

New way to detox? 'Gold of Pleasure' oilseed boosts liver detoxification enzymes

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University of Illinois scientists have found compounds that boost liver detoxification enzymes nearly fivefold, and they've found them in a pretty unlikely place—the crushed seeds left after oil extraction from an oilseed crop used in jet fuel.

"The bioactive compounds in *Camelina sativa* seed, also known as Gold of Pleasure, are a mixture of phytochemicals that work together synergistically far better than they do alone. The seed meal is a promising nutritional supplement because its bioactive ingredients increase the liver's ability to clear foreign chemicals and oxidative products. And that gives it potential anti-cancer benefit," said Elizabeth Jeffery, a U of I professor of nutritional toxicology.

Oilseed crops, including rapeseed, canola, and camelina, contain some of the same bioactive ingredients—namely, glucosinolates and flavonoids—found in broccoli and other cruciferous vegetables and in nearly the same quantities, she noted.

Because the oil from oilseed crops makes an environmentally friendly biofuel, scientists have been hoping to find a green use for the protein-rich seed meal left after [oil extraction](#). Animal feed was the obvious choice, but there were a couple of problems. Some rapeseed glucosinolates are toxic, and producers have balked at paying Canada for canola seed, the low-glucosinolate rapeseed that country had developed.

Jeffery thought *Camelina sativa* was worth a look so she began to work

with USDA scientist Mark Berhow. In the first study of camelina's bioactive properties, Berhow isolated four major components—three glucosinolates and the flavonoid quercetin—from its defatted seed meal.

Back at Jeffery's U of I lab, researchers began to test these components on mouse liver cells both individually and together. They found that all four major camelina bioactives induced the detoxifying [liver enzyme](#) NQO1 when they were used alone. However, when a particular glucosinolate, GSL9, was paired with the flavonoid quercetin, there was a synergistic effect.

"When these two bioactives were combined, induction of the detoxifying liver enzyme increased nearly fivefold," said Nilanjan Das, a postdoctoral student in Jeffery's lab.

In all the experiments, the scientists used sulforaphane, the cancer-protective component of broccoli, as a control because it is known to induce NQO1, the detoxifying enzyme. Like camelina seed meal, broccoli contains the flavonoid quercetin, so they decided to look for synergy between sulforaphane and quercetin.

"As had been the case with camelina's GSL9 and quercetin, the combined effect of quercetin and sulforaphane—in proportions found naturally in broccoli—was far greater than when either was used alone. This demonstrates to us the importance of eating whole foods. Thanks to synergy among its bioactive components, whole [broccoli](#) appears to be more powerful than purified sulforaphane that you might buy at a vitamin store or on the Internet," Das said.

Nilanjan Das, Mark A. Berhow, Donato Angelina, and Elizabeth H. Jeffery are co-authors of "*Camelina sativa* Defatted Seed Meal Contains Both Alkyl Sulfinyl Glucosinolates and Quercetin that Synergize Bioactivity." The article is available pre-publication online in the *Journal*

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