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File: ■ *Caralluma*
■ Obesity
■ Appetite Suppressant

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RE: Appetite Suppression and Anti-obesity Effects of *Caralluma*

Dutt HC, Singh S, Avula B, Khan IA, Bedi YS. Pharmacological review of *Caralluma* R.Br. with special reference to appetite suppression and anti-obesity. *J Med Food*. February 2012;15(2):108-119.

Members of the genus *Caralluma* number around 260 and are found in Asia, the Mediterranean, and Africa. Belonging to the Apocynaceae family, these perennial plants are succulents with small leaves. The *Caralluma* are commonly eaten as food and have a variety of traditional uses; for example, they have been used both traditionally and in contemporary times for weight loss and as an appetite suppressant with varying results. The prevalent compounds in *Caralluma* are pregnane glycosides, the same appetite suppressant compounds found in hoodia (*Hoodia* spp.), a popular plant also used for weight loss. As obesity is an epidemic of global proportions, the *Caralluma* and compounds therein may be of use in treating this problem. This review focuses on the ethnobotany, chemical constituents, and pharmacology of this genus with an emphasis on its bioactivity against obesity.

The ethnobotanical uses of *Caralluma* are extensive. For example, many species are used as food along with meat and milk. These plants are traditionally used for diabetes, leprosy, rheumatism, paralysis, joint pain, migraines, fever, malaria, and inflammation, among other conditions. A notable medicinal use is the widespread application for appetite suppression. The species *C. fimbriata* and *C. adscendens* var. *fimbriata* have been used in traditional Indian medicine in this manner. In addition, *C. tuberculata* has been used as a digestive aid and to treat diabetes.

The phytochemistry of *Caralluma* is well defined. In addition to pregnane glycosides, megastigmane glycosides and flavones have also been isolated from certain species. Pregnane steroids have been identified from *C. adscendens* var. *fimbriata*, and a flavonoid glycoside along with steroidal glycosides were isolated from *C. lasiantha*. Steroidal glycosides are also prevalent in *C. stalagmifera*. Pregnane ester glycosides and polyoxypregnane glycosides have been found in the aerial parts and leaves of certain species. In addition to these compounds, fiber, proteins, lipids, fatty acids, and aromatic compounds have also been detected. High-performance liquid chromatography

(HPLC) was used to successfully fingerprint various species in the *Caralluma* genus with the use of the compounds boucerin, caraumbelloside I, caraumbelloside II, caraumbelloside III, and caraumbellogenin.

Despite traditional uses for weight loss, a double-blind, randomized, placebo-controlled trial on *C. fimbriata* (Slimaluna®; Gencor Nutrients; Anaheim, California) failed to yield any significant change in weight; however, this species was able to obtain Generally Recognized As Safe (GRAS) status. It is surmised that pregnane glycosides work in a similar way as garcinia (*Garcinia cambogia*), by preventing fatty acid biosynthesis via inhibiting the citrate lyase enzyme and the formation of malonyl coenzyme A. As these are major enzymes in fatty acid synthesis, it is mentioned that inhibiting them is more efficient than interfering with individual steps of the pathway. Although it is speculative how pregnane glycosides act as appetite suppressants, certain reports suggest that they stimulate part of the basal hypothalamus. Additionally, *C. fimbriata* has a robust safety profile and has not shown any notable adverse side effects in clinical trials; it is reported to have a 50% lethal dose (LD_{50}) of greater than 5 g/kg.

Single compounds isolated from *C. tuberculata* were found to be both antitrypanosomal and antimalarial. Extracts from *C. edulis* have been shown to have antioxidant activity, and *C. arabica* and *C. stalagmifera* have anti-inflammatory activity in addition to other bioactive properties. Glucose concentrations of healthy rabbits were lowered significantly by 50, 100, 150, and 200 mg/kg dosages of *C. sinaica* given orally ($P<0.01$). Both *C. tuberculata* and *C. attenuata* also demonstrated hypoglycemic activity. Furthermore, isolated pregnane glycosides from *C. dalzielii* were found to be cytotoxic in mouse monocyte/macrophage, human epithelial kidney, and mouse fibrosarcoma cell lines.

Although a product made from *C. fimbriata* is on the market for weight loss, clinical trials using it have not found any appetite suppressant effects. In summary, the authors mention that to their knowledge, isolated compounds from the *Caralluma* genus have not been investigated for anti-obesity or appetite suppressant activity, necessitating further research into the potential of active compounds within this genus to be used in treating obesity and overeating. This review is thorough and contains useful tables, compound structures, and a chart of crucial parts of the fatty acid synthesis pathway to help summarize current knowledge of the *Caralluma* genus.

—Amy C. Keller, PhD

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