

Soybean seed: A treasure trove of bioactive compounds

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EDITORIAL

Nature has gifted ample of compounds beneficial for the mankind. Some of these have already been identified while plenty are yet to be identified and characterized. Research in the past few decades has shown that soybean seeds are highly rich in the proteins, peptides, fatty acids, isoflavones, and other secondary metabolites with potential bioactivity (1,2). These compounds exhibit antioxidant and anti-carcinogenic properties along with potential benefits against cardiovascular disease, osteoporosis, and menopausal symptoms, among others (1).

Kunitz-Trypsin inhibitor (KTI), Bowman-Birk inhibitor (BBI), and lunasin are three major and best-characterized bioactive proteins/peptides of soybean seeds (3). KTI and BBI are serine protease inhibitors with molecular weights of 20.1 and 8 kDa respectively (4). While KTI can inhibit trypsin only, BBI inhibits both trypsin and chymotrypsin (4). Both of these proteins have been shown to exhibit anti-carcinogenic and/or anti-invasive/metastatic activities (1).

Lunasin is a 2S-albumin derived peptide, and is not a protease inhibitor (5). It consists of 43 amino acids with a molecular weight of 5.5 kDa and exhibits several beneficial health effects, similar to BBI and KTI (4). There is compelling evidence gathered over the years which endorses the anti-oxidative, anti-inflammatory, anti-cancerous and cholesterol-lowering properties of this particular peptide (5).

In addition to these protein/peptides, secondary metabolites such as isoflavones and saponins, have also been shown to exhibit the anti-carcinogenic properties, albeit to a lesser extent than the BBI and KTI. Soybean isoflavones are present as glucosides (daidzin, genistin, and glycitin), malonylglucosides (malonyldaidzin, malonylgenistin and malonylglycitin), acetylglucosides (acetyldaidzin, acetylgenistin, acetylglycitin) and aglycones (daidzein, genistein, and glycitein) (6). The core structure of the isoflavones resembles the 17- β -estradiol and thus these are able to bind the estrogen receptors, exhibiting numerous beneficial health effects.

Growing body of evidence suggests isoflavones can inhibit hormones associated cancers like breast and prostate cancers because of their estrogen similar structure. Moreover, isoflavones were also shown to possess the antioxidant and anti-inflammatory properties (6,7). Soyasaponins, on the other hand, are triterpenoid glycosides, containing an oleanane-type aglycone and polysaccharide chains (8). In soybean, saponins are present in two major forms as group A and group B soyasaponins. Together, these soyasaponins

possess anti-inflammatory, antioxidative, anti-glycemic, anti-carcinogenic, hepatoprotection and cholesterol-lowering properties (8). Soyasapogenols are the aglycone forms of soyasaponins and are formed during fermentation of soy foods. It was reported that these soyasapogenols are better absorbed in the blood as compared to soyasaponins and therefore, these are supposed to be more potent than their corresponding soyasaponins (8).

In addition to these, soybean seeds contain several other bioactive compounds such as carotenoids, tocopherol, phenolic acids and flavonoids with potential health benefits. Therefore, soybean seeds can be included in the daily diet to improve the overall health with these non-toxic and inexpensive bioactive compounds.

REFERENCES

1. Isanga J, Zhang GN Soybean bioactive components and their implications to health a review. *Food Rev. Int* 2008;24:252-276.
2. Min CW, Lee SH, Cheon YE, et al. In-depth proteomic analysis of Glycine max seeds during controlled deterioration treatment reveals a shift in seed metabolism. *J Proteomics.* 2017.
3. Park JH, Jeong HJ, de Lumen BO Contents and bioactivities of lunasin bowman birk inhibitor and isoflavones in soybean seed. *J Agric Food Chem.* 2005;53:7686-90.
4. Dia VP, Gomez T, Vernaza G, et al. Bowman-Birk and Kunitz protease inhibitors among antinutrients and bioactives modified by germination and hydrolysis in Brazilian soybean cultivar BRS 133. *J Agric Food Chem.* 2012;60:7886-94.
5. Lule VK, Garg S, Pophaly SD Potential Health Benefits of Lunasin A Multifaceted Soy-Derived Bioactive Peptide. *J Food Sci.* 2005;80: R485-94.
6. Kao TH, Wu WM, Hung CF Anti-inflammatory effects of isoflavone powder produced from soybean cake. *J Agric Food Chem.* 2007;55:11068-79.
7. Ruiz-Larrea MB, Mohan AR, Paganga G Antioxidant activity of phytoestrogenic isoflavones. *Free Radic Res.* 1997;26:63-70.
8. Kamo S, Suzuki S, Sato T The content of soyasaponin and soyasapogenol in soy foods and their estimated intake in the Japanese. *Food Sci Nutr.* 2004;2:289-97.

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