Neuroprotective effect of *Amaranthus lividus* and *Amaranthus tricolor* and their effects on gene expression of *RAGE* during oxidative stress in SH-SY5Y cells

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ABSTRACT. *Amaranthus* plants, or spinach, are used as food sources worldwide. *Amaranthus* leaves are rich in antioxidant compounds, which act as free radical scavengers. Oxidative stress caused by the aberrant production of reactive oxygen species (ROS) represents an important mechanism for neuronal dysfunction and cell loss in different neurodegenerative disorders. The neuroprotective effects of antioxidant-containing plants have been extensively demonstrated in different models of neurotoxicity. However, few studies have investigated the antioxidant properties of *Amaranthus* extracts and their effect on the nervous system. In the present study, the leaves of *Amaranthus lividus* and *Amaranthus tricolor* were extracted using petroleum ether, dichloromethane, and methanol. Results indicated that antioxidant activities were the highest in methanol extracts from

both kinds of *Amaranthus* leaves. In addition, oxidative stress was induced in human neuroblastoma cell lines (SH-SY5Y) by using H_2O_2. Intracellular oxidative stress, cytotoxicity, and gene expression of *RAGE* were then determined. *In vitro* results demonstrated that pretreatment with *A. lividus* and *A. tricolor* extracts can significantly decrease cell toxicity and intracellular ROS production in SH-SY5Y cells. Interestingly, the extracts also significantly downregulated the expression of oxidative stress genes such as *HMOX-1*, *RAGE*, and *RelA/NF-κB*. Our results suggested that *Amaranthus* leaves may be useful for reducing oxidative stress and may be beneficial for age-related diseases and neurodegenerative disorders.

Key words: *Amaranthus*; Oxidative stress; RAGE; Neuronal cells