Coptis chinensis -
An amazing medicinal plant from China

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Introduction

Because of its declining habitat in the wild, Golden Seal (*Hydrastis canadensis*) is a herb that should only be purchased from cultivated rather than wildcrafted sources (Oliver, 2017). Even then, however, it is a challenging plant to grow, and securing sufficient volumes from the annual harvest, can be difficult. Therefore, continuing to place high-demand pressure on this herb is not considered ideal. Given that the alkaloid constituent berberine is widely regarded as having numerous pharmacological actions, and seems to account for a significant part of Golden Seal's antimicrobial actions, other medicinal plants rich in this phytochemical, are of interest. Other berberine-containing herbs are of course Oregon Grape (*Mahonia aquifolium*) and Barberry (*Berberis vulgaris*), but a very interesting one from China, is Coptis (*Coptis chinensis*), which generally contains much higher levels of berberine than Golden Seal.

Huang Lian

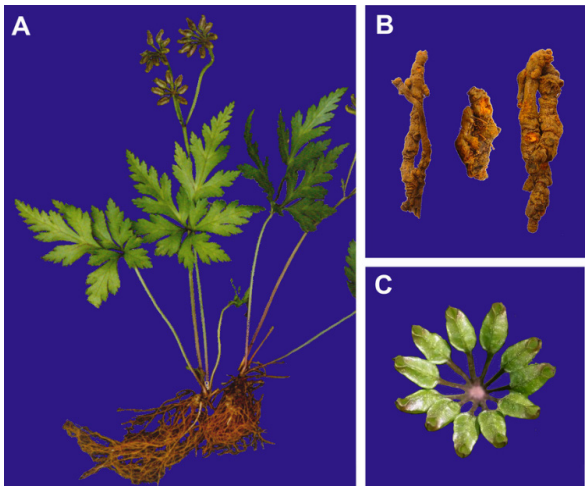
More than 380 papers have been published in peer reviewed journals on this medicinal plant, and Coptis (known as Huang lian in Mandarin), is one of the many Chinese herbs that stands out for its established medicinal properties. The name huang lian literally translates to "yellow thread", because of the intense golden colour (due to berberine content) of its rhizomes.

There are a number of Coptis species in use, but the most commonly used, with the greatest amount of research and traditional use, is *Coptis chinensis* (Coptis). It is a low growing plant indigenous to the mountainous regions of China. Originally a woodland understory plant, Coptis has now been cultivated in China for hundreds of years, and cultivated sources are preferred when they are environmentally sustainable (Qin, 2010).

One of the fifty fundamental herbs of Traditional Chinese Medicine, the rhizomes of Coptis have been used to treat digestive, respiratory, and infectious disorders for more than 2,000 years (Ho et al 2014). It's TCM properties are cold and bitter, with anti-inflammatory and antibacterial actions (A Barefoot Doctor's Manual, 1977).

Principle constituents include isoquinoline alkaloids such as berberine (3-8%), palmatine, jatrorrhizine, coptisine and columbamine; lignans, phenylpropanoids, flavonoids, phenolic acids and sterols (Friedemann et al, 2015).

One of these main constituents, berberine, has been intensively studied, and has many actions attributed to it, as alluded to earlier. Practitioners should note, however, the finding that berberine does not cross the gastrointestinal tract membrane readily; its actions are most focussed therefore, in the gastrointestinal tract itself, or on other bodily surfaces within which it comes into contact (Kamath et al, 2009).



Coptis chinensis A: whole plant. B: Dried rhizome. C: Carpels. (Creativecommons.org, n.d.

Gastrointestinal (GIT) system

Irritable and Inflammatory Bowel conditions

Coptis is traditionally used to address syndromes involving abdominal pain and diarrhoea. Berberine can reduce inflammation in the intestines, significantly reduce smooth muscle contraction and intestinal motility (thus reducing cramping), and delay intestinal transit time (Habtermariam, 2016).

Potential benefits in Inflammatory Bowel Disease, and on gut microbiota, have also been reported (Cui et al, 2018).

Gastroenteritis and Antimicrobial activity

Coptis has been used extensively in Chinese medicine to treat gastroenteritis and dysentery. Modern studies focus on berberine, determining it to be safe and effective in treating common gastrointestinal infections, including *Escherichia coli* (the common cause of 'traveller's diarrhoea'), *Salmonella typhimurium* (food poisoning), and *Shigella dysenteriae* (Wu et al, 2005; Shi et al, 2018).

Berberine's efficacy may be due to a combination of direct antimicrobial activity, inhibition of microbial attachment to mucous membranes and epithelial surfaces, and an ability to block actions of toxins produced by pathogenic bacteria (Sack & Froelich, 1981; Habtermariam, 2016).

Coptis may inhibit bacterial biofilm formation, demonstrated with regards to *Klebsiella pneumoniae* (Magesh et al., 2013) and *Salmonella* (Shi et al, 2018). However, it may also kill *bifodobacteria* in the process, and berberine itself, like most other phytoconstituents, can be prone to cellular efflux by resistant bacteria (Budeyri Gokgoz, et al., 2017). Practitioners should consider appropriate approaches regarding antimicrobial GIT issues with all herbs to balance this aspect.

Berberine extracts have also shown promise treating *Mycoplasma* species (Arjoon et al., 2012) as well as urethritis and cervicitis due to *Chlamydia spp.* (Li et al., 2008).

Coptis extracts also strongly inhibit *Candida spp.* growth and biofilm (da Silva et al., 2016). Antibiofilm and P-glycoprotein inhibitory effects by berberine and other alkaloids, may contribute to the synergistic effects shown with several antibiotics against resistant bacteria (Zhou et al., 2016; Morita et al., 2016).

Antiparasitic

Coptis extracts were found to be highly inhibitory against *Blastocystis spp*. in a number of *in vitro* trials (Su et al., 2007), while berberine has demonstrated activity against *Entamoeba histolytica, Giardia lamblia,* and *Trichomonas vaginalis* (Kaneda et al., 1990). Berberine hydrochloride at 10mg/kg/day for 10 days in children achieved a 90% reduction in Giardia-positive stools (Gupte, 1975).

Endocrine system

Much research has been undertaken into the influences of Coptis as well as berberine on diabetes and metabolic syndrome in recent years, including the ability to regulate glucose and cholesterol levels, and have anti-obesity and anti-diabetic effects (Hi 2018; Zhang 2019). Systemic reviews have noted that Coptis demonstrated anti-obesity results including weight reduction, lowered lipids, reduced lipid synthesis, and inhibited adipogenesis, while regulating gut microflora to promote weight reduction (Liu et al., 2017; Wu et al., 2014).

A meta-analysis concluded that Coptis alkaloids significantly lowered total and LDL cholesterol and triglycerides, while raising HDL cholesterol (Dong et al, 2013) apparently in part at least, through bile flow promotion via gene expression (Cao et al, 2012).

Coptis also demonstrates beneficial effects for blood glucose control in the treatment of type 2 diabetic patients, potential protection against diabetic kidney disease, and co-administration with conventional oral hypoglycaemic drugs improved glycaemic control (Dong et al, 2013; Prabhakar & Doble, 2017; Zhang 2019).

Coptis may have strong benefits for women with Polycystic Ovarian Syndrome (PCOS). Berberine has shown promise due to its ability to regulate insulin and glucose, inhibit excessive testosterone production, and, as above, benefit the gut microbiota, and reduce acne (Yarnell & Abascal, 2006; Wang et al., 2014).

In a clinical trial, researchers compared berberine to metformin for women with PCOS. After three months, both berberine and metformin groups exhibited improvements in insulin, body weight, and testosterone levels (Wei et al, 2012). In another clinical study, both berberine and metformin increased pregnancy rate and reduced the incidence of severe ovarian hyperstimulation syndrome for women with PCOS undergoing fertility treatment. Berberine treatment was associated with greater decreases in BMI, lipid parameters, total FSH requirement, and an increase in live birth rate with fewer GI adverse events than metformin (An et al., 2014).

Other uses

Antiviral

In parallel to traditional uses, preclinical trials have shown Coptis alkaloids effective against viruses, including herpes simplex and human cytomegalovirus (Hayashi et al, 2007; Song et al., 2014).

Antioxidant with skin protective applications

Coptis, as well as its major alkaloids, demonstrates potent protective activity against oxidative damage, as demonstrated in multiple pharmacological investigations (Pang et al., 2015). It elevates antioxidant enzymes such as SOD and glutathione peroxidase, while reducing ROS. Studies demonstrate effects topically and internally, suggesting a protective effect against UVB light as well as supporting liver and erythrocyte function (Xu et al, 2013).

These actions may contribute to protective effects against radiation and UV-induced skin damage (Wang et al., 2015; Wang et al 2013).

Suppression of inflammation as a result of Propionibacterium acne, has also recently been reported (Lee et al., 2018).

Anticancer

Many studies have evaluated the anti-cancer potential of berberine. In summary, it has inhibitory effects on colorectal cancer, lung cancer, ovarian cancer, prostate cancer, liver cancer, and cervical cancer cell lines in vitro through multiple mechanisms (Wang et al., 2015; Liu et al, 2019).

Conclusion

Coptis is a well-researched and highly regarded medicinal plant with a long history of traditional use in China, and as

cultivated sources of its rhizomes are available from sustainable sources, it should be regarded as a potentially very useful addition to our dispensaries.

While it adds to our treatment options for gastrointestinal tract infections, reducing pressure on the vulnerable Golden Seal resources, it also has a different spectrum of therapeutic actions, including for endocrine conditions such as acne, diabetes, metabolic syndrome and PCOS.

The concept of pathogenic involvement in endocrine dysfunction is further developing (Hechtman, 2018), and practitioners are outlining their experiences identifying the effects of pathogens as underlying causes in systemic situations. Coptis has fascinating potential for this paradigm, as revealed in the above literature.

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Editors Note: There are several species of Coptis, and as is the case with so many herbs now some are indeed endangered in the wild, hence *Coptis chinensis* being cultivated for several hundred years. This is why companies such as Phytomed source their *Coptis chinensis* 0from cultivated suppliers rather than wildcrafted plant material. NZAMH members are encouraged to source Coptis chinensis from cultivated sources to reduce the risk of extinction.