



sprouts

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Cruising Review

Sprouts: Publications and Research from SwissMixIt



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PDF Version of the webpage (first pages)

Sprouts Botanical Information

Edible sprouts with germinating seeds of a few days of age are naturally rich in nutrients and other bioactive compounds. Among them, the cruciferous (Brassicaceae) sprouts stand out due to their high contents of glucosinolates (GLSs) and phenolic compounds. In order to obtain sprouts enriched in these phytochemicals, elicitation is being increasingly used as a sustainable practice. Besides, the evidence regarding the bioavailability and the biological activity of these compounds after their dietary intake has also attracted growing interest in recent years, supporting the intake of the natural food instead of enriched ingredients or extracts. sprouts, Brassicaceae, elicitation, growing conditions, broccoli, radish, kale pak choi, isothiocyanates, whole grain, germination, phytochemical, health, microbiological safety, chemoprotection, glucosinolates, isothiocyanates, sulforaphane, glucoraphanin, Brassica oleracea, myrosinase, epithiospecifier protein, Proteasome, Oxidative stress, Nrf2, NF- κ B, HDAC, additives, cosmetics, black soybean sprouts, anti-oxidation, whitening

Keywords: sprouts, Brassicaceae, elicitation, growing conditions, broccoli, radish, kale pak choi, isothiocyanates, whole grain, germination, phytochemical, health, microbiological safety, chemoprotection, glucosinolates, isothiocyanates, sulforaphane, glucoraphanin, Brassica oleracea, myrosinase, epithiospecifier protein, Proteasome, Oxidative stress, Nrf2, NF- κ B, HDAC, additives, cosmetics, black soybean sprouts, anti-oxidation, whitening

Description and Research Abstract: Edible sprouts with germinating seeds of a few days of age are naturally rich in nutrients and other bioactive compounds. Among them, the cruciferous (Brassicaceae) sprouts stand out due to their high contents of glucosinolates (GLSs) and phenolic compounds. In order to obtain sprouts enriched in these phytochemicals, elicitation is being increasingly used as a sustainable practice. Besides, the evidence regarding the bioavailability and the biological activity of these compounds after their dietary intake has also attracted growing interest in recent years, supporting the intake of the natural food instead of enriched ingredients or extracts.

Broccoli is an edible plant which is classified under the italic cultivar group of species *Brassica oleracea*. It is a type of cruciferous vegetable and belongs to family Brassicaceae. It was originated in Italy about 2000 years ago. The word broccoli comes from the Italian plural of broccolo, which means the flowering crest of a cabbage and is the diminutive form of brocco, meaning small nail or sprout. Broccoli has large green flower head which is arranged like a tree like structure branching out from a thick edible stalk. Broccoli resembles a cauliflower and has been considered a uniquely valuable food among Italians.

Blue light in the cultivation of red clover sprouts had the most beneficial effect on the increase of carotenoids content and amounted to 42% in β -carotene, 19% in lutein, and 14% in zeaxanthin. It confirms that modelling the content of carotenoids is possible using UVA and blue light (440 nm) during seed cultivation. An increase in the content of β -carotene and lutein in red clover sprouts was obtained in comparison to the test with white light without PEF pre-treatment, respectively by 8.5% and 6%. At the same time a 3.3% decrease in the content of zeaxanthin was observed. Therefore, it can be concluded that PEF pre-treatment may increase mainly the content of β -carotene.

Unexpectedly, 3-day-old sprouts of cultivars of certain crucifers including broccoli and cauliflower contain 10–100 times higher levels of glucoraphanin (the glucosinolate of sulforaphane) than do the corresponding mature plants. Extracts of 3-day-old broccoli sprouts (containing either glucoraphanin or sulforaphane as the principal enzyme inducer) were highly effective in reducing the incidence, multiplicity, and rate of development of mammary tumors in dimethylbenz(a)anthracene-treated rats. Notably, sprouts of many broccoli cultivars contain negligible quantities of indole glucosinolates, which predominate in the mature vegetable and may give rise to degradation products (e.g., indole-3-carbinol) that can enhance tumorigenesis. Hence, small quantities of crucifer sprouts may protect against the risk of cancer as effectively as much larger quantities of mature vegetables of the same variety.

Broccoli (*Brassica oleracea* var. *italica*), a member of Cruciferae, is an important vegetable containing high concentration of various nutritive and functional molecules especially the anticarcinogenic glucosinolates. The sprouts of broccoli contain 10–100 times higher level of glucoraphanin, the main contributor of the anticarcinogenesis, than the edible florets. Despite the broccoli sprouts' functional importance, currently available genetic and genomic tools for their studies are very limited, which greatly restricts the development of this functionally important vegetable.

One of them is sulforaphane (SFN), an isothiocyanate present in cruciferous vegetables. SFN activates the antioxidant and anti-inflammatory responses by inducing Nrf2 pathway and inhibiting NF- κ B. It also has an epigenetic effect by inhibiting HDAC and DNA methyltransferases and modifies mitochondrial dynamics. Moreover, SFN preserves proteome homeostasis (proteostasis) by activating the proteasome, which has been shown to lead to increased cellular lifespan and prevent neurodegeneration.

Broccoli sprouts are natural functional foods for cancer prevention because of their high content of glucosinolate and antioxidant. Sprouts and mature broccoli are of potential importance in devising chemoprotective strategies in humans.

This study is focused on antioxidant and anticancer capacity of bread enriched with broccoli sprouts (BS) in the light of their potential bioaccessibility and bioavailability. Generally, bread supplementation elevated antioxidant potential of product (both nonenzymatic and enzymatic antioxidant capacities); however, the increase was not correlated with the percent of BS. Our data confirm chemopreventive potential of bread enriched with BS and indicate that BS comprise valuable food supplement for stomach cancer chemoprevention.

The sulforaphane content in seeds and sprouts ranged from 273 to 3632 μ g g⁻¹—the highest values were found in seeds and the 8- and 11-day-old sprouts. The results suggest that the broccoli sprouts are a rich source of nutrients and phytochemicals, these have a high potential as functional food.

Seeds and sprouts from legume crop plants have received attention as functional foods, because of their nutritive values including amino acid, fibre, trace elements, vitamins, flavonoids, and phenolic acids. Consumption of seeds and sprouts has become increasingly popular among people interested in improving and maintaining their health status by changing dietary habits. The seeds and sprouts are excellent examples of functional food defined as lowering the risk of various diseases and/or exerting health promoting effects in addition to its nutritive value.

Edible sprouts are phytonutrient-rich plant foods, good source of flavonoids, other polyphenols, glucosinolates, isothiocyanates, proteins, minerals and vitamins. The increasing consumption of sprouts requires optimisation of their quality, palatability and bioactivity. Multiple genetic and environmental factors (growth conditions, stress, elicitors) affect the production and accumulation of phytochemicals in these foods, offering the basis for further research on the improvement of the nutritional and health-relevant functional value of edible sprouts.

Cowpea (*Vigna unguiculata*), is an important arid legume with a good source of energy, protein, vitamins, minerals and dietary fibre. Sprouting of legumes enhances the bioavailability and digestibility of nutrients and therefore plays an important role in human nutrition.

Active ingredients in different lengths of black soybean sprouts were extracted with water. Concentrations of the main proteins and polysaccharides were determined by the Forint phenol assay and phenol-sulfuric acid assay, respectively. Anti-oxidizing capacities of the extracts were measured in vitro using the DPPH scavenging test and whitening capacity was measured in vitro using the tyrosinase inhibition test. No signs of allergic reactions were observed in the human patch tests. The optimum extract was obtained from bean sprouts grown to 0.5 cm. Extracts of black bean sprouts are safe and can be used as additives in anti-aging and whitening cosmetic products.

Vegetable sprouts are a very rich source for vitamins and physiologically active secondary metabolites. Cosmetic ingredients based on sprouts of different vegetables have been found to exert specific benefits in the skin. An active prepared from garden cress sprouts was shown to work as a general anti-aging ingredient by stimulating the cell's own defense system against free radicals. An extract of mustard sprouts, known to stimulate blood circulation, was found to increase the lip volume after topical application, and a preparation of sunflower sprouts turned out to be efficient in enhancing the cellular energy in the skin.
