

Introduction to the Soybean Topical Issue and the upcoming World Soybean Research Conference 11[☆]

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Soybean is the major protein and oilseed crop of the world, which is utilized for the production of livestock feed, numerous food components, and non-food products. In 2021, world soybean production has reached an all-time-high with a global planting area of over 129 million hectares. While Brazil and the United States were growing 39 and 34.9 mio ha, respectively, the European soybean production area was about 5.5 mio ha, of which only about 900 000 ha were grown in the European Union (FAOSTAT, 2023).

This topical issue of *OCL* on soybean is devoted to relevant questions related to production, breeding, processing, and feeding. In 11 different contributions, the issue provides insights into specific soybean cases discussed at present. The rapid expansion of soybean production in Brazil during the last 30 years is illustrated in terms of geography, yield increase, land protection, and economic importance (Cattelan and Dall'Agnol, 2018); increased soybean production in Brazil is closely associated with increased meat production both in Brazil and world-wide. In contrast, European Union soybean production (Debaeke *et al.*, 2022) is evaluated in the light of its heavy dependency on overseas meal imports for feeding; the study demonstrates that only under a best-case scenario involving reduced meat consumption and thus increased arable land availability, soybean imports could be reduced to 15% by the year 2050. In Central European countries such as Germany, Austria or Switzerland, organic soybean production is gaining in importance. For Switzerland, Klaiss *et al.* (2020) take a look at the needs of organic soybean production such as weed competitiveness; they identified soy-food production as a main market driver, and they summarized practical organic soybean production guidelines. For simulating soybean production in Iran, crop modelling was implemented by utilizing model parameters from regional experimental results, which revealed potential yields in the range of 1.8 to 4.7 t ha⁻¹ under Iranian growing conditions (Nehbandani *et al.*, 2020).

Genetic differences in soybean root architecture traits are of interest both to select for increased di-nitrogen fixation per unit area as well as for drought tolerance, but reliable and high-throughput imaging methods are required for appropriate

screening. In the paper by Dayoub *et al.* (2022), root traits such as tap root length and lateral root formation, their phenotyping and genetic variation within early maturity soybeans are described with a focus on developing soybean ideotypes for avoiding drought stress. Maslard *et al.* (2021) implemented a root image analysis method to measure nodulation in addition to other root parameters; they were able to classify a set of soybean genotypes into groups differing in nodulation and biological di-nitrogen fixation.

As soybean is a crop, which delivers chemical raw materials for different industries, processing and separation technologies are essential steps of the soybean value chain. An introductory overview of soybean crushing including different processes from oil extraction and refining to lecithin and meal preparation is presented by Demarco and Gibon (2020). Pilorgé and Muel (2016) look at the competitiveness of the protein fraction of oilseed crops, which is compared to grain legumes and cereals in different developmental scenarios relevant to the French and European vegetable oil and protein sector. On a more technical level, Benbouriche *et al.* (2022) demonstrate the improvement of thermal stability of soybean oil by blending with cold-pressed oils from lentisk, almond, sesame or other specialty vegetable oils; increased stability might be due to phenolic and antioxidant effects of blending on stability of linoleic and linolenic acids during heat treatments. The utilization of soybean oleosomes for improving rheological properties of emulsions has been investigated for different polysaccharide/oleosome ratios for optimizing novel plant based food products (Zambrano Solorzano and Vilgis, 2023), which is relevant for controlling textural and viscosity attributes of gels.

Most of the soybean used for feeding European livestock is from overseas meal imports, which is the main cause of the European protein deficit (see Debaeke *et al.*, 2022). In a French model study (Guilbaud *et al.*, 2023), a reduction of pig and poultry feed crude protein content by 1 or 2 percentage points has been shown to result in the replacement of imported soybean meal by cereals and rapeseed meal; apart from economic effects, the crude protein reduction significantly reduced ammonia emissions, but had no effect on emission of green-house gas.

The topical issue on soybean is very well representing the different research needs, particularly for the European soybean production. Similarly, the upcoming World Soybean Research

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Conference (WSRC 11, 18–23 June 2023, Vienna, Austria; see: <https://www.wsrc11vienna.com/>) will address the most recent research and market issues related to all aspects of soybean production and utilization. The motto of the conference is “*Soybean research for sustainable development*”, which will be elaborated in 30 scientific parallel sessions and workshops, 4 plenaries, and 2 poster sessions. The five major themes of the conference are soybean (i) breeding-genetics-genomics, (ii) agronomy-physiology, (iii) weeds-diseases-pests, (iv) food-feed-nutrition and (v) business-policy-market issues. The versatility of approaches to sustainable soybean production is reflected by miscellaneous contributions from fields such as genetic diversity, genomics-assisted breeding, genome editing, stress and climate change mitigation, novel developments in soy-food and feed including chemistry and nutrition, agro-technology and data-driven crop and soil management, seed science, soybean rhizosphere, progress in the management of weeds, diseases and pests, as well as policy and environment aspects. Scientists from major soybean producing countries including China, the United States, Canada, Argentina, Brazil, India, France, Serbia, Japan or South Korea will share and discuss their latest results. In addition, regional reports from all world regions with significant soybean production will provide unique insights into specific issues of soybean cropping. The conference is aiming to exchange knowledge and stimulate collaborative research among the world scientific community towards increased sustainability of future soybean production.

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