

ICNP-3 Meeting

24-28 February 2014, Pyeongchang,
Republic of Korea

**US company patents “Organic Roundup”,
an extract of the Asian long pepper plant***by Edward Hammond*

Sarmentine is a naturally occurring compound found in some species in the genus *Piper*, including long pepper (*P. longum*) and *P. sarmentosum*,¹ both plants used in food and traditional medicine in a number of Asian countries.

A California company, Marrone Bio Innovations (MBI), has obtained a US patent on sarmentine, and its chemical analogs, for use as a broad spectrum herbicide. It has also applied for patent elsewhere, including in Europe, Japan, South Korea, Canada, and Australia. The US patent’s specification further claims sarmentine’s use on “*plant phytopathogens such as plant pathogenic bacteria, fungi, insects, [and] nematodes ...*”² Research leading to the patent claims was supported by a business grant from the US government.³

MBI is has dubbed the compound “Organic Roundup”,⁴ referring to the trade name for glyphosate, the herbicide developed by Monsanto. MBI has submitted an application for US regulatory approval, intending to sell its sarmentine product beginning with American rice farmers.

MBI specializes in developing biological control products for use in agriculture, and its founder, Pam Marrone, has a track record of success in this business. In 2012, her former

¹ Long pepper is frequently referred to by an Indian common name, “pippali”. *P. sarmentosum* has no standard English name but numerous Asian common names. These include “pokok kadok” or “kaduk” (Malaysia), Cha Plu (Thailand), “bo lá lốt” (Vietnam), “sirih duduk”, “akar buguor” or “mengkadak” (Indonesia), phak i leut (Laos), and others.

² US Patent 8,466,192.

³ USDA (2013). Development of Bioherbicides for Rice Weed Control (web page). USDA REEIS. URL: <http://www.reeis.usda.gov/web/crisprojectpages/0225258-development-of-bioherbicides-for-rice-weed-control.html>

⁴ Marrone P (2010). Discovery & Development of Natural Products for Controlling Weeds (slide presentation). Annual Biocontrol Industry Meeting. URL: http://www.abim.ch/fileadmin/documents-abim/presentations2010/session3/6_Pam_Marrone_ABIM2010.pdf

company, Agraquest, was bought by Bayer for over US \$425 million.⁵ Since its founding in 2006, MBI claims to have filed “over 180 patent applications from its library of 18,000 microorganisms and 350 plant extracts, as well as from in-licensed technology.”⁶ MBI may have patented “organic roundup”, but it did not discover sarmentine. The compound appears to have been first isolated from *Piper sarmentosum* by Thai and Canadian researchers, who published their work in 1987.⁷

Also dating to the 1980s (and earlier) are scientific publications documenting traditional medicinal use for *P. sarmentosum* and *P. longum*. A number of these uses are suggestive of biocidal activity, including use of *P. sarmentosum* for toothache, influenza, and especially, fungal infections.⁸ Long pepper (*P. longum*) has an even longer list of traditional medicinal uses, with some again suggesting antimicrobial activity, including use for cholera, tuberculosis, as a larvicide and as a bactericide.⁹

Plants used in traditional medicine, like *P. longum* and *P. sarmentosum*, are frequently studied in the growing field of allelopathy, which seeks to explain how biochemical compounds produced by some plants can inhibit the growth of other species (for example, a tree that exudes a chemical that prevents seeds of other species from germinating beneath it).

Underlying the interest in medicinal plants in allelopathy, a field dominated by agriculture-oriented research, is the supposition that medicinal plants, in their frequently long relationships with humans, have been identified and selected for allelopathic traits. Allelopathy is a focus of MBI’s efforts to identify new biological controls, although the California company was not the first to consider the allelopathic potential of *P. longum* and *P. sarmentosum*. Before MBI filed for patent, scientists in China focused studies on the on use of *P. sarmentosum* extract against crop fungal pathogens.^{10 11 12}

Sarmentine has been used as a mixing agent (“solubilizer”) in cosmetics and pharmaceuticals, and methods for its synthesis have been published. It is unclear if MBI

⁵ Bayer (2012). Bayer CropScience Completes Acquisition of AgraQuest (press release). 16 August. URL: <http://www.prweb.com/releases/2012/8/prweb9809093.htm>

⁶ MBI (2013). MBI Receives Patent on Herbicide Active Ingredient (press release). 27 June. URL: <http://www.marronebioinnovations.com/2013/06/mbi-receives-patent-on-herbicide-active-ingredient/>

⁷ Likhitwitayawuid K et. al (1987). Structural elucidation and synthesis of new components isolated from *Piper sarmentosum* (piperaceae). Tetrahedron 43:16.

⁸ Seyyed A et. al. (2013) Review on the ethnomedicinal, phytochemical and pharmacological properties of *Piper sarmentosum*: scientific justification of its traditional use. TANG Humanitas Traditional Medicine 3:3.

⁹ Duke's Phytochemical and Ethnobotanical Databases (2013). Entries for *Piper sarmentosum* and *Piper longum*. USDA ARS. URL: <http://www.ars-grin.gov/duke/>

¹⁰ Yuan H et al (2009). Antifungal Activities of the Methanol Extract of *Piper sarmentosum*. Journal of Anhui Agricultural Sciences 2009:17.

¹¹ Sun D et al (2008). Inhibition of *Piper sarmentosum* and *Peperomia pellucida* extracts on pathogens. Guangdong Agricultural Sciences 2008:08.

¹² Renjun BI et al (2009). Toxicity of 2% *Piper Sarmentosum* Roxb. Microemulsion to Several Pathogens and Insects. Tropical Agricultural Engineering 2009:02.

intends to rely on synthetic or natural sources for the compound. The company claims, however, that sarmentine is 80-100% effective in controlling major weeds of rice, while have no ill effect on rice itself.¹³

Use of *Piper* plant extracts including sarmentine to control weeds may or may not be new, more information on traditional uses is needed in order to be sure. It is certainly the case, however, that the traditional medicinal use of *P. sarmentosum* and *P. longum* as biocides are what triggered interest in the *Piper* species from crop protection scientists, first in China and later in California, and in this sense (at a minimum), MBI has relied on traditional knowledge and genetic resources from Asia to create its patented product.

Minimally, especially in Asia, close scrutiny should be given to the alleged novelty of MBI's sarmentine patent claims (which vary in different iterations of its patent applications). These claims tread similar ground as some traditional uses of *Piper* species, and may not disclose relevant "prior art" in the form of traditional knowledge, prior art that could restrict or invalidate claims.

Also, although *P. sarmentosum* and *P. longum* are fairly widely known and distributed plants, consideration should be given to benefit sharing issues including on transboundary cooperation among the Asian countries . These concerns can be validated by the Asian origins of both the plants and knowledge of their potential for human use.

¹³ Marrone P. (2010).