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Biochemical Analysis of Betalain Biosynthesis and Photosynthesis of Amaranth (*Amaranthus Tricolor* L.) by Dessication under High-Temperature

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Extended Abstract

Amaranth (*Amaranthus tricolor* L.) is the only C_4 plant among dicotyledonous plants belonging to the Caryophyllales order [1]. Caryophyllales order, included amaranth has betalain pigment instead of anthocyanin performs similar functions while both pigments are structurally different and never coexist in plants [2]. In this study, changes in betalain biosynthesis amount and photosynthetic electron transfer efficiency were analyzed to study the mechanism of betalain by desiccation under high-temperature. Amaranth Red and Green leaf morphs were cultivated in greenhouse. As for the treatment conditions, amaranth of the control group (appropriate watering) and the desiccation group (water deficit) were compared by water deficit and then re-watering when 12th true leaves appeared.

As result, the amount of betalain biosynthesis of Amaranth Red and Green increased during water deficit and decreased during re-watering. The variance value of betacyanin ratio (%) increased whereas betaxanthin decreased during water deficit and then increased after re-watering. In particular, green morph significantly increased betaxanthin compared to the betalain content in re-watering. The relative variation fluorescence (ΔV_{OP}) was increased by desiccation under high-temperature, and the O-J step and the J-I step were decreased in the green morph but increased in the red morph. It indicates for VOP and VOJ that the electron transfer energy and energy absorbed followed the pathway for reduction of Q_A to Q_B^-, closing the PSII reaction center, respectively [3].

Although green morph maintained stably the thylakoid membrane electron transport protein under desiccation, red morph was degraded light-harvesting chlorophyll a/b binding protein 1 (Lhcb1) and PSI subunit protein (PasK) by desiccation.

Therefore, betaxanthin tends to maintain photosynthetic electron transport function by inhibiting photosynthetic electron transport protein protection and damage to photochemical apparatus in Amaranth. In the betalain biosynthesis pathway, betacyanin and betaxanthin are expressed spontaneously. To study betalain defense environment-tolerant, It is assumed that betacyanin and betaxanthin play also a role in thylakoid stability.

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