

Anti-Inflammatory Effects of *Mukdenia rossii* (Olive.) Koidz. on DSS-Induced Colitis in Mice

Mi-Ra Lee, Bohye Kim, Hee-Jun Kim, Yongjun Lee*

Hongcheon Institute of Medicinal Herb, Hongcheon-gun, Gangwon State, 25142, Korea

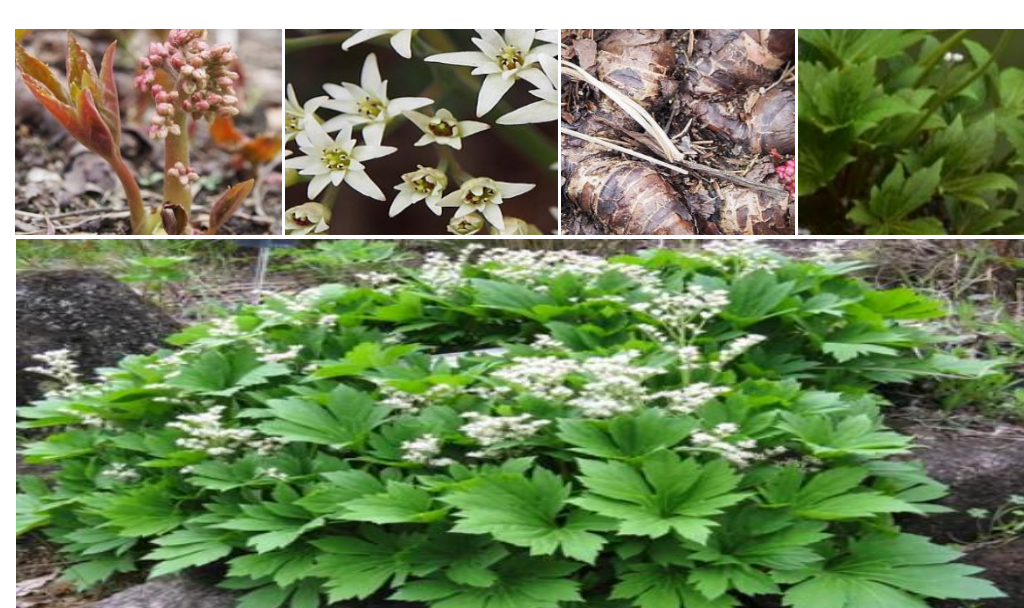
ABSTRACT

Background : Inflammatory bowel diseases (IBD) of the gastrointestinal tract such as ulcerative Colitis are characterized by both acute and chronic inflammation of the intestine with multifactorial etiology. *Mukdenia rossii* (Olive.) Koidz.(MRK) is a perennial herb known as ‘Doldanpung’ because it is usually found in the cracks of rocks. This study evaluates the potential of MRK, a medicinal herb in dextran sulfate sodium (DSS)-induced colitis mice and DSS-induced HT-29 cells.

Methods and Results : The anti-inflammatory effects of MRK extract was evaluated both *in vitro* and *in vivo*. Inflammation was induced in HT-29 cells by 2% dextran sodium sulfate (DSS) and in DSS-induced colitis mouse mode by same concentration of DSS. MRK extract significantly reduced the levels of NO in RAW 264.7 cells and increased IL-8 levels in DSS-treated HT-29 cells. MRK supplementation significantly attenuated disease activity index(DAI) score, which implied that it suppressed diarrhea, gross bleeding, and the infiltration of immune cells in DSS-induced colitis mice. MRK administration also prevented shortening of the colon length. Histological examinations indicated that MRK preserved epithelial layer and crypt structure and also suppressed the goblet cell loss by DSS-induced colonic damage. In addition, MRK inhibited the production of pro-inflammatory cytokines including IL-6 and IL-22 in mice with DSS-induced colitis.

Conclusion : Taken together, these results suggest that anti-inflammatory effects of MRK have the potential for therapeutic application against colitis.

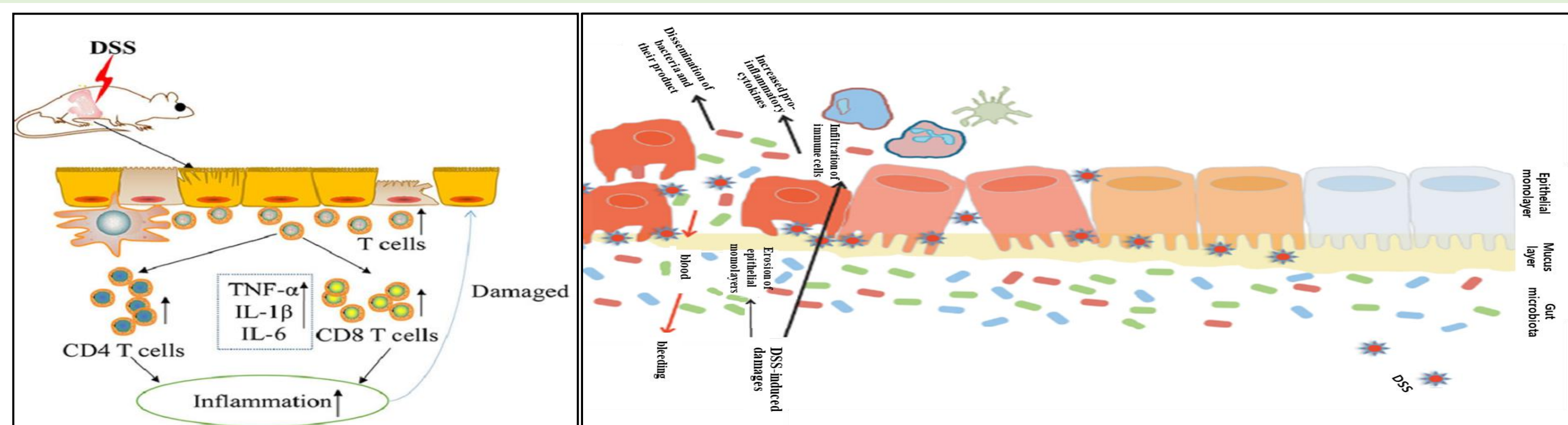
BACKGROUND & METHODS



***Mukdenia rossii* (Olive.) Koidz**

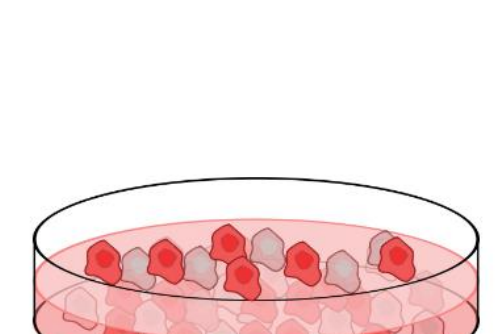
- ✓ ‘Doldanpung’ in Korean
- ✓ Saxifragaceae family
- ✓ Young Leaves, Flower, Root, Leaves used medical herb
- ✓ Anti-oxidant effect, Diuretic effect, Effective against heart disease
- ✓ Anti-cancer effect : Triterpene

Dextran sodium sulfate (DSS) -induced colitis mice model



Experimental schedule

In vitro



NO assay, IL-8 detection

In vivo

Raw 264.7 cell / HT-29 cell



Table 1. Evaluation of Disease activity index (DAI)

Score	Weight loss(%)	Stool consistency	Blood in stool
0	None	Normal feces	No blood
1	0-10%	Loose stool	-
2	10-15%	Watery diarrhea	Hemocult(+)
3	15-20%	Slimy diarrhea	-
4	> 20%	Sever watery diarrhea	Gross bleeding

RESULTS

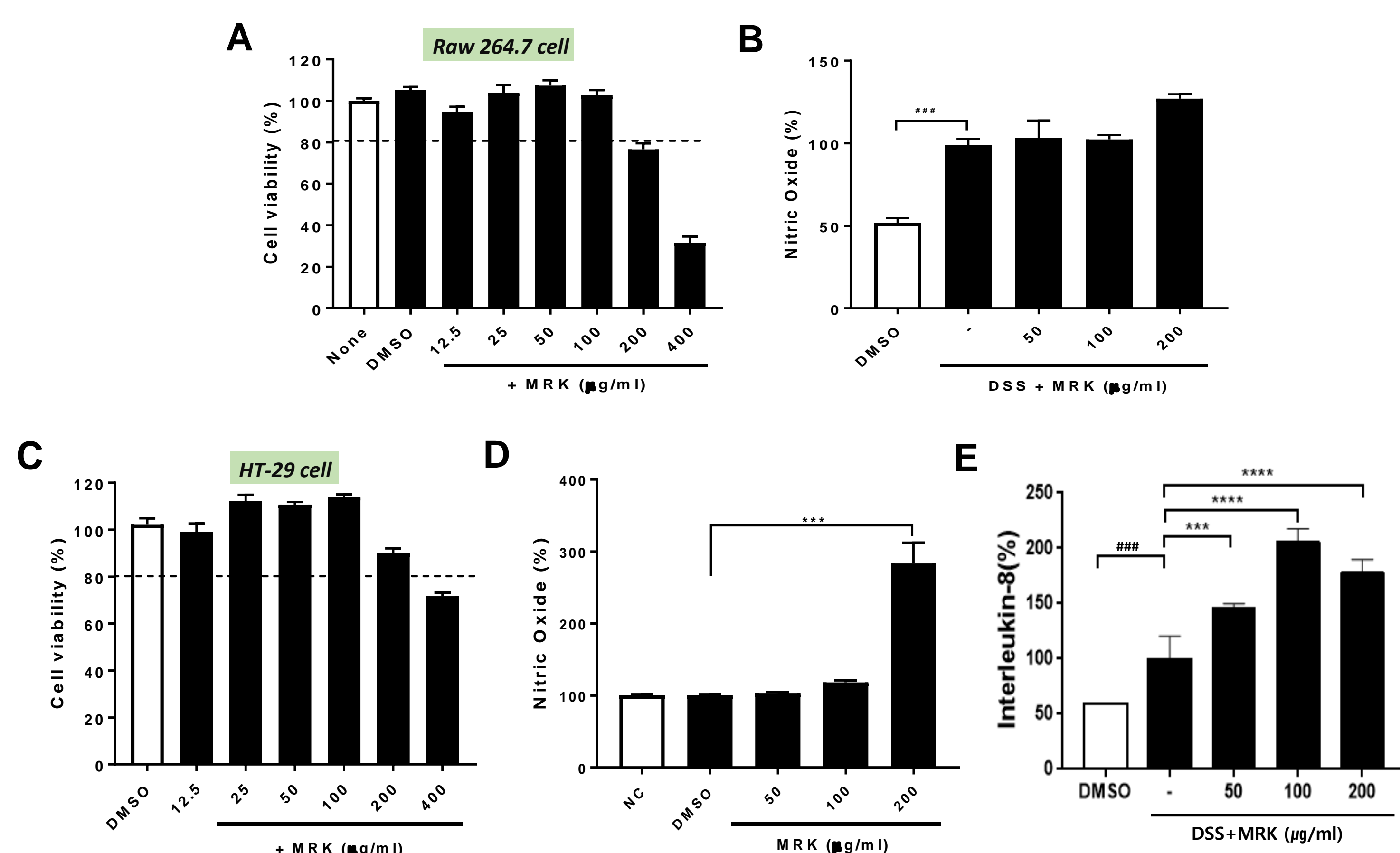


Figure 1. Effect of MRK extract on cell viability, NO production in Raw 264.7 macrophages and HT-29 cell (A-D). IL-8 secretion in HT-29 cell was treated with various doses of MRK extract as indicated (E). Results are expressed as mean ± SD.

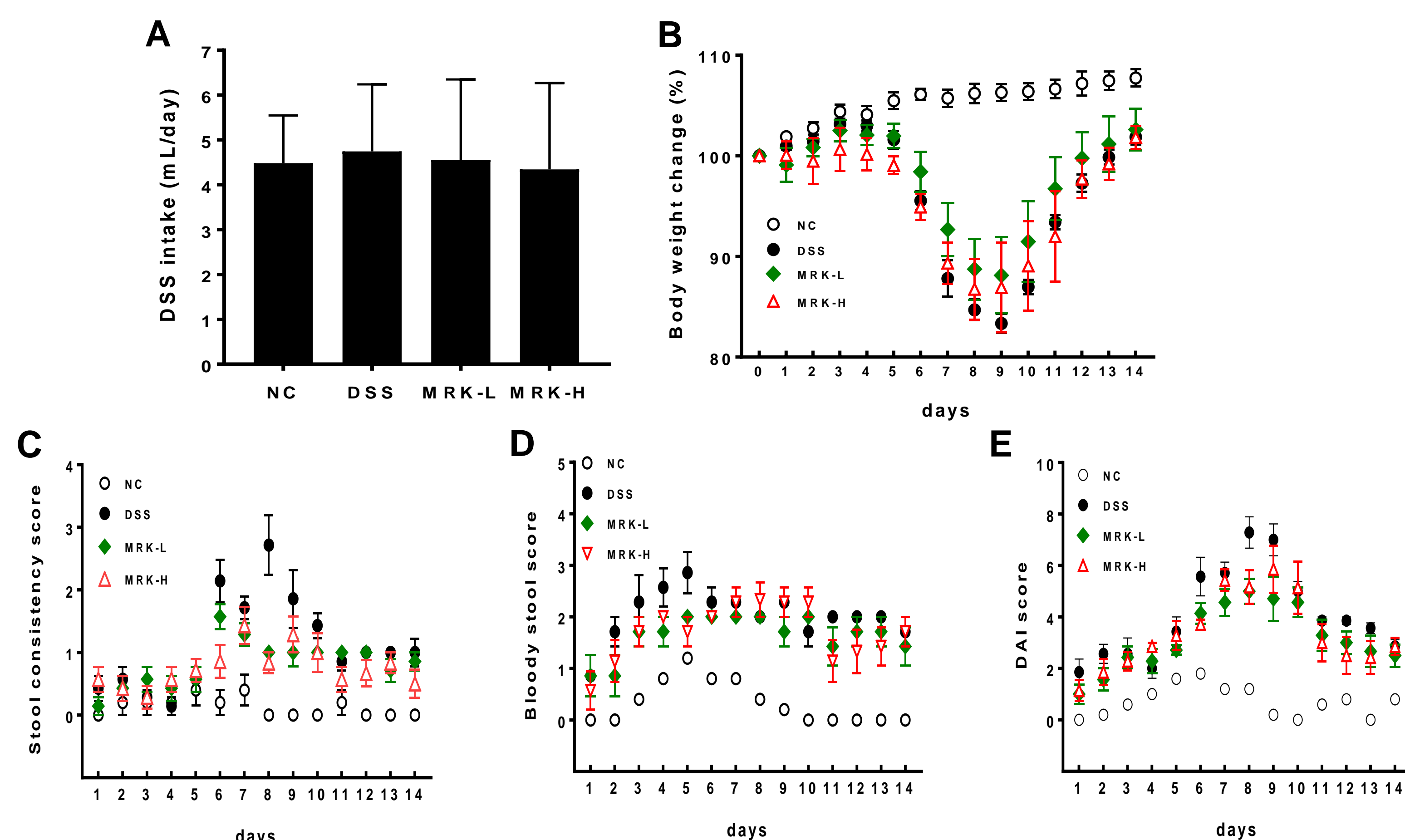


Figure 2. Effect of MRK extract on the clinical markers in DSS-induced colitis mice. Mice treated with 2% DSS in their water for 5 days. MRK extract was administrated once per 14 days. (A) DSS intake, (B) Percentage change in body weight, (C) Stool consistency (D) Bleeding stool score, (E) DAI score.

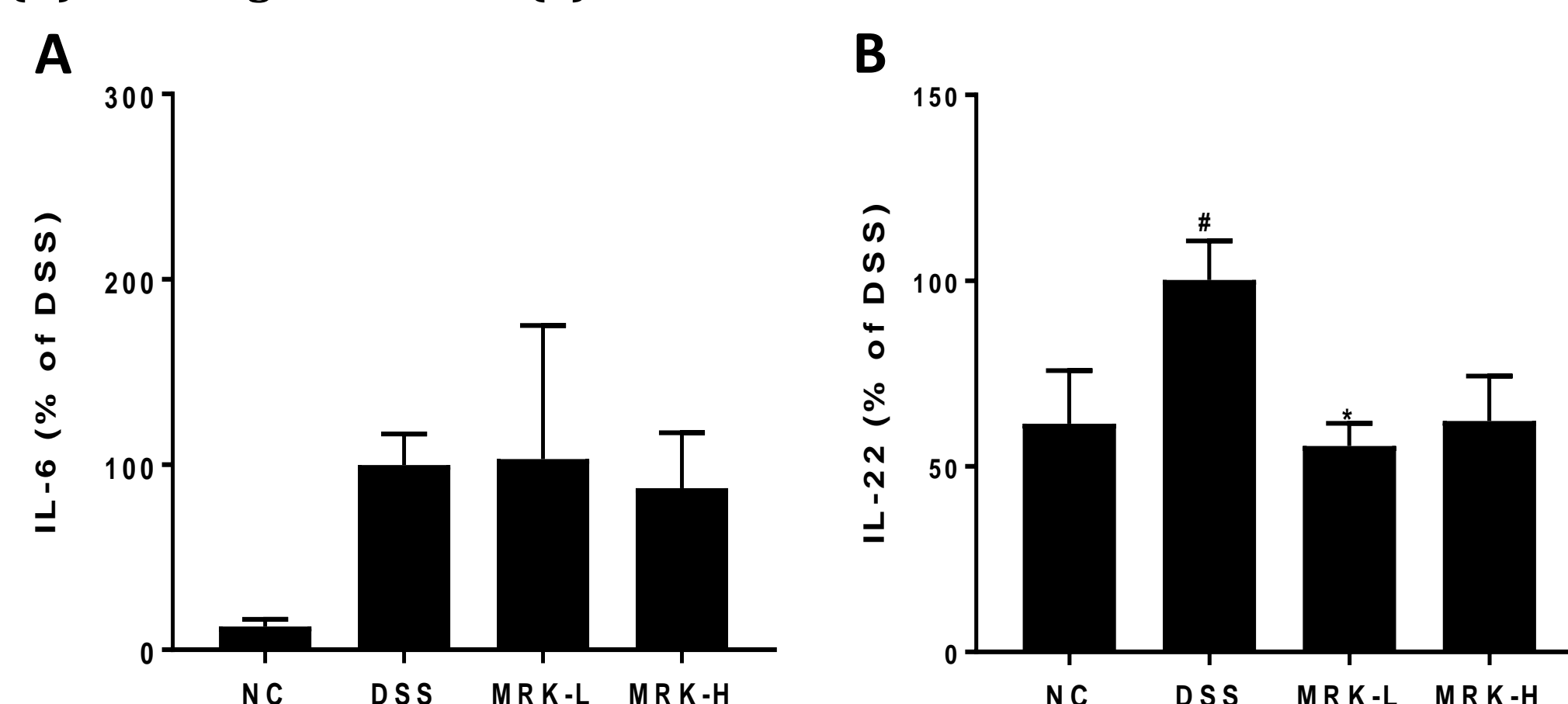


Figure 3. Effect of MRK extract on the pro-inflammatory cytokines in DSS-induced colitis mice. (A) IL-6, (B) IL-22. #*p*<0.05 vs NC, **p*<0.05 vs DSS group

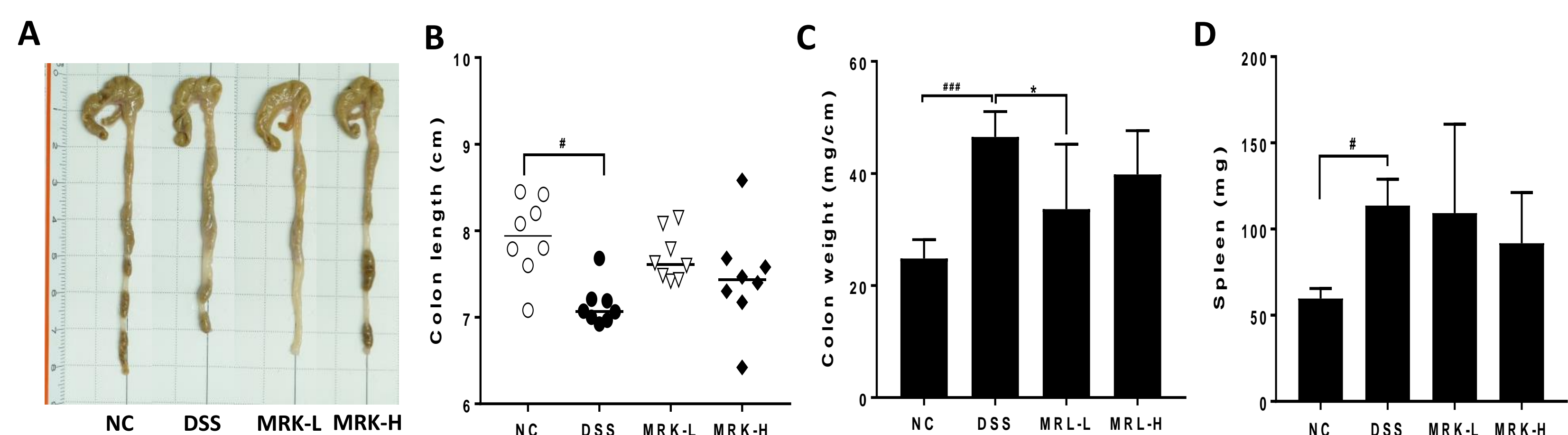


Figure 4. Effect of MRK extract on spleen and colon weight and colon length. (A) Representative photographs of colon tissue, (B) Colon length, (C) Colon weight per cm (D) Spleen weight. #*p*<0.01, ###*p*<0.001, vs NC, **p*<0.05 vs DSS group.

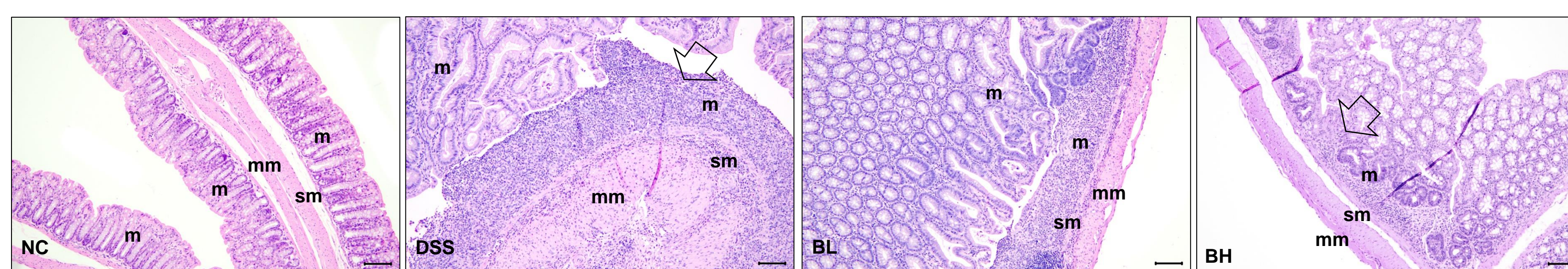


Figure 5. Histological feature of the representative intestine of each group. Note the focal or extensive mucosal ulcerative colitis (Thick open arrows). m, mucosa; sm, submucosa; mm, muscular layer. Bars = 100μm.

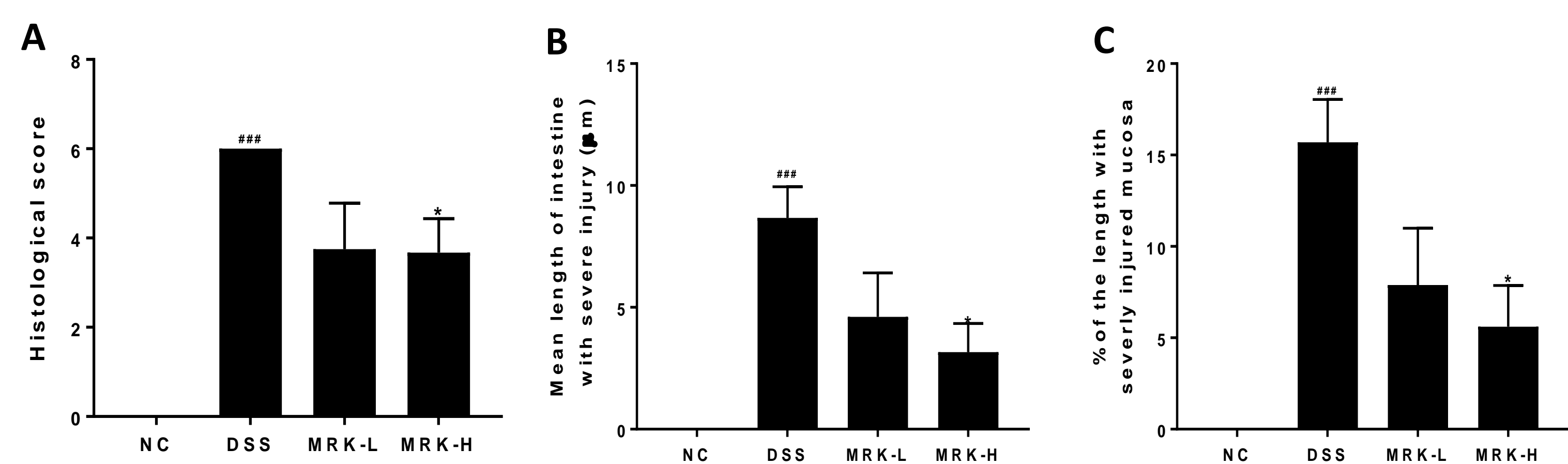


Figure 6. The mean grading scores of histological score (A), Length of severe injury intestine (B), and percentage of the total intestinal length measured (C). ###*p*<0.001 vs NC, **p*<0.05 vs DSS group.

Conclusion

Our results indicate that MRK suppressed the pro-inflammatory cytokines and immune stimuli in both *in vitro* and *in vivo*. Moreover, MRK displayed the alleviative effects on inflammatory bowel disease model may be a useful therapeutic approach to inflammatory bowel disease

References

- Dextran sulfate sodium(DSS)-induced colitis in mice. Current protocols in immunology 2014, 104:15.25.1-15.25.14
- Dietary fish oil and curcumin combine to modulate colonic cytokinetics and gene expression in dextran sodium sulfate-treated mice. British Journal of Nutrition 2011, 106:519-529

Acknowledgement

This research was supported by Hongcheon-gun, under the “2022-2023 Immunomodulation functional material development platform construction project”.