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Development of Anti-aging Nutraceuticals from *Nelumbo nucifera*

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A general characteristic of the aging process is progressive physio-pathological deterioration with time. Consequences are functional deficits resulting in a loss of the organism's ability to withstand both internal and environmental stresses from a failure in the maintenance of cellular homeostasis. Among the many proposed hypotheses for aging, the oxidative stress hypothesis may offer the most mechanistic and molecular elucidations of aging phenomena (Yu, 1996). The oxidative stress hypothesis of aging process that a redox imbalance due to the net effect of oxidative stress and a counter-acting, anti-oxidative force is responsible for the disruption of normal cellular functions and characteristics of the aging process (Harman, 1973). As our understanding of chemistry of free radicals progressed, reactive oxygen species (ROS) and reactive nitrogen species (RNS), such as NO and ONOO⁻, became clear to be a part of normal, biological processes. ROS/RNS are linked to various age-related processes including vascular degeneration, inflammation, cancer, and dementia (Halliwell & Gutteridge, 1999). Oxidative stress may also play an important role in the development of complications in diabetes such as lens cataracts, nephropathy, and neuropathy (Osawa & Kato, 2005). Recently, full correlation between ROS/RNS production and increase HMGCoA reductase during aging has been reported (Pallottini et. al., 2005). That is, the effect of ROS/RNS on the activation state of the HMGCoA reductase sheds a light on a possible therapeutic tool for the treatment of the age-related hypercholesterolemia and hyperlipidemia. Consequently, ROS/RNS have been suggested to be involved in the pathogenesis of a wide range of age-related diseases. Therefore, the effective protection against excessive ROS/RNS generation could be required to protect biological systems from damage. To date, there is little description about ROS/RNS scavenging activities of plant originated natural products and their isolated compounds. In the course of screening that scavenge ROS/RNS by natural products, which are distributed in Korea, kaempferol derivatives from *Nelumbo nucifera* showed the potent activity. The mechanism of action of flavonoids is due to ROS/RNS scavenging, decrease of NF- κ B activation and inhibition of COX-2 and iNOS gene express. Because of their therapeutic potential for treatment or prevention of disease, bioactive flavonoids may be used components in functional foods or nutraceuticals. Thus, extracts and flavonoid derivatives derived from *N. nucifera* will be a new promising foods being properties anti-aging, antioxidant, anti-hyperlipidemic, and anti-diabetic complications. *N. nucifera* Gaertn. (Nymphaeaceae) is a perennial aquatic crop grown and consumed over the world, especially in India, China, Japan, Korea, South East Asia, Russia and some countries in Africa. Due to its various

therapeutic effects, it has been used as a traditional folk medicine for the treatment of diarrhea, gastritis, insomnia, nervous prostration and as a haemostatic in Korea and other countries, such as China and India. The biological activities of *N. nucifera*, such as anti-diarrheic (Mukherjee et al., 1995), psychopharmacological (Mukherjee et al., 1996), hypoglycemic (Mukherjee et al., 1997), hypolipemic (La Cour et al., 1995), anti-pyretic (Sinha et al., 2000) and antioxidant activities (Liou et al., 1999; Guo et al., 2000; Jung et al., 2003) have been reported previously. In this study, the roles for nutraceutical supplements of extracts and flavonoid derivatives derived from *N. nucifera* will be discussed in relation to the anti-aging with emphasis on scavenging of ROS/RNS and clinical integration with natural drug therapy as indicated based, in part, on antioxidant, anti-hyperlipidemic, and anti-diabetic complications.

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