

Reversibility of Photosynthetic Activity and Pigment-protein Complexes Expression During Seed Development of Soybean and Black Soybean

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Abstract : Seeds are non-leaves green tissues. Photosynthesis begins with light absorption by chlorophyll and then the energy transfer between two pigment-protein complexes (PPC). Most studies of photosynthesis and PPC expression were focused on leaves; however, during seeds' development were rare. Developed seeds from beginning pod (stage R3) to dried seed (stage R8), and the dried seed after sowing for 1-4 day, were analyzed for their chlorophyll contents. Thornber and MARS gel systems analysis compositions of PPC. Chlorophyll fluorescence was used to detect maximal photosynthetic efficiency (Fv/Fm). During soybean and black soybean seeds development (stages R3-R6), Fv/Fm up to 0.8, and then down-regulated after full seed (stage R7). In dried seed (stage R8), the two plant seeds lost photosynthetic activity (Fv/Fm=0), but chlorophyll degradation only occurred in soybean after full seed. After seeds sowing for 4 days, chlorophyll drastically increased in soybean seeds, and Fv/Fm recovered to 0.8 in the two seeds. In PPC, the two soybean seeds contained all PPC during seeds development (stages R3-R6), including CPI, CPII, A1, AB1, AB2, and AB3. However, many proteins A1, AB1, AB2, and CPI were totally missing in the two dried seeds (stage R8). The deficiency of these proteins in dried seeds might be caused by the incomplete photosynthetic activity. After seeds germination and seedling exposed to light for 4 days, all PPC were recovered, suggesting that completed PPC took place in the two soybean seeds. This study showed the reversibility of photosynthetic activity and pigment-protein complexes during soybean and black soybean seeds development.

Keywords : light-harvesting complex, pigment-protein complexes, soybean cotyledon, grana development

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