

Effect of NaCl on the Myrosinase Activity, and Their Application in Salted Cruciferous Vegetable

Susumu Tanaka¹, Hiroki Matsuoka¹, Sonoko Ayabe¹, Yoshio Ozawa¹ and Kohei Hosaka²

¹Department of Health & Nutrition, Faculty of Health & Welfare, Takasaki University of Health & Welfare

²Department of Basic Sciences for Medicine, Gunma University School of Health Sciences

Summary

It is known that isothiocyanate—a pungent component found in cruciferous vegetables such as daikon (radish), wasabi, and mustard greens—is generated by the action of myrosinase obtained from pungent-component precursors. It has been clarified that *in vitro*, myrosinase is activated through ascorbic acid alone or the combination of ascorbic acid and magnesium (Mg^{2+}). Furthermore, isothiocyanate has various bioactivities, such as antioxidant and anticancer effects. In this study, we investigated the influence of *in vitro* myrosinase activity on NaCl and ascorbic acid from the viewpoint of applications in tsukemono (pickling processing). The quantity of NaCl, glucosinolate (pungent precursor), myrosinase, and ascorbic acid were measured in regard to both dehydrated and salted conditions in the tsukemono of different varieties of cruciferous vegetables, particularly daikon.

The results showed the myrosinase activity increased up to about 1.3-fold at 1% of NaCl (170 mmol/L), but no synergy with ascorbic acid was observed. When the commercially available salts “Hakata no Shio” and “Okinawa no Shio” were used for evaluation, a final concentration of around 1% intensified the myrosinase activity within range of 1.2 to 1.25-fold, respectively. Next, monovalent cations such as Li^+ , K^+ , and Cs^+ were investigated. These elements increased the myrosinase activity similar to that of Na^+ .

Next, kinetic analyses were performed on salt content and levels of glucosinolate, myrosinase, and ascorbic acid in different varieties of daikon. We also carried out the same determination on those compounds in pickling processes using both daikon dehydrated by sun drying and “shiooshi” (which salted fresh daikon), respectively. In “shiooshi”, the concentration of salt in pickled daikon of ten varieties (hoshiriso, shinhasshu, akidzumari, ofukuro, shiroyari, akinosato, fuyubijin, ajigonomi, oroshi, nezumi) was $6.8 \pm 0.5\%$. There was no major change in salt content between “shiooshi” and sun-dried daikon after 1, 2, 4, and 8 months under low-temperature pickling processes, which showed the concentration of $6.9 \pm 0.7\%$. Moreover, the level of glucosinolate and ascorbic acid decreased markedly after dehydration or pickling. Further, the level of myrosinase protein detected by using the tissue printing method showed the highest value in fresh daikon, while it decreased slightly in dehydrated daikon. On the other hand, that value greatly decreased after 1 month since starting pickling daikon.