Genetic modification of sunflower (*Helianthus annuus*) cell and organ cultures

Joachim Püschel

α-Tocopherol is the most active vitamin E derivative that is used in food and cosmetics industry. It is used as unpolar antioxidant in contrast to vitamin C that is a polar antioxidant. Annual sunflower plants (*Helianthus annuus* L.) are characterized by high vitamin E levels in the oil fraction. However, other tissues do not have such high amounts. In this project we wanted to establish undifferentiated callus cultures and especially hairy root cultures of sunflower with elevated α-tocopherol contents. The specific isomer has the highest bioactive potential, so it was chosen as target. While wild type cultures produced less α-tocopherol than the adult plant, the biosynthesis should be increased by transforming genes from *Arabidopsis thaliana* encoding for four different key enzymes in the tocopherol biosynthetic pathway into the cultures using *Agrobacterium tumefaciens* for cell cultures and *Agrobacterium rhizogenes* for hairy roots. The transgenic cultures will be evaluated for their content of α-tocopherol as well as their improved stress resistance since the vitamin is also involved in compensating stress situations in plants. However, probably due to the localization of the pathway in the plastids it was not possible to find differences between wild type and transgenic cultures, while it was possible to increase production in a wild type photomixotrophic cell culture.