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The Chile Pepper Institute

NEWSLETTER

http://www.chilepepperinstitute.org e-mail : hotchile@nmsu.edu

Three New Species of Capsicum and a Key to the Wild Species from Brazil

By: Gloria Barboza and Luciano Bianchetti

There are five species of *Capsicum* that have been domesticated that include; *C. annuum, C. baccatum, C. frutescens, C. chinense*, and *C. pubescens*. These species are cultivated for desirable characteristics including hot and sweet types, larger fruited varieties, and those adapted to certain growing conditions. Besides the domesticated species, there are many wild species of chile peppers mostly indigenous to regions of Brazil.

Dr. Armando Hunziker, a researcher with the *Instituto Multidisciplinario de Biología Vegetal*, dedicated a large amount of his work to studying *Capsicum*. Hunziker passed away before his work could be completely published. From his work, Gloria Barboza and Luciano Bianchetti of the University of Cordoba, Argentina have presented three new wild species from Brazil with the intent to publish a more comprehensive article in the near future. The following are summarized notes from the researchers describing each of the wild species.

Capsicum pereirae; the plant has a shrub habit reaching up to 6 ½ feet tall with branching smooth stems and young stems having ridges. The leaves can grow between 3 and 5 inches in length, the shape is elliptical and they are very shiny. The plant produces white flowers that can be solitary or in groups, ½ inch in diameter with spots of purple in the lobes and white anthers. Fruits are round, pendulum, green when immature, yellowish-green at maturity and 2/3 inch in diameter. Pods produce 5-20 seeds per fruit and are brown-black in color. The pods are very mild. This species is very similar to other species growing in the eastern coastal region of Brazil.

Capsicum friburgense; the plant has a shrub habit growing up to 7 feet tall with less branching than others, and smooth at the base of the stem with ridges near the flowers. The plant produces leaves that are 3 to 5 inches in

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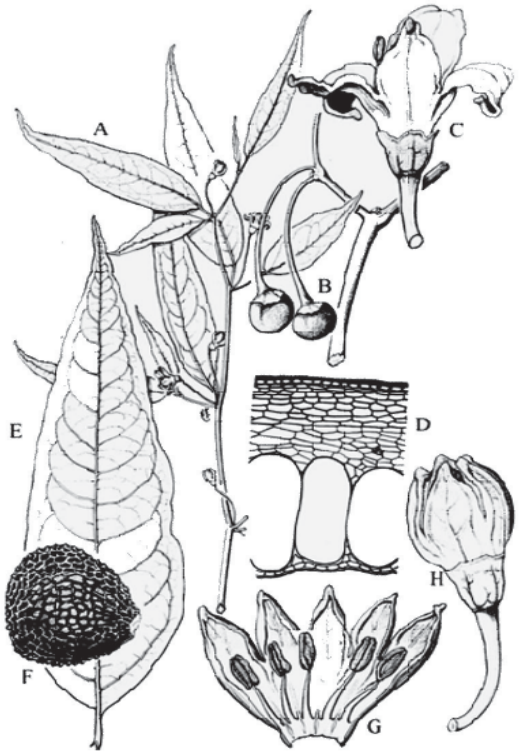


Fig 1. *Capsicum pereirae*. A. Habit. B. Fruit. C. Flowers. D. Microscopic cross section of the pericarp, there are larger than normal cells in the mesocarp. E. leaf. F. Seed. G. Opened flower. H. Flower bud.

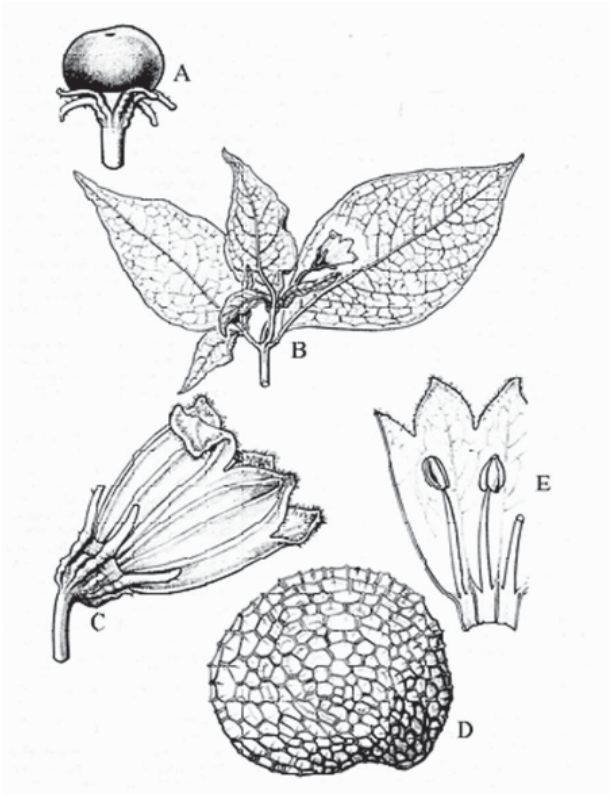


Fig 2. *Capsicum friburgense*. A. Fruit. B. Flowering branch. C. Flower. D. Seed. E. Cross section of a flower.

length, egg shaped to elliptical. Flowers are solitary or paired and erect, ½ inch in diameter with buds that are violet while the area around the anthers can be pink with yellowish anthers. This species produces fruits that are round, dark green when immature, yellowish-green at maturity, and ½ in diameter. The pods are very mild with four to eight seeds that are brownish to black per fruit. This species is distinguished by its unique flower color and shape.

Capsicum hunzikerianum, this particular species has a shrub habit and can reach 3 to 9 feet tall with branching smooth stems. Leaves can grow 2 to 8 inches in length, egg-shaped to elliptical, and discolored. The plant produces flowers in groups of two or three, erect, and almost an inch in diameter. Flowers are pure white outside with the inside being tinged with green and yellow with yellow anthers. The plant produces fruits that are round and ½ inch in diameter being green when immature turning to yellow-green when mature. The pods are very mild and produce 10-20 seeds that are brownish-black. This is a very distinct species, having the largest flowers observed. *From Systematic Botany, 2005. Rewritten for space and content.*

The Chile Pepper Institute Newsletter
Paul Bosland & Danise Coon – Production
Chris Coon – Editor/Writer
The Chile Pepper Institute
MSC 3Q, P.O. Box 30003
Las Cruces, NM 88003
(575)646-3028
(575)646-6041 fax
http://www.chilepepperinstitute.org

Fig 3. *Capsicum hunzkierianum*. A. Flowering branch. B. Fruit. C. Anther. D. Seed. E. Cross section of a flower. F. Flower.

Fig. 4. A-D. *Capsicum perirae*. E, F. *Capsicum hunzikerianum*. G. *Capsicum friburgense*.

RECIPE: GAZPACHO

The Andalusians have devised many ways to deal with the searing heat of their summers, and one of the best is this cold soup.

8 medium vine-ripened tomatoes
2 slices day-old bread – crusts removed
1 seeded and roughly chopped red bell pepper
2 cloves garlic, chopped
1 seeded and roughly chopped serrano
1 tsp sugar
3 tbs red wine vinegar
3 tbs extra-virgin olive oil

Garnish
½ seeded and finely diced cucumber
½ seeded and finely diced red bell pepper
½ seeded and finely diced green bell pepper
½ seeded and finely diced red onion
½ seeded and finely diced vine-ripened tomato

Boil tomatoes for 10 seconds, then plunge in cold water and remove skins. Cut tomatos in half and remove seeds. Chop tomatoes.Soak the bread in cold water for 5 minutes, then squeeze out any excess liquid. Put the bread in a food processor with the tomatoes, bell pepper, serrano, garlic, sugar, and red wine vinegar and process until smooth.With the motor still running drizzle olive oil into food processor, until a smooth, creamy mixture is made. Season to taste and refrigerate. Spoon the chilled gazpacho into bowls and top with mixed garnish. *From Cooking Spanish by John Newton, Available from the Chile Pepper Institute*

IS YOUR LABEL RED?
IT'S TIME TO RENEW YOUR CPI MEMBERSHIP!!

Chile Pepper Institute Member has Great Success with Bhut Jolokia

Robert Reinbolt of Bellville, Il is a current member of the Chile Pepper Institute and a 'Bhut Jolokia' success story. In late January of this year we received photos from Mr. Reinbolt of his 'Bhut Jolokia' plants from the previous season. We were amazed with the size of the plants and the great number of pods on the plants. He received the same small packet of seed as all other Chile Pepper Institute members and was able to get all 10 seeds to germinate and thrive. He took the three strongest seedlings and potted them in large pots, the remaining seven were planted in the ground. We asked him to share his techniques with other Chile Pepper Institute members.

Every zone and area is different for all types of varieties of chile peppers, the following is simply a list of suggested tips and techniques. Mr. Reinbolt also suggested that if you have never grown chile peppers from seed before do not try the 'Bhut Jolokia' for the first time, this variety is not for the novice grower.

- Soak seeds in distilled water for 48 hours

- After seeds germinate provide 12-17 hours of good quality light

- Do not allow plants to become root-bound, transplant to larger pots or ground at 12 weeks

- Using organic, high quality compost in a well-drained soil

- Applications of organic foliar fertilizer once a week helps maintain a strong plant canopy

- Applying micro-nutrients to the soil helps maintain a strong root system

- Pruning plants helps maintain a strong canopy

- Read-up on vegetable growing and utilize all knowledge of horticulture

Updated NMSU Guide

Canning Green Chile Guide

New Mexico State University (NMSU) has released an updated guide for canning green chile, reviewed by Nancy Flores, a food technology specialist with the NMSU Extension Service. The updated guide gives good advice on the safety of canning a low acid product as well as tips for selcting good chile pepper pods, how to remove the skins by blistering, general canning procedures, storing and adjustments for altitude. The guide is available at http://www.cahe.nmsu.edu/pubs/ and then typing "canning green chile" in the search box.

Pepper Mild Mottle Virus Can Survive Reclaimed Water Process

New research is revealing that reclaimed wastewater contains a host of viruses — many uncharacterized — that could ultimately affect other organisms in our environment. A team of researchers, led by Mya Breitbart, a marine biologist at the University of South Florida, have uncovered unexpected viruses, among them plant and insect viruses, in treated and untreated sewage. The work provides clues about viruses that could ultimately become bio-indicators, flagging areas contaminated by human sewage. It may also have ecological implications, because recycled wastewater is increasingly being used as a source of water for irrigation. Although it's possible to estimate the overall viral abundance in the environment, identifying specific viruses is trickier, explained Rosario, a graduate student in Breitbart's laboratory. Metagenomics offers a potential solution, making it possible to look at viral diversity and discover viruses that would otherwise remain imperceptible.

Chile pepper plant infected with Mild Mottle virus.

Because viruses in the human gastrointestinal tract can influence human body functions and the microbial flora dwelling within, Breitbart and her team decided to explore this viral diversity. They first applied viral metagenomics to human fecal samples, extracting viral nucleic acids (either DNA or RNA) from filtered and purified samples. By sequencing these nucleic acids and comparing the sequences to those in available databases, they were able to start characterizing the viral flora in the feces of healthy humans. The researchers found that approximately 60 percent of the DNA viral sequence was from unknown viruses. "There's a lot of novelty in these genes and we have no clue what these sequences are," Rosario said. Amongst the known genes, most sequences identified were from phages, viruses that infect bacteria. While that made sense, Rosario said, given the abundance of bacteria in the human gut, the team still expected to find human viruses when they looked at the RNA virus metagenome. Instead, the viral sequences most often came from a plant pathogen called the pepper mild mottle virus or PMMoV, which causes malformation and mottling in pepper plants.

They found PMMoV in three different libraries, all of which were sequenced by collaborators at the Genome Institute of Singapore: two libraries of RNA viral genes from one individual's feces at different times and a third library from another individual. When the researchers expanded their search to include 18 people from San Diego and Singapore, they found PMMoV sequence in the feces of 78 percent of those living in San Diego and 67 percent of those living in Singapore. It was also detected in every raw sewage sample tested in 11 states.

"The first guess is that it's probably coming from our food," Rosario said.

But, as it turned out, those carrying PMMoV weren't necessarily scarfing down peppers. When Breitbart and her team tested a variety of foods for PMMoV, they didn't find the virus in any of the fresh peppers tested. They did find it in several processed foods, though, including chile sauces, chili powder, and Indian curry. Subsequent experiments indicated that the PMMoV that had passed through the human digestive system could successfully infect plants, suggesting humans unwittingly help the viruses get to their preferred hosts. "We are probably vectors of the virus," Rosario said. That made the researchers wonder what happens to the viruses in human waste when we treat sewage and convert it back into water; a process called wastewater reclamation. Because of water shortages in some areas, reclaimed water has increasingly become an alternative to other water sources for agricultural and other irrigation. The team is continuing their characterization of these and other viruses in the reclaimed wastewater work that may inform the way such water is used in the future. And, Rosario said, by combining metagenomics with complementary techniques, they hope to get a more complete understanding of what's happening in that water source.

From the Boston GenomeWeb News, May 2008

CAPSICUM NEWS

Device Can Help Your Plants Tell You When They are Thirsty

The Botanicalls Twitter answers the question: What's up with your plant? It offers a connection to your leafy pal via online updates that reach you anywhere in the world. When your plant needs water, it will post to let you know, and send its thanks when you show it love (water it). Twitter is social software that asks a simple question: What are you doing? Botanicalls is a system that was developed to allow plants to place phone calls for human help. When a plant on the Botanicalls network needs water, it can call a person and ask for exactly what it needs. When people phone the plants, the plants orient callers to their habits and characteristics. With just a few ingredients you can construct your own Twitter. The step-by-step procedure is very detailed, for the complete list of instructions go to http://www.botanicalls.com/twitter/

Chemists Measure Chile Pepper Sauce Heat with Nanotubes

Chemists can now use carbon nanotubes to judge the heat of chile pepper sauces. The technology might soon be available commercially as a cheap, disposable sensor for use in the food industry. Richard Compton and his team at Oxford University, UK, have developed a sensitive technique to measure the levels of capsaicinoids in samples of chile pepper sauce. The current industry procedure is to use High-Performance Liquid Chromatography (HPLC), which is very expensive. Compton claims it is not only quicker and cheaper than other methods but more reliable for purposes of food standards; tests could be rapidly carried out on the production line.

They tested a range of chile pepper sauces, from the mild "Tabasco Green Pepper" sauce to "Mad Dog's Revenge," which sports an extensive health warning and liability disclaimer. In Compton's method, the capsaicinoids are adsorbed onto multi-walled carbon nanotube electrodes. The team measures the current change as the capsaicinoids are oxidized by an electrochemical reaction, and this reading can be translated into Scoville Heat Units. The technique is called adsorptive stripping voltammetry, and is a relatively simple electrochemical method.

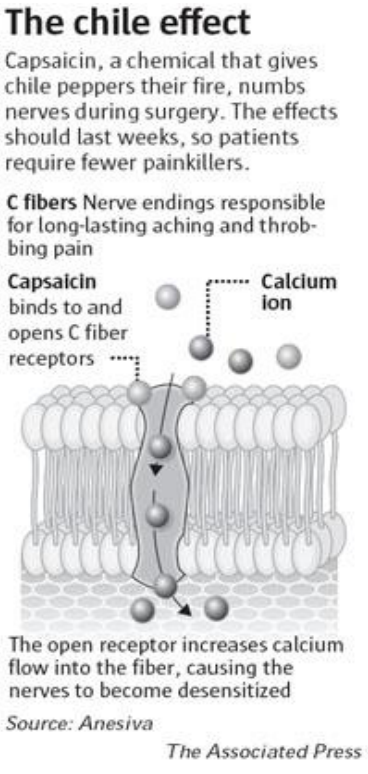
Compton has applied for a patent on the technology, and Oxford University's technology transfer subsidiary is actively seeking backers to commercialize the technique.

From ScienceDaily (May 8, 2008)

Structure of Receptor For Hot Chile Pepper And Pain Revealed

You can now not only feel the spicy kick of a jalapeñ o pepper, but you can also see it in full 3-D thanks to researchers at Baylor College of Medicine (BCM) in Houston, Texas. Using sophisticated equipment, the research team led by Dr Theodore G. Wensel, professor of biochemistry and molecular biology at BCM, generated the first three dimensional view of the protein that allows you to sense the heat of a hot chile pepper.

"This protein, known as TRPV1 not only senses spicy foods, but also makes it possible to feel real heat and the pain and inflammation related to other medical conditions," said Wensel, senior study author. "This method of viewing the protein now gives us the chance to clearly see the functional relationship between outside stimuli and the nerve cell."



BURNING QUESTIONS

Q. What kind of soil do chile peppers prefer? What balance of fertilizer should be used on chile peppers?
A. Chile peppers prefer a moderately sandy, well-drained soil with good amounts of organic matter and compost. Chile peppers need moderate amounts of nitrogen. Take care not to over-fertilize or you will get lots of foliage and no fruits. In most gardens, compost and small amounts of aged manure are enough, or one can fertilize with diluted 15-15-15 fertilizers, remember to keep the second number (Phosphorous) as high as or higher than the first number (Nitrogen).

Q. I am an amateur chile pepper grower and decided to try the 'Bhut Jolokia'. I planted them in late February indoors, and transplanted them to large pots mid-May. The soil is a regular fertilizer amended potting soil. I keep the pots moist but not real wet. The tallest plant is about 16" tall, but I have no sign of flowering not to mention fruit. All the leaves are healthy green, and new leaves are larger than the previous ones. The pots sit under a porch that gets lots of direct morning sun and is shaded in the afternoon.

A: The 'Bhut Jolokia' are notorious for dropping flowers. You should have signs of flowers at this point. If air temperatures are reaching above 95°F the pollen will abort and flowers will drop. High levels of nitrogen also cause flowers to drop.
Q. I bought some seeds and have been trying to germinate them, all but the chitelpin and 'Bhut Jolokia' seeds have germinated. I used small peat pots with seed starter medium in them.
A. Chiltepin and 'Bhut Jolokia' seeds can be very difficult to germinate. Chiltepins are called bird peppers because birds are the primary dispersal agent for them in the wild. When the birds eat the seeds, they pass through the bird's digestive track, causing the seeds to be scarified. This makes it easier for the seed to germinate, without this process of scarification the seeds can be very difficult. The 'Bhut Jolokia' can be difficult to germinate if precise conditions are not met. Soil temperatures must be kept between 80-90°F during the entire germination process and moderately moist, never soggy and never allowed to dry out. Use a germination heating mat to help keep the soil warm. Soaking the seeds in a 10% bleach solution prior to planting can be helpful, just remember to rinse out all the bleach after soaking.

News continued

It has been known for years that the burning sensation results from the action of a chemical known as capsaicin on TRPV1 found on the nerve cell membrane. TRPV1 is an ion channel, a tiny pore on the cell membrane that allows chemicals such as calcium to flux in and out.
"Any time you feel a burn or pain sensation, it is mediated by a TRPV1 channel. Different levels of heat are mediated by different TRP channels," said Dr. Vera Moiseenkova-Bell, a postdoctoral associate in Wensel's laboratory at BCM and first author of the study.
Isolating TRPV1 gives researchers an idea of how other channels are structured as well.
"Visualization of TRPV1 gives us insight on other TRP channels since they are structurally similar," said Moiseenkova-Bell. "Pharmaceutical companies target these TRP channels to make sure the drug binds properly. With this first structure we can start to build models of binding sites and hopefully in the future design more effective pharmaceuticals for a wide range of medical conditions."
The report appears in the current issue of the Proceedings of the National Academy of Sciences.
From ScienceDaily (May 22, 2008)

The
Chile Pepper Institute
New Mexico State University
MSC 3Q, P.O. Box 30003
Las Cruces, NM 88003-8003

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The Chile Pepper Institute
New Mexico State University
MSC 3Q Box 30003
Las Cruces, NM 88003-8003

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