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Objectives: The prevalence of ulcerative colitis (UC), a chronic inflammatory bowel disease, is on the rise with ∼700,000 patients in the US alone in 2018. Gut bacterial dysbiosis plays an important role in ulcerative colitis. We have recently shown that anthocyanin-containing potatoes exert anti-inflammatory activity in colitic mice. However, no information is available on whether gut bacteria play a role in the anti-colitic activity of color-fleshed potatoes. This study examined the anti-colitic activity of red/purple-fleshed potatoes in mice with intact and antibiotic-ablated microbiome.

Methods: We used DSS-induced murine (C57BL6) colitis model with and without the administration of antibiotics in drinking water for nine weeks. Mice were randomly assigned to the control (AIN-93G diet), DSS (AIN-93G diet), DSS + PP (20% purple potato) and DSS + RP (20% red potato) groups. After eight weeks, mice were treated with 2% DSS in their drinking water for five days to induce colitis. Intestinal permeability was measured using FITC-dextran. Serum myeloperoxidase (MPO) levels were measured using ELISA. RT-PCR was used to analyze the relative gene expression levels of cytokines and bacterial abundance.

Results: Administration of antibiotics resulted in a 95% reduction in gut bacterial load. Antibiotics administration did not alter food intake, water intake, and weight gain. Antibiotic-treated mice had five times greater cecum weight, a hallmark of germ-free mice, compared to no-antibiotic mice. In antibiotic mice, DSS-induced splenomegaly, elevated gut permeability (serum levels of FITC-dextran), and reduced colon length and weight were more pronounced compared to no antibiotic mice. Purple- or red-fleshed potato supplementation (20% w/w) ameliorated ($P \leq 0.05$) DSS-induced reduction in colon length, elevation in permeability, spleen weight and MPO levels in no antibiotic mice only. Moreover, purple-fleshed potato supplementation alone improved the ZO-1 and MUC-2 gene expression levels in no-antibiotic mice, but not in microbiota-ablated mice.

Conclusions: In summary, these results suggest that purple-fleshed potatoes are more potent compared to red-fleshed potatoes and the gut microbiome is critical for the anti-colitic activity of anthocyanin-containing potatoes.

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