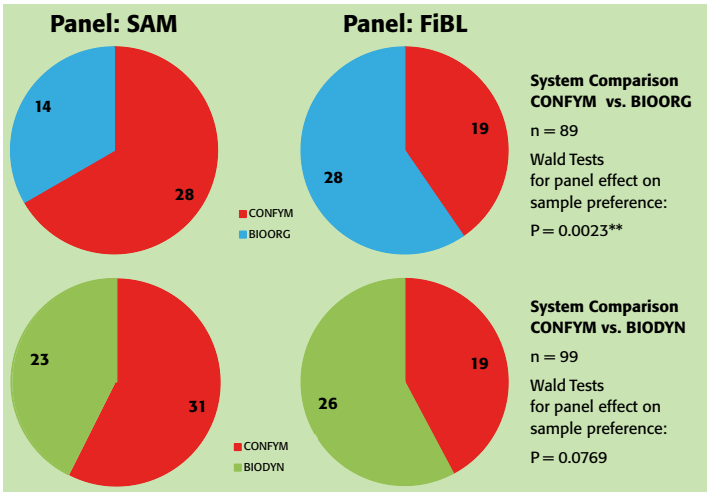

Fig. 4 Preference of farming system depended on panel. The size of circle segments shows the percentage of preference for the respective sample; figures in circle segments are absolute counts of correct triangle test answers. Samples were coded; panellists were not informed on the nature of sample differences.

Conclusions

- Triangle tests with dry whole-wheat flour were very challenging for the panellists resulting in a low proportion of correct differentiation. Only in two out of 24 comparisons sensory differences between organic and conventional flour were proven.
- However, there was a significant factor influence of "farming systems' pair" on differentiation when the whole three-year datasets were analysed. Best differentiation was achieved between the biodynamic and the conventional farming system.
- Interestingly, preference for either organic or conventional wheat was significantly dependent on the panellists' eating habit.

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