The use of plants in Traditional Chinese Medicine (TCM) has a long and well-recorded history. Not all plants in the TCM pharmacopoeia share this long history of use, however, and TCM, like any institution of knowledge, continues to grow, expand, and change. As an example, the medicines sold in TCM stores in Chinatowns in the United States include a mix of herbs that have been known for centuries, and some that have been introduced to the TCM pharmacopoeia only in the last few decades. This article provides the context for my research on one of those recent introductions to the TCM pharmacopoeia: an unassuming yet potentially medicinally powerful herb in the mint family called donglingcao.

Folk Medicines and Formal TCM

One of the earliest written works about botanical medicines in TCM is the Divine Farmer’s Materia Medica (Shen Nong Ben Cao Jing) which was written over 2,000 years ago and catalogues more than 300 types of medicines, most of which are plants (Yang 1998). The book has been attributed to the mythical Shennong (the Divine Farmer) who is claimed to have tasted different plants himself to determine which were poisonous and which could be used as medicine. Many, if not all, of the herbs listed in the Divine Farmer’s Materia Medica remain in use. For example, the book includes herbs such as ginseng (Panax ginseng), licorice (Glycyrrhiza uralensis), and goji berries (Lycium chinense).

While works such as the Divine Farmer’s Materia Medica maintain an influence in formal TCM practice, the use of different botanical medicines in China continues to transform...
and grow. For example, the recently published multi-volume work of the *Chinese Materia Medica* (Ministry of State Administration of Traditional Chinese Medicine 1999) lists more than 9,000 different medicines, or roughly 30 times as many substances as listed in the *Divine Farmer’s Materia Medica*. The *Chinese Materia Medica* contains different substances, such as animals and minerals, but plants make up the overwhelming majority. The *Chinese Materia Medica* includes plants that have been in recorded use in China for hundreds of years, and also those that were incorporated only very recently. Of the latter, a large number of the newly recorded botanical medicines were catalogued for the first time in the 1960s and 1970s under Chairman Mao’s directions to develop and improve medicine in the Chinese countryside. One result of those efforts was the documentation of plants used as folk medicines (in Chinese, *caoyao*) (Harris and Yang 2009). Folk botanical medicines are typically used in a limited area in China (e.g., within one province), are generally not accompanied by
written documentation, and information about their medicinal uses is passed down orally from generation to generation. Folk botanical medicines can be distinguished from formal TCM herbs (in Chinese, zhongyao). Formal TCM herbs typically have a much longer written history, standards for their production and use, are often cultivated, and are well known throughout China. Ginseng, licorice, and goji berries are good examples of these. In general, formal TCM herbs are listed in the official Pharmacopoeia of the People’s Republic of China (Chinese Pharmacopoeia Commission 2005). By contrast, folk medicines are not standardized and are usually collected from the wild. There are many examples of folk medicines from throughout China, but one of recent note is the herb donglingcao (Isodon rubescens).

**The Story of Donglingcao**

*Donglingcao* (Isodon rubescens) is a mint family (Lamiaceae) plant within the basil and allies group (Tribe Ocimeae) and is closely related to plants like lavender (*Lavandula*) and coleus (*Solenostemon*). The genus *Isodon* includes about 100 species, most of which occur in Asia, with a few species in Africa (Li and Hedges 1994). *Isodon rubescens* is distributed throughout central China, usually in dry areas on slopes or in thickets along streams. The area of tradi-
tional medicinal use of the plant is in the Taihang Mountain range near the Yellow River in Northern Henan province.

Plants of *I. rubescens* are shrubs that can grow about 1 meter (3.3 feet) tall. They typically have many sprawling branches with ovate leaves [Li and Hedges 1994]. *Isodon rubescens* flowers from late summer into autumn with inflorescences of small (about 1 cm (.4 inches) long) white or purplish flowers.

Interestingly, populations of *I. rubescens* growing in parts of China that experience subfreezing temperatures can sometimes produce ribbons of ice—known as “ice flowers”—from the stem [Means 2005]. In fact, the Chinese name *donglingcao* (冬凌草) roughly translates...
as “winter-ice herb,” probably in reference to this phenomenon. Based on the tolerance of the plant to low temperatures, it is possible that donglingcao would be able to grow in gardens in New England. I have not seen it grown here yet, but curious gardeners who would like to try growing it may find seeds of *I. rubescens* available commercially from some distributors in the United States.

The first written records of the medicinal use of donglingcao in China are from the 1960s and 1970s during the period of documentation of China’s folk medicines. The plant has been traditionally used for indications such as sore throat and stomach problems. *Donglingcao* is usually collected in the wild, although there have been some recent efforts at cultivation in northern Henan province.

To prepare *donglingcao* as a medicine, the aerial portions (i.e., stems and leaves) are collected in July and August and dried in the sun. When needed, the dried plant is usually steeped in water to make a tea. The taste of the tea is extremely bitter, owing to diterpenoid chemicals produced by the plant (more about those below). In fact, it is very easy to identify plants of *Isodon* in the field by simply tasting a leaf—if after several bites the bitter taste compels you to spit it out, then the plant is likely a species of *Isodon*. In addition to being taken as a tea, *donglingcao* has been combined with other herbs in some Chinese patent or proprietary medicines that are available in pill form.

During the effort to study folk botanical medicines in the 1970s, it was discovered that one of the bitter diterpenoids in *donglingcao*, a chemical called oridonin, might have some use in treating cancer (Sun et al. 2006); interestingly, parallel work in Japan on related species of *Isodon*, such as *I. japonicus* also came to similar results. This discovery followed the general integration of scientific and chemical approaches in the research of Chinese herbs (in what might be called a “re-tooling” of Shennong’s approach). A

*Donglingcao* cultivation site in northern Henan province. The plants shown are usually larger in the wild, but this picture was taken in late October after the plants had already been harvested.
famous example of the fruits of these efforts is the anti-malarial compound artemisinin. Artemisinin was originally discovered in the 1970s by Chinese researchers examining *Artemisia annua*, a plant long known in TCM (Hsu 2006). Artemisinin is now used globally as a standard treatment for malaria, and cultivated plants of *Artemisia annua* remain the main source of the compound today. In contrast to the more popular *Artemisia*, *donglingcao* and the chemical oridonin gradually lost the spotlight after the initial studies in the 1970s. However, in the last few years oridonin has again garnered scientific interest for its potential as an anti-cancer remedy (Zhou et al. 2007).

**Current Research**

Starting in 2009, I became interested in *donglingcao* as an example of a folk botanical medicine that had clear potential to become a standardized TCM herb with more common and widespread use. I began research on this plant to understand the evolution and ecology of the chemicals that are responsible for the medicinal effect, in particular the compound oridonin. The primary goal of this research was to suggest populations or related species of this plant that would have the highest production of oridonin. In collaboration with researchers in the colleges of Chinese medicine in Beijing and Henan province, I traveled to China in the fall of 2009 to collect plants of *I. rubescens* and related species. The trip included collection areas in Henan province where *donglingcao* is traditionally used and also other areas in China where *I. rubescens* is known to occur (Hubei and Guizhou provinces).

Through the course of the collecting trip, I traveled together with a Chinese graduate stu-
dent by car, sleeper-train, bus, and taxi, covering a distance of more than 1,500 kilometers (over 900 miles) from the northernmost collection site to the southernmost site (roughly the same distance as between Boston and Chicago). This distance allowed me to visit various scenic rural areas, from the expansive Taihang Mountains to small ethnic minority villages in Guizhou province. The collection trip also provided the opportunity to sample a wide variety of Chinese local cooking, from mutton noodle soup in Henan in the north to fried “field chicken” (=frog) in the south.

At each collection site, I collected several individual plants of *Isodon* to account for possible variability of chemical production within populations. For each individual plant, I collected a pressed voucher specimen, dried leaves in silica desiccant, and a seed sample if the plant was in fruit. The vouchers will be accessioned and deposited at the Harvard University Herbaria. The dried tissue in desiccant has been used for DNA and chemical analyses. The seeds were collected so that chemical content of all populations could be compared in greenhouse grown samples in order to factor out possible differences in chemical production that result from different growing environments. I have completed the chemical and genetic lab work on the wild-collected and greenhouse-grown samples and am now eagerly examining and interpreting the results.

In addition to my primary goal of locating sources of high oridonin production, the results of my work will provide insight into the degree of variability in oridonin production in *I. rubescens* and related species, and will ideally help in the standardization of the use of the plant for more widespread use in TCM and elsewhere. In fact, although previous editions of the *Pharmacopoeia of the People’s Republic of China* did not list *donglingcao*, the most recent edition released in the summer of 2010 now includes this plant. It is likely, then, that research and
development of this plant will continue. With roots as a folk medicine in China, *donglingcao* has seemingly finally earned its place in the canons of the official Traditional Chinese Medicine. And, depending on the plant’s hardiness and desirability as an ornamental, it may also earn its place in gardens in New England.

[NOTE: Some of the greenhouse-grown *Isodon rubescens* plants from this collection trip will be planted at the Arnold Arboretum within the next year or two.]

References


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