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Study on Physiological Active Substances in the Cocoon of the Silkworm, *Bombyx mori*

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The water-soluble extract of the *Bombyx mori* cocoon contains many low-molecular-weight proteins that are different from sericin and fibroin, the two major components of silk. Two of the low-molecular-weight proteins were physiologically active and identified as serine protease inhibitors. Recently, sericin has been found to have physiological functions such as antioxidative activity as well as tyrosinase inhibition activity. It is well known that extracts from colored cocoons have much stronger DPPH radical scavenging activity than those from non-colored cocoons. This strong antioxidative activity was in part due to coloring components. Based on UV spectrometry and HPLC-MS, three quercetin glycosides, quercetin 5-O-β-D-glucoside, quercetin 7-O-β-D-glucoside, and quercetin 4'-O-β-D-glucoside, and two kaempferol glycosides, kaempferol 5-O-β-D-glucoside and kaempferol 7-O-β-D-glucoside, along with their aglycones, quercetin and kaempferol, were identified in an ethanolic extract of Sasamayu (yellow green) cocoons. These flavonoid compounds were responsible for potent antioxidative activity in the cocoon. It was assumed that the five flavonol glycosides identified are insect metabolites because they are different structurally from those of the mulberry leaves (*Molus alba*). In addition to flavonols, another cocoon component with antioxidative activity was isolated. The LC/ESI-MS mass spectrometry of the purified antioxidant gave an estimated molecular mass of 167.7. Based on UV and IR spectrometry, it was identified as uric acid. The content of uric acid varied depending on silkworm strains, with yellow-green cocoons (e.g. Daizo) containing 15 times more uric acid than non-colored cocoons (e.g. Kinshu x Showa).

The sericin layer of cocoons has been selectively removed from fibroin during the silk manufacturing process to make silk fiber lustrous, and the removed sericin materials have been wasted. This waste has nowadays become potentially attractive as a new biomaterial because it contains the physiological active substances described here as well as some minerals.