University of Oulu

Department of Ecology and Genetics

Welcome to the public defence of my doctoral thesis titled:

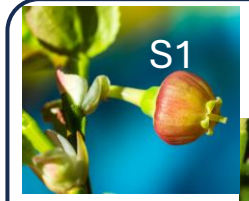
"Towards a comprehensive understanding of the fruit development and ripening process of wild bilberry (*Vaccinium myrtillus* L.)"

in auditorium IT115, Linnanmaa Campus
on 12th April at 12.00

Nga Nguyen, M.Sc.

Opponent: Prof. Paula Mulo - University of Turku
Custos: Doc. Soile Jokipii-Lukkari

**Sparkling wine will be served right after the defence*



Wild bilberry

Five developmental and ripening stages

Mutant types of bilberry

White-colored

Glossy, black-colored

- Bilberry (also known as European blueberry or *'mustikka'* in Finnish) is one of the most popular wild-harvested berries which can be easily found in forests in central and northern Europe. The wide use of bilberry stems from healthy eating trends, and medicine and cosmetic applications thanks to its very high antioxidant levels and its excellent taste. The nutrients and taste of fruits result from the development and ripening process that causes the combination of changes in size, color, texture, and flavor. During bilberry ripening, the most visible change is the turn of color from green to blue given by anthocyanin accumulation. Other bioactive compounds such as carotenoids, triterpenoids, and vitamins C and E, have also been found in bilberry fruits from skin to seeds.
- Studies on bilberry regarding fruit ripening have largely focused on understanding the content and biosynthesis of several bioactive compounds, especially anthocyanins. However, comprehensive knowledge of biological systems from genes to compounds during the ripening process and database resources remain scarce. This may limit further potential discoveries on novel prospects for bilberry utilization. Moreover, two different mutant color types of bilberries, which are white-colored and glossy, black-colored berries, are found in the same natural forests with the blue-colored bilberry. This raises up the question of why and how their appearances are different. Therefore, my doctoral thesis aimed at extending the current knowledge on the fruit development and ripening process of wild bilberry to address these research questions. The thesis applied omics technologies to generate large-scale datasets from different bilberry ripening stages to look for meaningful messages hidden in the biological system.
- The studies provided the novel datasets for bilberry, which, among other things, i) indicated the genes and plant hormones controlling the ripening process of bilberry; ii) shed light on the changes in nutrient sets in connection to different visible signs from unripe to ripe fruits; iii) unravelled new information on the compound profile of white berry compared to blue bilberry, iv) and the relationship between wax morphology and its chemical composition of glossy, black bilberry.
- The outcome of this thesis lays a foundation for future research in different aspects of bilberry and many other berry species, such as developing fruit quality, breeding programs, and new industrial applications.