

'Green' chemistry extraction method developed for hot capsicum fruit

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This is a graduate student with carotenoids extracted from the dried powder of a red chile cultivar. Also shown are samples of chile powder before (right) and after (left) supercritical fluid extraction. Credit: Photo by Rich Richins

Plant pigments are an important source of non-toxic compounds for use as food or cosmetic coloring agents. In addition to their known nutritional value, the red pigments in Capsicum (chile pepper) are important as sources of non-toxic red dyes; the red pigments are added to many processed foods and cosmetics to enhance their appearance. Certain varieties of Capsicum annum can be 'extracted' to isolate red-

colored xanthophylls, an important economical source of red pigments that can replace carcinogenic synthetic red dyes.

Until now, the common method for extracting red pigments from dried fruit of *Capsicum* has used hexane as the extraction solvent. A noteworthy new research study from New Mexico State University presents a process for efficient extraction of these red pigments using "[green chemistry](#)". The method recovers 85% or greater of the pigmented carotenoids from dried *Capsicum* and reduces the hazardous waste and environmental risks associated with traditional extraction methods.

In New Mexico, the economic value of a chile crop includes the value of the fruit harvested as a fresh green product and a dried red product often harvested later in the season. Current extraction processes are limiting; red pigment can only be recovered from American paprika varieties or other mild cultivars. According to a team of researchers from the Department of Plant and Environmental Sciences at New Mexico State University, if extraction of the red pigments could be achieved separate from the capsaicinoids, then a wider range of red-fruited cultivars could be used, including those with important values as fresh green crops.

The scientists created a "green chemical" method that generates an oleoresin from dried *Capsicum* fruit with virtually the same carotene and xanthophyll composition as the hexane extraction method. The report appears in [HortScience](#). Mary A. O'Connell, corresponding author of the study, explained; "If alternative and environmentally sound, "green" extraction protocols could be developed to replace the use of hexane as a solvent for oleoresin production. This would improve the environmental risks for the isolation of red pigments from *Capsicum* fruit."

The "green" extraction method includes a process that separates the pigments from the capsaicinoids, an important step which the

researchers say increases the flexibility of the process to allow a variety of red Capsicum fruit to be used easily for pigment production. The authors noted that this step in the process is critical, as it allows the pigment industry and Capsicum farmers to use virtually any variety of chile regardless of heat level for pigment production. "Pungent chiles with high American Spice Trade Association (ASTA) values could be grown for either food/spice uses or pigment production", they remarked.

The researchers added that since growers may rely on mechanical harvest of chiles in the future, contamination of the red fruit with stems and leaves may become higher with mechanical harvesting than in hand harvesting. They observed that the type of supercritical fluid extraction method presented in this study provides an advantage for red fruit harvests mixed with leaf material because it reduces the amount of chlorophyll that contaminates the carotenoid pigment extracts as compared with a hexane extract.

More information: The complete study and abstract are available on the ASHS HortScience electronic journal web site:

[hortsci.ashspublications.org/c ... t/abstract/45/7/1084](https://hortsci.ashspublications.org/content/45/7/1084)

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