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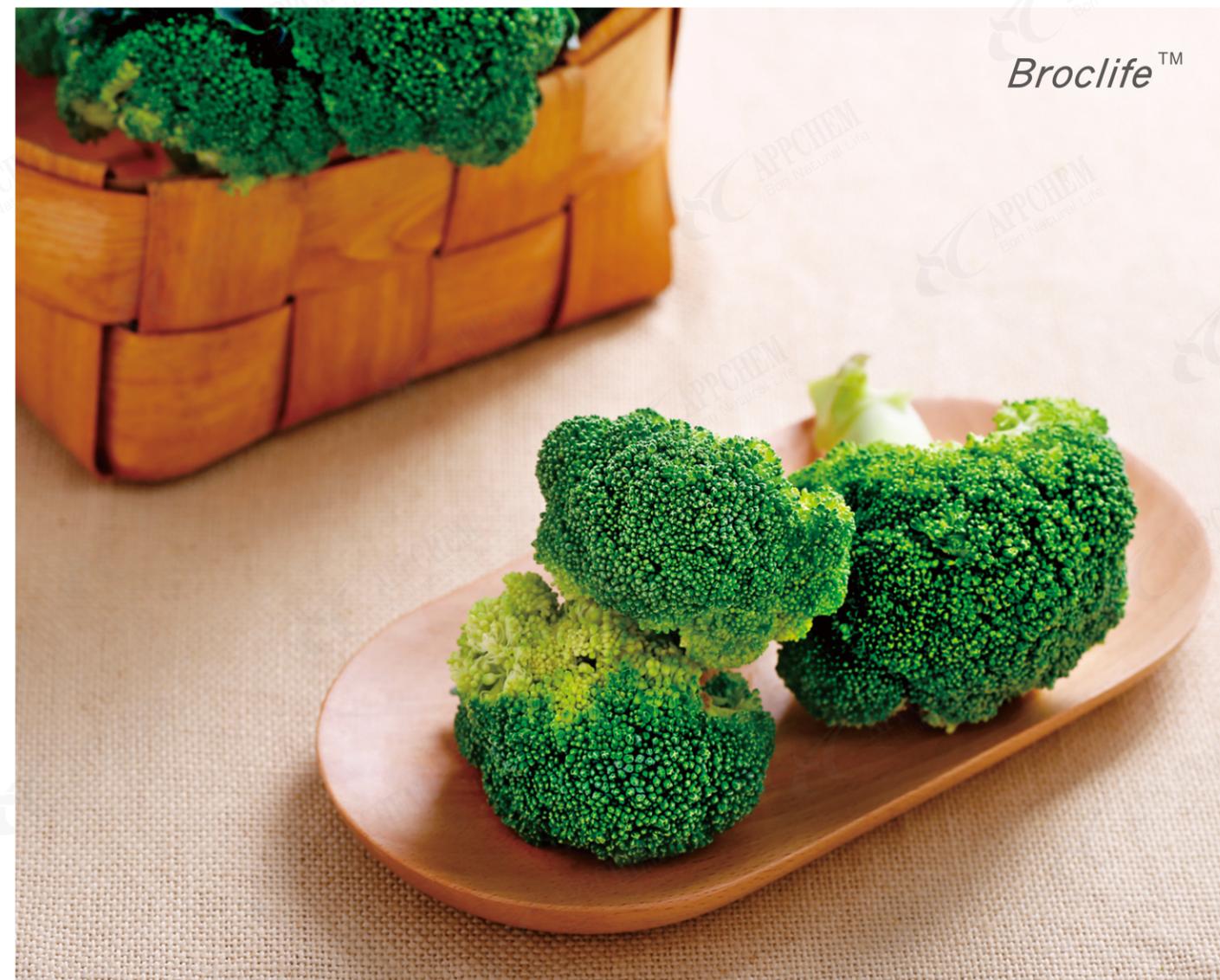
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Aqueous Extracts of Broccoli Seeds

Broccoli (broccoli), also known as tender stem cauliflower, is a variety of Brassica cabbage belonging to the Cruciferae family. Broccoli is rich in glucoraphanin, and its metabolite sulforaphane has significant effects on anti-cancer, antioxidant, anti-inflammatory, antibacterial, and detoxification, and is widely used in tumors, digestive health, central nervous system health, and anti-aging.

In 2017, the National Health and Family Planning Commission issued the Announcement on 10 New Food Raw Materials such as Shea Butter (No. 7 of 2017), which included aqueous extract of broccoli seeds marked as glucoraphanin into the new food raw material. We have carried out in-depth research on the aqueous extract of broccoli seeds, which has greatly improved the stability of the active ingredients of it, and has established high-content glucoraphanin broccoli breeding bases in Yunnan and other places, in order to provide consumers with better quality and more stable products.



Product Introduction

Main component

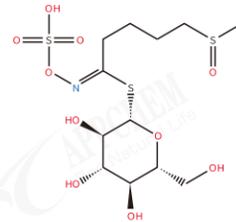
Glucoraphanin

Glucoraphanin features light yellow powder and it is soluble in water, methanol and other solvents and unstable under conditions such as acid, light or high temperature. Glucoraphanin can be degraded into physiologically active radish under the action of intestinal flora or myrosinase Sulfane.

molecular formula: $C_{12}H_{23}NO_{10}S_3$

molecular weight: 437.51

Structural diagram of glucoraphanin:



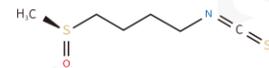
Sulforaphane

Sulforaphane is a sulfur-containing compound, which is produced under the action of intestinal flora or myrosinase Sulfane. It is the main active component of broccoli extract. It is yellow or white liquid at room temperature and it is insoluble in water, but easily soluble in methanol, dichloromethane, acetonitrile and other organic solvents, and easily decomposed under high temperature and alkaline conditions.

molecular formula: $C_6H_{11}NOS_2$

molecular weight: 177.29

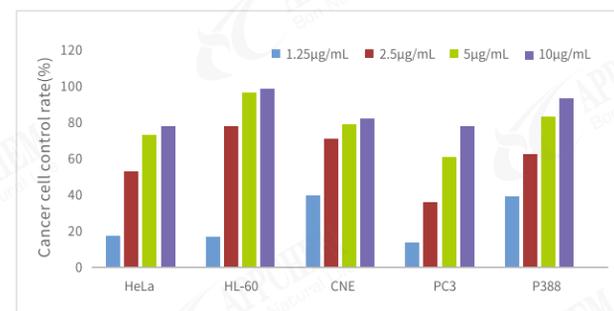
Structural diagram of glucoraphanin:



Health Benefits - Illustrated with Sulforaphane

1 Anti-cancer

Sulforaphane can significantly inhibit a variety of tumor cell lines (human cervical cancer HeLa cells, human myelocytic leukemia HL-60 cells, human nasopharyngeal carcinoma CNE cells, mouse leukemia P388 cells, human prostate cancer cells PC3 cells, human breast cancer cells Cancer MCF-7 cells), and the inhibitory effect showed a significant dose-dependent^[1]. Studies have found that sulforaphane can inhibit the activity of phase I enzymes and reduce the carcinogenic activity of carcinogenic components; enhance the activity of phase II enzymes and promote the metabolism and excretion of carcinogenic factors. At the same time, sulforaphane can induce cancer cell apoptosis, cytostatic effect and can effectively prevent and treat cancer by inhibiting the formation of blood vessels of cancer cells, preventing the deterioration of cancer cells and inhibiting the metastasis and spread of cancer cells.



Inhibitory effect of sulforaphane on various cancer cells

2 Central nervous health

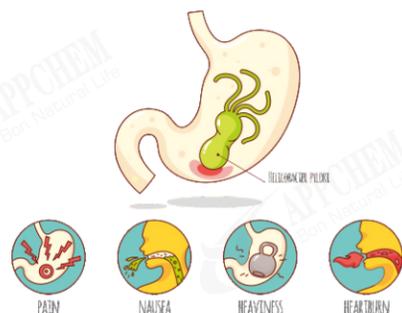
Sulforaphane can remarkably improve mental diseases such as Alzheimer's disease, schizophrenia, autism and intelligence improvement. Studies have found^[2] that sulforaphane can improve various psychiatric diseases through different ways, such as relieving Alzheimer's disease by promoting the clearance of amyloid beta protein peptides; regulating the levels of glutamate and BDNF to improve mental health Schizophrenia; improving autism by up-regulating genes that protect against oxidative stress, inflammation and DNA damage.



3 Gastrointestinal tract protection

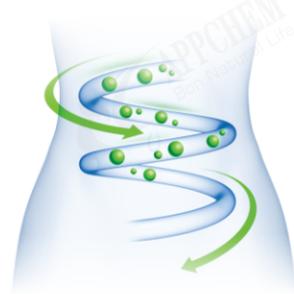
Protect the stomach

Sulforaphane can not only effectively inhibit the proliferation of Helicobacter pylori (HP), but also reduce the oxidative stress damage and mitochondrial damage of gastric mucous epithelial cells caused by HP, and reduce the activation of NLRP3 inflammasome by enhancing the activity of antioxidant enzymes. Thereby it plays a vital role in protecting the stomach^[3].



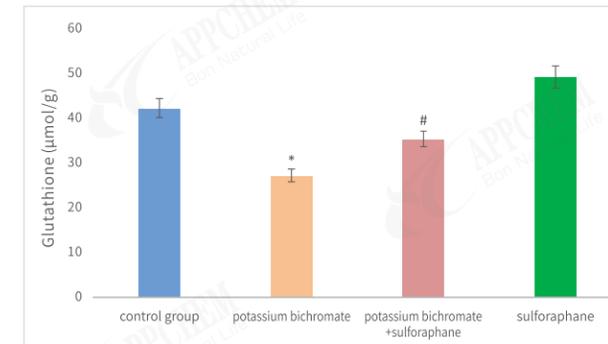
Protect the gut

SFP can up-regulate the expression of IκB-α protein, down-regulate the expression of NLRP3, inhibit the activity of NF-κB^[4], and alleviate DSS-induced acute colon inflammatory injury by reducing the level of intestinal inflammation.

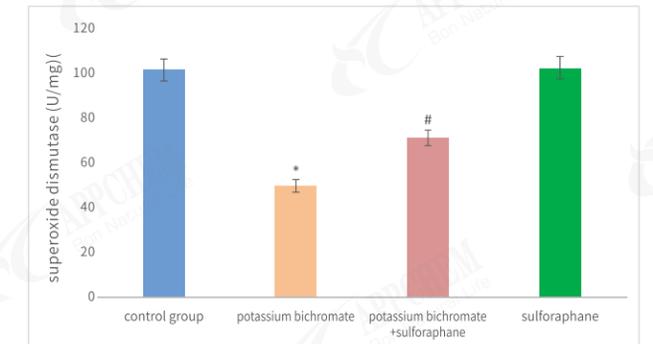


4 Antioxidant / Anti-ageing

Sulforaphane has good antioxidant and anti-aging properties. It can effectively inhibit the increase of malondialdehyde and the decrease of glutathione and superoxide dismutase (SOD) levels caused by potassium dichromate, while taking it alone has no negative effect on various indicators of the human body^[5]. Therefore, the antioxidant capacity of sulforaphane can be improved by activating the body's own antioxidant enzyme activity, thus reducing the damage of free radicals and other harmful substances to the body. Consequently, it can leverage its role in anti-ageing.



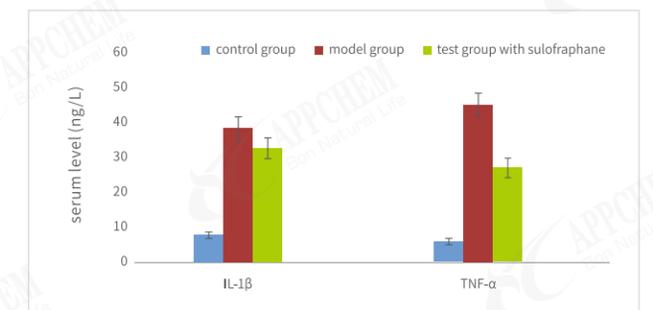
The effect of sulforaphane on glutathione



Effects of sulforaphane on superoxide dismutase

5 Anti-inflammation

Sulforaphane has anti-inflammatory properties. It can regulate Nrf2 channel and TLR4/NF-κB signaling pathway^[6], reducing the levels of pro-inflammatory factors such as interleukin-1β and TNF-α.



Anti-inflammatory comparison of sulforaphane

Product Specifications and Applications

source	production	specification	form	application
broccoli seeds	glucoraphanin	10%	light yellow powder	functional food, beverage, general food
		13%		
		20%		
		50%		
	sulforaphane	10%	light white powder	

References

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- [3] Fahey J W , Stephenson K K , Wade K L , et al. Urease from Helicobacter pylori is inactivated by sulforaphane and other isothiocyanates[J]. Biochemical & Biophysical Research Communications, 2013, 435(1):1-7.
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- [6] Harvey C J , Thimmulappa R K , Sethi S , et al. Targeting Nrf2 Signaling Improves Bacterial Clearance by Alveolar Macrophages in Patients with COPD and in a Mouse Model[J]. Science Translational Medicine, 2011, 3(78):78-109.