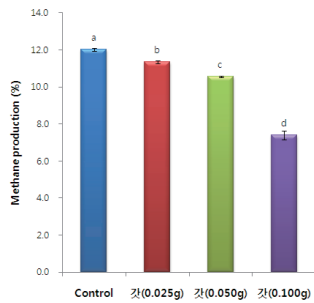


5. Nutrition and physiology Research

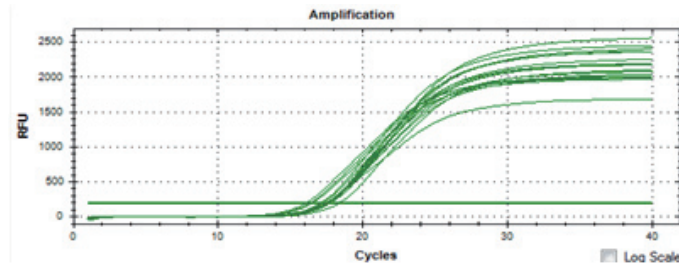
(1) Development of supplemental feed for inhibiting CH₄ production from gastrointestinal fermentation in Hanwoo

Methanogenesis is an important metabolic activity in the rumen ecosystem. CH₄ was produced by rumen microbes for digesting feed ingested by ruminants, and released via their respiration or belching. Generally, ruminant lost 2~15% of total ingested energy in forms of CH₄. It was released by ruminal microbes which leads to major source of greenhouse gas as well as energy loss. Therefore it is necessary to decrease CH₄ production by microbes in rumen by manipulation of feeding practices. For this objective, we evaluated inhibitory effects of mustard leaf extract and allyl isothiocyanate(AIT) included cabbage extract having anti-inflammatory and antioxidant properties on CH₄ reduction.

We examined the inhibitory effects of CH₄ production of two substances, the plant extract mustard leaf and allyl isothiocyanate(AIT) known as anti-microbial function. The former could increase total gas production by 13% compared with the control, CH₄ production was decreased by 38% compared with the control group in in vitro trial without any inhibition of rumen fermentation. The latter could inhibit CH₄ production by 85% at high dose, and 19% at low dose, in in vitro study. The DNA Ratio of Methanogenic microbial by Real-time PCR was decreased by 38% compared with the control group in in vitro trial.



CH₄ reduction by plant extract
mustard leaf



The change of Methanogenic microbial
DNA (allyl isothiocyanate)

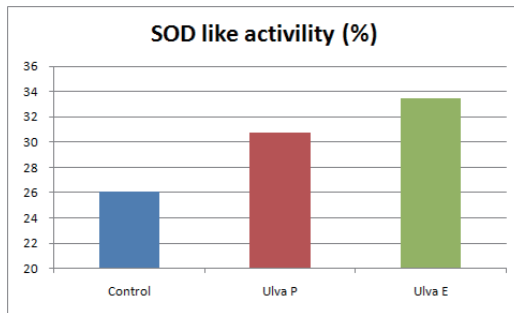
(2) Antioxidant and Immunomodulatory Effects of *Ulva pertusa kjellman* on Broiler Chickens

This study was conducted to determine the possible use of *Ulva pertusa kjellman* as immunomodulators in lipopolysaccharide (LPS)-exposed broilers by investigating their effects on serum superoxide dismutase (SOD) like ability, immunoglobulin concentration and splenic cytokines mRNA expression.

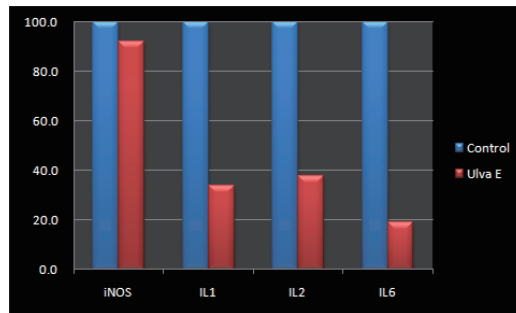
A total of ninety six 1-d-old male broiler chicks (Ross×Ross 308) were divided into 4 treatment groups with 8 replicates of 3 birds in each group. NC (negative control, no immune substances), PC (positive control, β -glucan 25 ppm), Ulva P (*Ulva pertusa kjellman* Powder 3 %), and Ulva E (Extract form *Ulva pertusa kjellman* 0.3 %) treatments were administered through water supplementation. The SOD like activities in Ulva P and Ulva E were significantly increased in comparison with those of the other groups ($P < 0.05$). The immunoglobulin M content was significantly lower in the Ulva E than that of other groups ($P < 0.05$). Expression patterns of splenic cytokine mRNA in the IL-1, IL-2 and IL-6 were similar. Expression rate of IL-1, IL-2 and IL-6 in *Ulva pertusa kjellman* (Ulva P, Ulva E) were significantly decreased when compared with those of the other groups. Expression rate of IL-1, IL-2 and IL-6 were significantly lower in groups treated with Ulva E than in Ulva P.

In conclusion, the dietary supplementation of *Ulva pertusa kjellman* improved SOD like activity and affect immunomodulatory by inhibiting inflammatory response in

broiler chicks. In addition, it is more effective to use *Ulva pertusa* kjellman extract than powder towards the stimulation on immunomodulatory function. These results suggest the possibility that *Ulva pertusa* kjellman could be used as the immunomodulator for inflammatory response in broiler chicks.



Effects of dietary *Ulva pertusa* on antioxidation



Effects of dietary *Ulva pertusa* on spleen cytokines mRNA expression