
# CONCERT-Japan 3rd call
# Food Crops and Biomass Production Technologies

## INTERIM REPORT

**Project title:** **Comparative potato and cassava OMICS for sustainable crop production**

**Project acronym:** **COSMIC**

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In spite of the enormous economic relevance of potato and cassava as main staple food crops, the signaling events implicated in formation of the stem-derived tubers and tuberous roots is still poorly understood. In potato, short day lengths and cool temperatures promote tuber formation through transcriptional activation of an homolog of the FLOWERING LOCUS T (FT) gene in leaves. The protein product of this gene (SP6A) is transported via the vascular phloem to the underground stems, where it induces division of cells at the subapical stolon region and their differentiation into storage parenchyma cells. Whether formation of tuberous cassava roots relies on a similar FT mobile protein and differentiation of these organs implies related signaling events as potato tuberization is however unknown. Moreover, while potato is extremely sensitive to elevated ambient temperatures that impair photosynthesis and drastically reduce tuber yield, cassava profits from high temperatures, which positively impact on biomass and root/tuber production. As such, in the proposal we first performed an unbiased comparative study of the leaves and tubers/roots of plants grown under optimal and restrictive temperatures, to elucidate the mechanisms underlying the constrasting temperature effects on carbon allocation and storage organ formation in both crop species. Transgenic potato and cassava lines that simultaneously expressed the glycolate dehydrogenase gene in leaf chloroplasts and the G6P/P (GPT) and adenylate (NTT1) translocators in the amyloplast storage organs were obtained, to assess for enhanced leaf source and store sink capacities of these plants (push-pull approach). Finally, cambium cell specific promoters were employed to generation of potato INTACT and Ribo-TRAP lines to test if storage organs originate from cambial cells that divide and differentiate.

So far, important outcomes of the proposal were the discovery that cassava tuberous root formation is regulated by day length, that formation of storage cassava roots and potato tubers correlates with an increase in cell division and sink strength-promoting cytokinins, and that key transcription factors with a role in cambial meristem cell division and xylem specification are differentially expressed on initiation of these organs.