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22-24 November 2021
Online Conference

Plant breeding for the ‘Green Deal’

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Vereinigung der Pflanzenzüchter
und Saatgutkaufleute Österreichs

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Universität für Bodenkultur Wien

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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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3430 Tulln an der Donau
E-mail: pflanzenzuechtung@boku.ac.at
URL: https://boku.ac.at/dnw/pz

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Table of contents

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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Identification of useful traits for organic soybean breeding in limiting and changing agro-climatic conditions

Vuk ĐORĐEVIĆ [1], Marjana VASILJEVIĆ[1], Predrag RANĐELOVIĆ[1], Jegor MILADINOVIĆ[1], Marina ĆERAN[1], Maria BERNHART[2], Ion TONCEA[3]

[1] Institute of Field and Vegetable Crops, Maksima Gorkog 30, 21101 Novi Sad, Serbia

[2] Saatzucht Gleisdorf, Am Tieberhof 33, 8200 Gleisdorf, Austria

[3] National Agricultural Research and Development Institute (NARDI), Str. Nicolae Titulescu 1, Fundulea 915200, Romania

(✉) vuk.djordjevic@ifvcns.ns.ac.rs

Abstract

Organic farming is practiced on over 72 million hectares of agricultural land worldwide. Soybean (*Glycine max*) is cultivated organically on 644 323 ha. Each year, the selection of the right soybean varieties for their fields is one of the most challenging management decisions that farmes must undertake. Soybean breeding companies continuously offer varieties from their breeding programs that can meet the various needs of farmers, industry and consumers. The growing demand for soybean varieties suitable for organic farming is fostering breeding activities to better fulfil the specific requirements of the organic value chain participants.

Within the ECOBREED project, characterisation of a soybean working collection is carried out across contrasting environments in three countries, *i.e*. Austria, Romania and Serbia, which will enable the identification of useful traits (variation) and the level of local adaptation of genotypes. The following traits are assessed: yield and yield components, crop growth related traits, grain quality traits. The main priority of the project is the creation and selection of new soybean breeding material suitable for organic farming and breeding. The ECOBREED trial network includes in total 208 accessions, subdivided in two maturity groups, and is tested in the thee countries from 2019 to 2022. Here, first selected results are presented. Due to a severe weed infestation in the early growing period and severe drought later, the trials conducted in Romania in 2020 were excluded from statistical analysis.

One important trait for organic breeding is canopy cover, as a surrogate for canopy light interception, and on the other hand as potential weed competitiveness trait. The importance of canopy cover of soybean in weed competitiveness is not clear. Some stu-

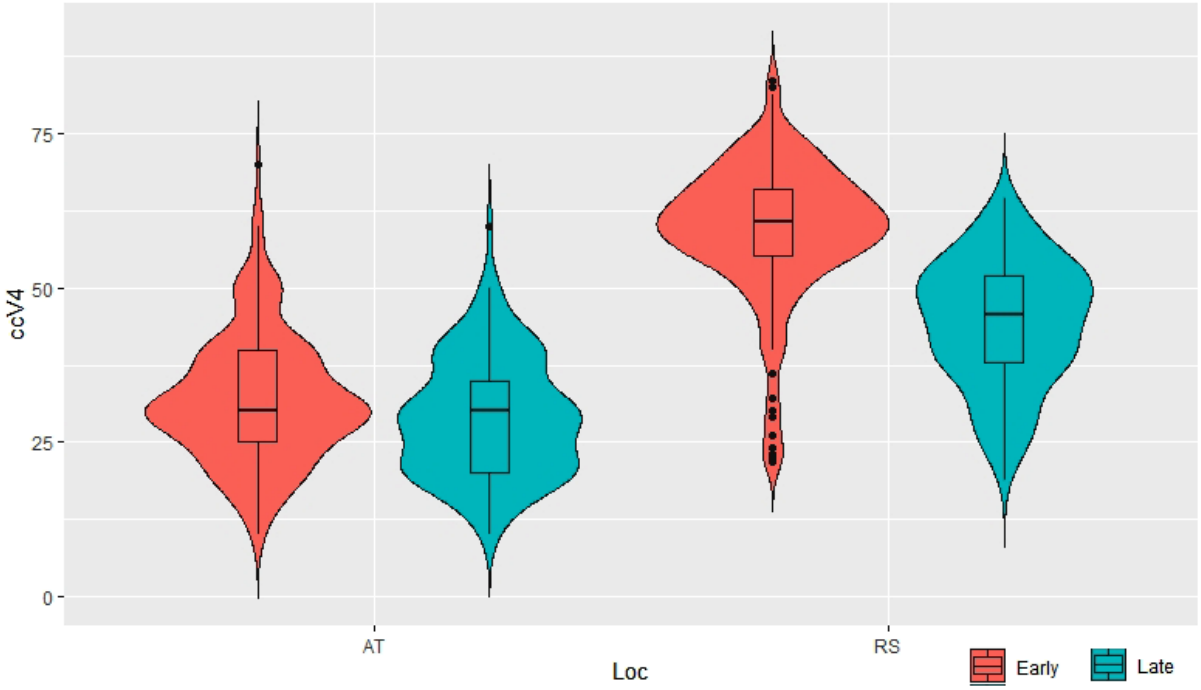

Figure 1 Variability in canopy cover of 208 soybean genotypes tested in 2020 in Gleisdorf, Austria (AT) and Novi Sad, Serbia (RS). The nursery was subdivided into two trials at each location according to maturity groups.

Đorđević V, Vasiljević M, Ranđelović P, Miladinović J, Ćeran M, Bernhart M, Toncea I (2022) Identification of the useful triats for organic soybean breeding in limiting and changing agro-climatic conditions. In: Vereinigung der Pflanzenzüchter und Saatgutkaufleute Österreichs (Ed), 72. Jahrestagung 2021, 22-24 November, Raumberg-Gumpenstein, pp 81-82. University of Natural Resources and Life Sciences, Vienna, Austria. ISBN-13: 978-3-900932-96-1

dies indicate that this trait is important for weed competitiveness, whereby other studies have not confirmed a relationship between these traits. All studies were done on a relatively small number of genotypes and the reported variability in this trait was low. In this study, canopy cover was screened during the V3-V4 phase of development using the Canopeo App.

In general, canopy cover was higher in Serbia than in Austria (Fig. 1), mainly due to higher temperatures during the vegetaton period. Considerable variation in canopy cover was observed at both locations and in both maturity groups. In Austria, the mean canopy cover of the early and late genotypes was similar, while in Serbia early genotypes showed a higher canopy cover compared to late genotypes. In each group, it was possible to identify genotypes with a high canopy cover (20% higher than the group mean) that represent soybean genotypes with a potential good weed competitiveness. Future studies should provide more information about the importance of this trait in the relationship between soybean and weeds.

Keywords

Canopy cover · *Glycine max* · organic breeding · weed competitiveness

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