

# Antioxidants in corn line could aid human IBD protection, therapy

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Researchers bred this novel line of corn at Penn State's Russell E. Larson Agricultural Research Center to produce compounds called flavan-4-ols. The team then conducted an experiment with mice to judge the effect of those powerful antioxidant compounds on induced colonic inflammation. Credit: Surinder Chopra/Penn State

Flavonoids from a specific line of corn act as anti-inflammatory agents in the guts of mice with an inflammatory-bowel-disease-like condition, according to a team of researchers who said flavonoid-rich corn should be studied to determine its potential to provide a protective effect on human health.

The researchers bred a novel line of corn at Penn State's Russell E. Larson Agricultural Research Center to produce compounds called flavan-4-ols. The team then conducted an experiment with mice to judge the effect of those powerful antioxidant compounds on induced inflammation of the colon.

"In this study, we utilized two corn lines—one containing flavan-4-ols and one lacking flavan-4-ols—to investigate the anti-inflammatory property of that [flavonoid](#)," said Surinder Chopra, professor of maize genetics in the College of Agricultural Sciences, Penn State. "They are near isogenic lines, meaning that their genetic makeups are identical except for a few specific genetic loci that are responsible for generation of the flavonoids."

According to the researchers, inflammatory bowel disease, often referred to as IBD, is a chronic intestinal inflammatory condition that awaits safe and effective preventive strategies. Naturally occurring flavonoid compounds are promising therapeutic candidates against IBD due to their great antioxidant potential and ability to reduce inflammation and leaky gut syndrome.



The red-flavonoid containing corn line used in this research was developed by introgression of a few genetic backgrounds of field corn lines that harbored different genes and gene pathways that lead to creation of flavonoids. This photo shows multiple ears with variable flavonoid contents developed during this breeding project. Credit: Surinder Chopra/Penn State

A growing number of epidemiological studies show that diets rich in fruits and vegetables, which contain a significant amount of flavonoids, have been associated with reduced risk of hypertension, cardiovascular disease, type 2 diabetes and other chronic diseases such as [inflammatory bowel disease](#). In addition to their anti-inflammatory properties, naturally occurring flavonoids are safer than standard drugs.

In the study, researchers obtained seeds for an inbred corn line from the National Seed Storage Laboratory at Fort Collins, Colorado, and for a corn genetic stock containing genes required for the flavonoid pathway. After back-crossing the plants, the resulting hybrid possesses a higher antioxidant capacity than conventional lines—a promising trait that could be introduced into elite cultivars to increase dietary benefits, according to Chopra.

Mice in the study with the induced-IBD syndrome were divided into four groups. One group was fed a control, or standard, diet. The second and third groups' diets were supplemented with corn containing flavan-4-ols at 15% and 25%. The fourth group was fed a diet supplemented with a genetically related corn that did not contain the flavonoids.



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In findings recently published in *Nutrients*, researchers reported that mice consuming a corn-based diet with flavan-4-ols exhibited alleviated IBD-like symptoms resulting from the protective effect of flavonoids against colonic inflammation by restoring intestinal barrier function. The study, spearheaded by Binning Wu and Rohil Bhatnagar, doctoral candidates in Penn State's Department of Plant Science, provides a rationale for breeding for flavonoid-enriched cultivars for better dietary benefits.

The idea that flavonoids coming from grains may promote [human health](#) is a new one, noted Lavanya Reddivari, assistant professor of food science at Purdue University, who helped guide the study. She and Chopra began collaborating on research related to antioxidant compounds in crop plants about five years ago when she was a faculty member at Penn State.

"Most of the epidemiological studies focus on flavonoid-enriched fruits, especially berries," she said. "However, grains contain a high concentration of bound flavonoids that are thought to exert better antioxidant activity and prolonged presence in systemic circulation, compared to free-form flavonoids, due to their slower and continuous release during digestion and microbial fermentation. These results suggest the feasibility of a human intervention study with flavonoid-rich

[corn](#) to investigate its protective effects."

**More information:** Binning Wu et al. Intestinal Mucosal Barrier Function Restoration in Mice by Maize Diet Containing Enriched Flavan-4-Ols, *Nutrients* (2020). [DOI: 10.3390/nu12040896](https://doi.org/10.3390/nu12040896)

Provided by Pennsylvania State University

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