72nd Conference

22-24 November 2021
Online Conference

Plant breeding for the ‘Green Deal’

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Vereinigung der Pflanzenzüchter
und Saatgutkaufleute Österreichs

72. Tagung

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Plant breeding for the „Green Deal“

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Eva Blatnik, Agricultural Institute of Slovenia (KIS), Ljubljana
Agroinfiltration of Phytophthora infestans effector gene Avr4 on potato detached leaves. The resistance protein R4 in leaf tissue interacts with Avr4 from the vector Agrobacterium tumefaciens, which results in hypersensitive response (left) compared to the mock control of A. tumefaciens with an empty vector (right).

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Preface

In its 72-year long history, the Annual Conference of the Austrian Association of Plant Breeders and Seed Merchants was now held two consecutive years as an online conference due to COVID-19 restrictions. The topic of the conference from 22nd-24th November 2022 was *Plant breeding for the Green Deal*.

The conference was opened by a key-note lecture on *The European Green Deal and its farm to fork strategy* by Georg Häusler from the European Commission, Directorate-General for Agriculture and Rural Development (AGRI). The European Green Deal was announced in December 2019 as a response to climate change, loss of biodiversity and environmental pollution, aiming to improve the well-being of people. The communication, press releases, highlights, actions, factsheets and other documents on this European priority can be retrieved at the official website of the European Union (https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en). The Farm to Fork strategy, which Mr. Häusler introduced in his lecture, is at the heart of the European Green Deal with the aim to make food production, food processing and distribution, and food consumption more sustainable, as well as to prevent food loss and waste (https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_de).

Plant breeding is considered a congenial partner to the European Union's strategy towards more sustainable developments in agriculture and beyond. However, various scientists believe that the goals of Europe's Farm to Fork strategy may be jeopardized by insisting on the current regulation of new plant breeding techniques and biotech innovations. Kai Purnhagen, Chair of Food Law at the University of Bayreuth, outlined in his lecture aspects of conflicts in the EU's commitment to biotechnology and organic farming. Prof. Purnhagen's arguments and ideas can be retrieved from several recent publications (*e.g.*, Purnhagen *et al.*, 2018; 2021; Eriksson *et al.*, 2019; Purnhagen & Wesseler, 2021; Wesseler *et al.*, 2022)

In the meantime, Russia's invasion of Ukraine got worse the rising of global food prices which started already in fall 2020 with lower harvests and disrupted supply chains due to climate change and COVID-19, respectively. Especially dramatic is the rise of the vegetable oil price (FAO, 2022) as the Black Sea region is a crucial source for sunflower oil. Hence, voices rose to water down the objectives, targets and timeline of the Farm to Fork strategy for Europe's food security (Bounds, 2022). A rather improper demand in view of 88 million tons of food waste per year (EUFIC, 2021; European Commission, https://ec.europa.eu/food/safety/food-waste_en). Therefore, the challenge is not so much an increase in production but in avoiding food waste. Moreover, significant amounts of grain are produced to feed swine and poultry although meat consumption in most European countries is already too high and associated with adverse health behaviours and characteristics (Richi *et al.*, 2015; Papier *et al.*, 2021). Intensive agriculture and livestock production ignoring animal welfare also leads to deforestation, loss of biodiversity, habitat fragmentation and pollution. Besides increasing urbanization and global connectedness, it is these environmental factors which in return are drivers of increasing human-animal contacts and accelerated transmission rates of zoonotic diseases such as COVID-19 (Mishra *et al.*, 2021; Holmes, 2022). Europe's Farm to Fork strategy might be ambitious from today's viewpoint but inevitable in order to stop the growth of badlands caused by human greed. Overexpansion, climate change, environmental degradation and wrong leadership led to the collapse of Ancient Egypt, Carthage, Classical Greek, the Roman Empire, Mesoamerican and many other societies in history (see *e.g.* Diamond, 2005). Today we are visiting the ruins of these vanished cultures, we are impressed by their size and beauty, they stimulate our fantasy, but have we learned their lessons?

Heinrich Grausgruber

72. Tagung der Vereinigung der Pflanzenzüchter und Saatgutkaufleute Österreichs
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Diversity of spelt and common wheat grown under different management based on their bioactive component composition

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Abstract

Wheat and other cereals are important sources of dietary fibre and antioxidants. Most of the bioactive components are found in the outer layers and aleurone layers of the seed, but also the flour contains some. The major dietary fibre components in the wheat grain are cell wall polysaccharides such as arabinoxylan and β-glucan, which account for about 70% and 20%, respectively, of the total cell wall polysaccharides in the starchy endosperm. Barley and oats are rich in β-glucan, while wheat and rye are richer in arabinoxylan. Arabinoxylan has two forms, *i.e*. water-soluble (WE) and insoluble (WU) fractions, which differ in their health benefits. Antioxidants (*e.g*., alkylresorcinol) delay or inhibit oxidation processes. Alkylresorcinol is formed in the organism and acts against free radicals, which are responsible for the cell degradation.

Spelt (*Triticum spelta*) is often supposed to be healthier than common wheat (*T. aestivum*), but this assumption has never been confirmed based on the compositional properties of the grain. However, the environment and field management practices could also influence grain composition. The current study evaluated differences in the composition of bioactive components between spelt and wheat, as well as the effects of growing location and field experimental practices. Five wheat and five spelt varieties were grown for three years (2019-2021) at two sites in Hungary (M, conventional; O, organic). The organic site was an experimental field, where no artificial fertilisation and chemical treatment was applied for at least three years. The total amount of mixed-linkage β-glucan was determined according to the ICC166 Standard Method using the Megazyme assay kit (Megazyme, Bray, Ireland). Total and water-extractable pentosans, of which arabinoxylan (AX) is the major component, were determined by the colorimetric method. Alkylresorcinol content was measured by spectrophotometry.

The results showed that the main fibre of wheat, arabinoxylan (AX) content, was higher in wheat than in spelt, but there were no differences between conventional and organic growing sites. The water-extractable fraction of arabinoxylan (WEAX) was also higher in common wheat than in spelt, with no differences due to field management practice (conventional vs. organic). β-Glucan, present in lower amounts than arabinoxylan, showed also higher amounts in common wheat than in spelt. The highest mean value was found for both species at the organic site. However, variation was high in the wheat samples grown on the organic site. The content of alkylresorcinol, which has antioxidant activity, was similar in spelt and wheat, with higher variation in wheat (Fig. 1). Consequently, the content of dietary fibre (arabinoxylan, β-glucan) was lower in spelt than in common wheat under both conventional and organic growing conditions. No difference was found in the mean alkylresorcinol content of spelt and common wheat at any of the sites. Organic field management resulted in significantly higher mean β-glucan content for both species compared to the conventional site.

Keywords

Alkylresorcinol · arabinoxylan · beta-glucan · diversity · organic farming · *Triticum aestivum* · *Triticum spelta*

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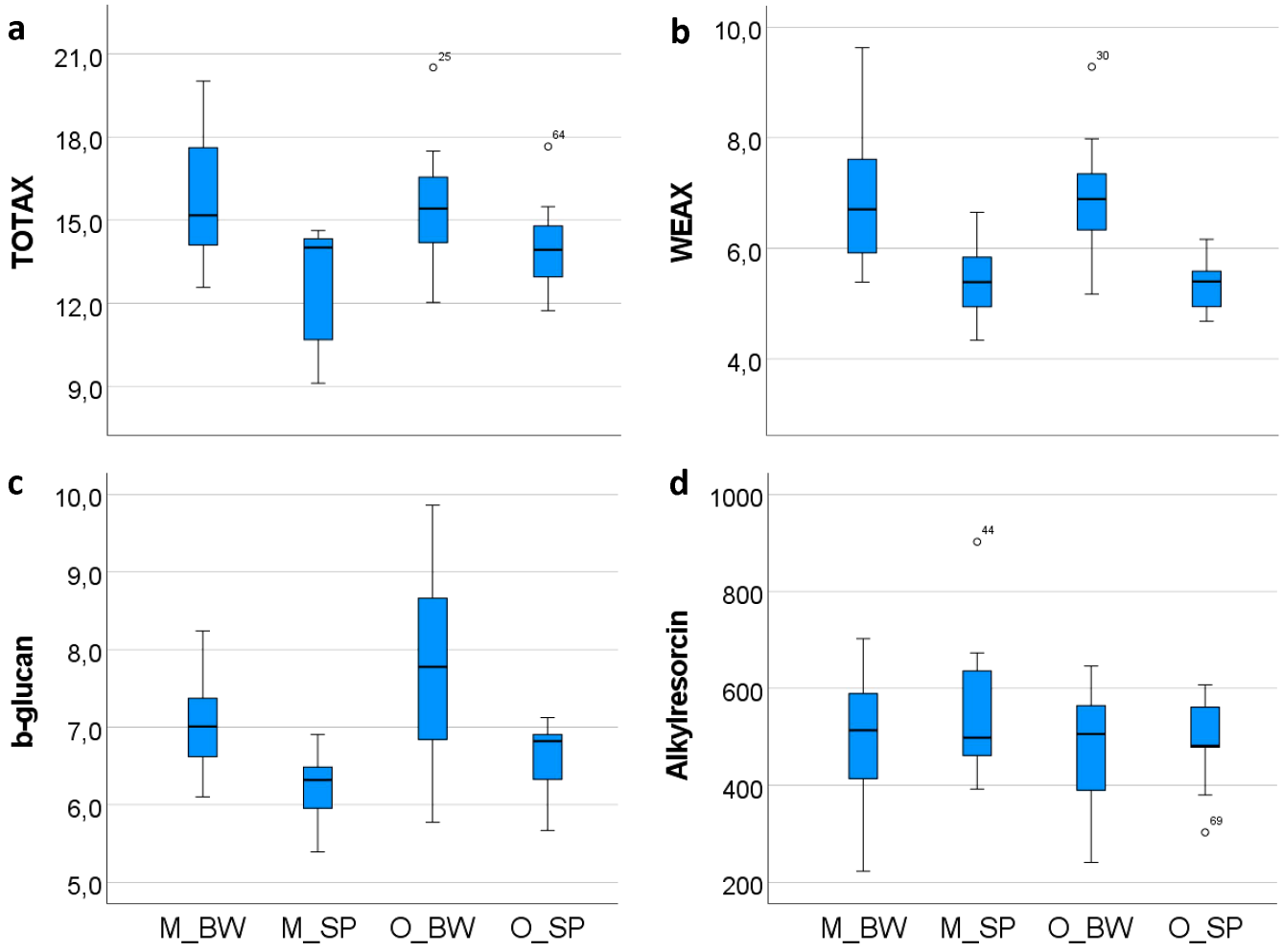

Figure 1 Variation in bioactive components of common wheat (BW) and spelt (SP) grown under conventional (M) or organic (O) management in Martonvásár, Hungary, from 2019 to 2021. **a** Total-arabinoxylan content (TOTAX; mg·g^{-1}); **b** Water extractable-arabinoxylan content (WEAX; mg·g^{-1}); **c** β-glucan content (mg·g^{-1}); **d** alkylresorcinol content (µg·g^{-1})

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