

Flaxseed, its Lignans Content and their Effect on Hormonal Cancers in Humans

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Abstract

The purpose of this review is to investigate the properties of using flaxseed as one of the important sources of antioxidants and anti-cancer. Nowadays flaxseed is very popular in terms of oil, fiber, essential amino acids and lignans. In addition, flaxseed is also very important in animal nutrition. Flaxseed has been identified as the main source of secoisolariciresinol diglucoside (SDG); one of the plants phytohormones that has a phytoestrogenic effect in the human body and can affect the process of cell division and proliferation. Therefore, lignans in flaxseed can somewhat reduce the risk of hormonal cancers in humans.

Keywords: Flaxseed; Secoisolariciresinol diglucoside; Lignans; Cancer

Introduction and Discussion

Flax (*Linum usitatissimum* L.) is one of the oldest known useful plants from the Linaceae family, which is distributed almost on whole the world [1]. The main purposes of the cultivation of this plant are the production of fiber and oil. Flaxseed oil has a large amount of α -linolenic acids (ALA 18:3n-3) and other unsaturated fatty acids. Also, the plant is a rich source of micronutrients, dietary fiber, protein, vitamin B1 and lignans [2]. Lignans are actually a large collection of plant anti-cancers, a class of diphenolic nonsteroidal phytoestrogens with a wide variety of health benefits. Different types of lignans have been reported in various plant species, but in flax, lignans are usually found glycosylated in oligomeric chains like secoisolariciresinol diglucoside (SDG), and aglycone (SECO) [3,4]. Flax lignans are natural phytoestrogens for which a positive role in metabolic diseases is emerging. The content of lignans in flax is about 75 to 800 times more than cereal grains, legumes, fruits and vegetables [5]. Various studies have shown that SDG offers several health benefits, including protective effects against cardiovascular

diseases, diabetes, cancer, and mental stress. These health benefits have been attributed to the antioxidant properties of SDG [6]. In fact, SDG is formed from the glycosylation of SECO as a precursor with the help of UGT family genes, and therefore the highest amount of lignan percentage in the matured seed is SDG, the final process of its formation is shown in Figure 1. Some useful SDGs have been attributed to their antioxidant properties. Use of SDG to eliminate hydroxyl radicals may contribute to treat cancer and lupus nephritis [7]. SDG and its metabolites have also been shown to prevent DNA damage and lipid peroxidation [8]. The antioxidant activities of SECO, SDG END and ENL were shown to be involved in hypocholesterolemia and anti-atherogenic [9]. In addition, a recent study comparing flaxseed oil and flaxseed lignan showed that SDG can prevent metabolic-related crises [8,9]. In addition, SDG inhibited radiation-induced HOCl Physiological solutions, and a synthetic SDG (LGM2605) was proposed as an amplifier of stress-induced tissue damage [10].

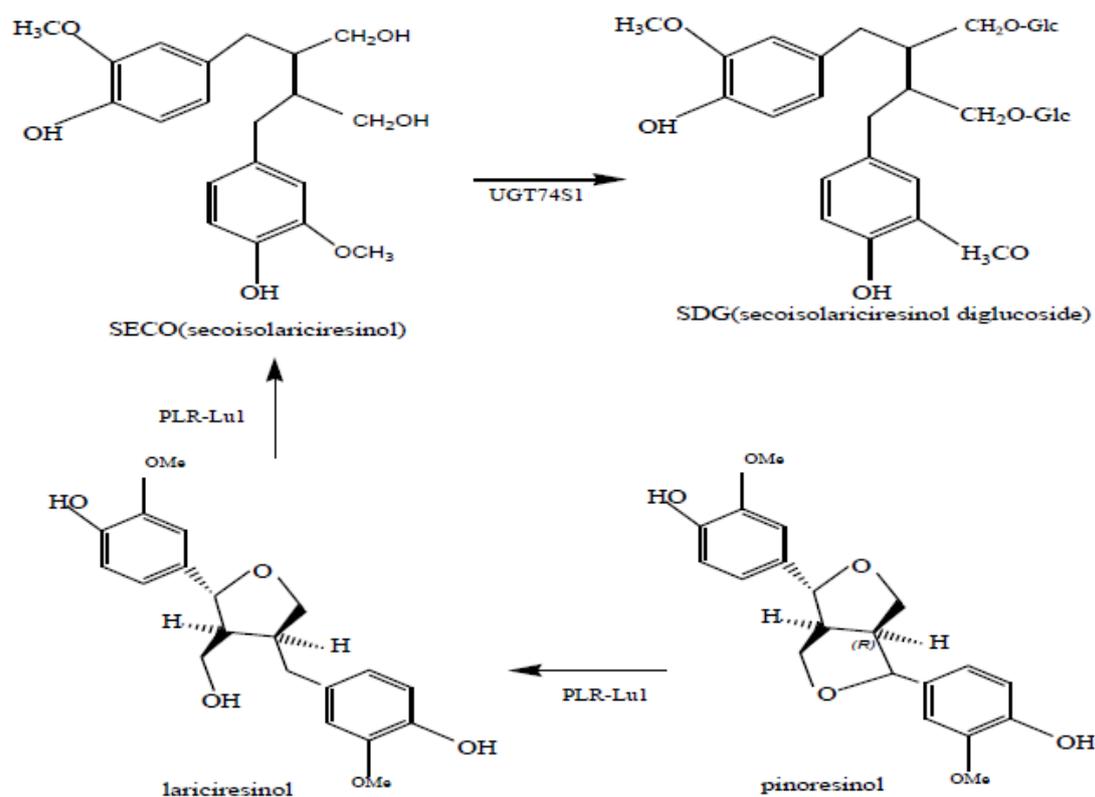


Figure 1: The cycle of lignan biosynthesis in flaxseed.

The reason for the importance of lignans, especially SDG in flaxseed, is their antioxidant properties, because this antioxidant is able to scavenge hydroxyl radicals and might contribute to treat cancer and lupus nephritis [11]. Also, secoisolariciresinol diglucoside was suggested to work against breast cancer owing to its regulation of the expression level of zinc transporters since the concentration of zinc is higher in breast cancer cells than in the normal breast cells [12]. Moreover, the lignans in flax have a high ability to suppress the proliferation, migration and metastasis of cancer cells, especially in breast tumors [13]. The amount of lignan in flaxseed depends on the plant growth conditions as well as the seed coat color. The seeds have two main colors, yellow and brown, and the number of secondary metabolites in the seeds with brown seed coat color is more than yellow seeds. In addition, the lignin content in plants that grow in dry areas or under water stress conditions, is more than that in temperate regions; therefore, there is much lignin content in brown seeds grown in low humidity conditions [14].

Conclusion

Flax is one of the most important sources of lignans and the consumption of lignans in the human diet is really vital. The main lignans in flax are SDG and SECO. Lignans with their phytoestrogenic effect have a great influence on reducing the risk of developing and advancing hormonal cancers.

Acknowledgment

None.

Conflict of interest

No conflict of interest.

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