Rungnapa Kaewthongrach 2009: Leaf Photosynthetic Potential of Amaranth (*Amaranthus tricolor*). Master of Science (Agricultural Biotechnology), Major Field: Agricultural Biotechnology, Interdisciplinary Graduate Program. Thesis Advisor: Professor Suntaree Yingjajaval, Ph.D. 89 pages.

Leaf photosynthesis potential of Amaranth (*Amaranthus tricolor*), a C4 dicotyledon plant was evaluated. Measurements of light response curve, quantum efficiency of PSII electron transport, chlorophyll content and CO_2 compensation were made for 4 lines of Amaranth, namely the green leaf lines of AS202 and AS220 and the red leaf lines of AS041-B and AS224-A. In addition, one diurnal measurement was made to study the effect of atmospheric conditions on the leaf gas exchange.

The maximum gross photosynthesis rates (P_m) of Amaranth were very high of 49–66 $\mu molCO_2\ m^{-2}\ s^{-1}$ at leaf age of 8-10 days after full expansion. The light saturation point (I_s) was about 1,000 $\mu molPPF\ m^{-2}\ s^{-1}$, the maximum rate of linear whole-chain electron transport rates (ETR_{max}) were 181-212 $\mu molE\ m^{-2}\ s^{-1}$ and the maximum stomatal conductance (g_{s2000}) ranged between 386–559 $mmolH_2O\ m^{-2}\ s^{-1}$. The CO_2 compensation (Γ) of Amaranth were as low as 0-2 $\mu molCO_2\ mol^{-1}$, while the levels of carboxylation efficiency or mesophyll conductance (g_m^{CO2}) were very high of 475-577 $mmolCO_2\ m^{-2}\ s^{-1}$. Only 3.3-4.1 moles of electron were required for each mole of CO_2 fixed. During the day, the net photosynthesis rates (A) were around 40% lower than P_m. The most crucial limiting factor was the stomatal conductance. The interesting result was that the elevated leaf temperature of up to 39C showed no effect on the gas exchange rates, as the high transpiration rate maintained the leaf temperature to be lower than the air's the whole day. In addition, the color of the leaf did not relate to leaf photosynthetic potential, as all the relevant parameters showed little difference between the green and the red leaves of Amaranth.

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