Edamame abstract August 10, 2001

This paper reports with effect of cooking on isoflavone and saponin levels in retail edamame rather than survey in a number of edamame varieties which is the topic of another talk. The isoflavone and saponin levels will be compared with those in other soy foods.

There are three glucoside structures of the three soy isoflavone forms, genistein, daidzein and glycitein. Each form may be present in soy food as the β-glucoside, the malonyl-glucoside and the acetyl-glucoside as well as the aglucon form. The form distribution depends upon the type of processing the raw product has undergone. The effect of cooking retail edamame beans (w/o pods) or "green soy peas" by boiling or microwaving according to package directions was performed. Data is shown in μmoles isoflavone /g on a dry weight basis. The isoflavones in the two brands "H" and "W" are quite similar to that in mature soybeans. Microwaving results in lower loss of isoflavones to cooking water than boiling. A portion of the malonylglucoside forms are converted to the β-glucosides. These data are similar for boiling steps in soy processing we have reported before. The difference between microwaving and boiling edamame in the pods for the de-podded beans, or the edible portion shows microwaving allows a little greater retention of isoflavones than boiling. Cooking the podded beans allowed greater retention of isoflavones compared to beans without the pod. The isoflavone levels found in the empty edamame pods demonstrated isoflavones are found in most parts of the soybean plant. The levels of isoflavones in the empty pods is about ½ that of the edamame beans.

We measured the group B saponins found in soybeans. There also group A saponins in soybeans, but they co-elute with the isoflavones so we cannot measure them. There are typically 6 detectable group B forms. In raw soybeans, the αg, βg and βa predominate. Mild heat treatment causes the DDMP group to detach. Then these saponins are called saponin V, I and II, respectively. Saponins co-extract with isoflavones. Although we use ultraviolet absorbance detection to analyze them, they are much harder to detect due to their much lower uv absorbance compared to isoflavones. The forms missing the DDMP group have even lower uv absorbance. The saponin levels in these raw edamame beans is somewhat higher than in mature soybeans. Cooking according to package directions by boiling and microwaving did not result in any statistical different in saponin totals in beans or podded beans in contrast to what we observed with isoflavones. There was redistribution of the saponin forms as expected by heat with more the saponin I, II and V being generated. In marked contrast to isoflavones, the empty edamame pods had much lower saponin levels compared to the edible edamame bean. The saponin levels in a variety of other soy foods were comparable the saponin levels in edamame. Soy germ, typically not a food source, are a very concentrated source of saponins. There is no correlation between isoflavones and saponins in mature soybeans. We compared the total saponin and total isoflavone levels in soy food products. The concentrations of these two phytochemicals are relatively comparable on a mole basis. The significance of the concentration in foods remains to be determined.

In summary, it appears edamame are a good source of isoflavones and saponins. They are comparable in concentration to other soy foods. Traditional cooking of edamame results in small losses of isoflavones but not saponins to cooking water and inter-conversion of the molecular forms of isoflavones and saponins as expected by heat.