

## Pueraria mirifica

### **Introduction**

Women in the rural communities in Thailand where this herb grows have used the tuberous roots of Pueraria Mirifica effectively as "rejuvenating" folk medicine for well over a hundred years. It has become well known and has received much attention from Thai and foreign scientists and mainstream alike not so many years ago. According to Thai traditional medicine, this "rejuvenating" herb is recommended for both aged men and women for its efficacy to grow hair, strengthen and darken existing ones, help improve complexion and remove wrinkles, improve eyesight, increase energy and vigor leading to more reflexive body movements.

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### **What is Pueraria mirifica?**

Pueraria mirifica Airy Shaw & Suvatabandhu is an indigenous herb of Thailand, known in Thai as "Kwao Kreu" or "Kwao Kreu Kao" (White Kwao Kreu), It belongs to the Family Leguminosae, subfamily Papilionoideae or the soy, bean & pea subfamily. The plants are commonly found in abundant in the forests in the north, the west and the northeast of Thailand at the altitude of 300-800 meters above sea level. Active principles in this plant are found in the tuberous root, which looks like a chain of round-shaped bulbs of various sizes connected to the next one via small root throughout the entire length of the root. The shape and size of the tuberous root are diverse depending on the environment in which it exists.

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### **Ethnobotanic Use**

Local communities in Thailand have used Pueraria mirifica for well over one hundred years, specifically for its rejuvenating qualities. The belief has been passing down from one generation to another and more recently through the publication by Luang Anusan Suntara,

In May 1931, Luang Anusan Suntara published a pamphlet on the subject of "Kwao Kreu". It is stated in the pamphlet that Pueraria mirifica can

- serve as the "fountain of youth" for aged men and women
- serve as an anti-wrinkle agent for aged and wrinkled skin
- darken white hair, and increase hair growth
- alleviate cataract problems
- help with memory loss
- increase energy and vigor, more reflexive bodily movements
- increase blood circulation

- increase appetite, and
- alleviate sleep disorders.

In 1932, Dr. A.F.G. Kerr, the Director of the Botanical Section of the Journal of the Siam Society, directed the attention of the scientific community to the fact that the tuberous roots of a Thai plant called "Kwao Kreu", mistakenly identified then as *Butea superba*, were considered to be of value as a rejuvenating drug. Dr. Kerr was the first to create international awareness of the rejuvenating qualities of this plant, which subsequently led to the isolation of a potent phytoestrogen that is unique to this plant only and to the identification of the plant as *Pueraria mirifica* in 1952.

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### **Chemical Composition**

The compounds that make *Pueraria mirifica* different from any other phytoestrogen-containing plants in the Family Leguminosae are Miroestrol and Deoxymiroestrol, which possess highest estrogenic activity among the known phytoestrogens due to structural similarity to estradiol. Miroestrol was actually the first compound isolated from this plant by a group of German chemists in 1940, but the plant had been mistakenly reported then as *Butea superba*. It was later on classified as a new plant called *Pueraria mirifica* Airy Shaw et Suvatabhandu,

The isolation and identification of deoxymiroestrol from the root of *Pueraria mirifica* has just been reported in the February 2000 issue of the Journal of Natural Products. The authors proposed that since deoxymiroestrol is easily oxidized to miroestrol, deoxymiroestrol, not the previously reported Miroestrol, is more to be the actual chemical constituent of *Pueraria mirifica*. However, it is very likely that the two phytoestrogens coexist in the root of this plant. As shown below, the chemical structures of the two compounds are very similar to that of estradiol, the main human estrogen.

In addition to miroestrol and deoxymiroestrol, *Pueraria mirifica* also contains other chemicals that belong to isoflavone and coumestran groups of phytoestrogens, e.g., Genistein, Daidzein, Daidzin, Genistin, and Coumestrol that are usually found in soybeans. However, the estrogenic activity of Miroestrol and Deoxymiroestrol is much more potent than that of soy isoflavones.

#### Chromene

Miroestrol  
Deoxymiroestrol

#### Isoflavones

Daidzein  
Genistein

Kawakhrin  
Kawakhrin hydrate

Isoflavone

Daidzin  
Genistin  
Mirificin  
Puerarin  
Puerarin-6"-monoacetate

Coumestans glycosides

Coumestrol  
Mirificoumestan  
Mirificoumestan glycol  
Mirificoumestan hydrate

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**Toxicity Study**

Toxicity study of Pueraria mirifica has recently been conducted in male and female Wistar rats by the Medicinal Plant Research Institute, Department of Medical Sciences, Ministry of Public Health and by the Department of Biology, Faculty of Science, Chulalongkorn University. The animals were given the suspension of root powder in water orally at the dose range between 10-1000 milligrams per kilogram of body weight per day continuously for a period of ninety days.

From the animal toxicity study, no estrogenic effect was observed at the doses of 10 mg/kg/day. The histopathological studies and biochemical data at different dose levels in rats of both sexes suggested that the maximum tolerated dose in rats would be around 100 mg/kg/day. When consider the uncertainty factor for the difference in the species and sensitivity among individuals, it is concluded that the safe dosage of Pueraria mirifica as a dietary supplement for human should be about 1-2 mg/kg/day or about 50-100 mg/day.

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**Aging Problems ? How Pueraria mirifica can solve it.**

Most women are very concerned about aging, particularly the effects brought about by the aging process. For the average women, menstruation cycles end at 48-50 years of age when the reproductive system stops or slows down functioning. The body experiences dramatic changes due to lower estrogen levels: the body's systems and its functions begin to decelerate and the immune system weakens, accordingly menopausal women will usually experience both psychological and physiological changes. Psychological changes range from anxiety, tension and nervousness to chronic depression, whereas the

physiological changes include hot flushes, fatigue and insomnia to more severe conditions as bone loss, balding and degeneration of the reproductive area.

Consequently, women at the age of 45-50 and post-menopausal women need something to replace the loss of natural estrogen. Hormone replacement therapy (HRT) has been extensively used to alleviate both the psychological and physiological changes. However, this estrogen substitute can be quite expensive and must be conducted under a physician's close supervision. An effective alternative approach would be to delay those aging problems by using natural phytoestrogens present in Pueraria mirifica as a dietary supplement.

Health benefit of phytoestrogens is at least two folds. Firstly, as stated earlier, Pueraria mirifica contains various kinds of phytoestrogens, e.g., miroestrol, deoxymiroestrol, genistein, daidzein, daidzin, genistin, coumestrol, etc. These phytoestrogens can bind to the estrogen receptors like estrogen does with different degrees of affinity giving different estrogenic potency. When Pueraria is taken, its phytoestrogens would go around the body through blood circulation and bind estrogen receptors present in various organs. This would help restore normal function of the body once slow down due to the aging process. Hence, phytoestrogens from Pueraria mirifica can correct estrogen insufficiency in the body and relieve the post-menopausal symptoms.

Secondly, there is evidence to support that phytoestrogen consumption contributes to lower risks of cardiovascular disease and that phytoestrogens may even prevent cardiovascular-related diseases. In a study, it was proven that phytoestrogens in soybeans could decrease the level of LDL cholesterol and increase the level of HDL cholesterol in the blood; therefore, reducing the risk of cardiovascular diseases. Moreover, it was reported that subjects who consumed soy at least three times daily had a decrease in the levels of total cholesterol, LDL cholesterol and triglyceride. It is quite likely that phytoestrogens from Pueraria mirifica will work just the same or even better than isoflavones since, in the previously mentioned toxicity study in rats, a very significant reduction of blood cholesterol levels in all groups of Pueraria mirifica-treated rats was also observed.

Preliminary data from a clinical trial conducted in Thailand to study the beneficial effect of Pueraria mirifica supplement have recently been obtained. Eight female subjects who were having menopausal symptoms received Pueraria mirifica in the form of capsule once daily at the dose of 200 mg for 4 months followed by the dose of 100 mg, for 8 months. Improvement of menopausal symptoms was observed in 5 out of 8 subjects throughout the study period. Physical examinations and biochemical studies revealed that all subjects were healthy. The dietary supplement dose of Pueraria mirifica recommended by the physician for its estrogenic effect in this case is 100 mg per day.

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## **Applications**

Pueraria mirifica has long been traditionally prepared in the form of pills for oral intakes. Currently, the dried roots are finely ground, sometimes mixed with other medicinal herbs, packed in capsules and marketed as a dietary supplement.

Pueraria mirifica in the form of extract has been introduced just recently. With modern extraction technology, the extract from dried roots is standardized and prepared in the form of powder and solution. The extract solution is used in cosmetic industry such as preparation of breast cream, eye gel, and skin moisturizer.

When Pueraria mirifica is taken as a dietary supplement, its phytoestrogen constituents will naturally alleviate symptoms occurring as a result of the aging process and a deficiency in estrogen levels, e.g., sagging breasts, wrinkled skin, bone loss, gray hair, etc. These aging signs and symptoms will, to a certain extent, be reversed.

When applied topically to the skin, Pueraria mirifica will be beneficial to that respective part of the body. Topical uses of Pueraria mirifica have been known to include:

- Breast creams: to firm breasts,
- Eye gel: to reduce the look of lines and wrinkles around the eyes and postpone their future appearance, and

Various forms and preparations of Pueraria mirifica should provide an effective and inexpensive alternative to women who wish to take charge of their own health and to enhance their beauty or utilize Pueraria mirifica for many cosmetic purposes.

With regard to the safety and efficacy of dermal preparations of Pueraria mirifica extract, standard dermal toxicity tests were performed in various animal species as well as in humans, and no toxicity was observed. Moreover, the efficacy of breast cream was recently evaluated in a large group of human volunteers.

\* Excerpt from Medicinal Plant Research Institute, Dept. of Medical Sciences, Ministry of Public Health, Thailand.