

ONION PEEL POWDER: SOURCE OF BIOACTIVE ANTIOXIDANT PHENOLIC QUERCETIN DERIVATIVES

Ozlem TOKUSOGLU^{1,2}

Abstract

Functional food progression and by-product/ waste management is rapidly increasing as a result of consumer consciousness regarding healthy and nutritious foods/ drugs and value-added products. Onion peel or skin is a by-product obtained from onion processing that includes various phytochemicals, contributing to its antioxidant potential. Researches have confirmed that onion peel is a more concentrated source of phytochemicals than edible flesh, with quercetin as the major phenolic constituents in onion peel. Besides, quercetin 3,4'-diglycoside, quercetin, protocatechuic acid, kaempferol, 2-(3,4-dihydroxybenzoyl)-2,4,6-trihydroxy-3(2H)-benzofuranone, isorhamnetin, quercetin-7,4'-diglycoside, isorhamnetin-3,4' diglycoside, quercetin-3-glycoside, quercetin-4'-glucoside, isorhamnetin-4'-glycoside, protocatecoyl quercetin, quercetin dimer 4'-glycoside, quercetin dimer hexoside, quercetin dimer, and quercetin trimer have been identified in onion skin. The presence of all those bioactives confers on onion peel its various therapeutic influences in preventing cancer (CA), diabetes, obesity, cardiovascular disorders, neurodegenerative problems, possible microbial detriment and erectile dysfunction. In this context, onion peel in the form of powders or extracts can be employed in diversified industries as a therapeutic and pharmaceutical agent.

Keywords: Key Words: Onion, Onion Peel, Quercetin, Quercetin Glycosides, By-Product, Waste

Introduction

Dried onion (*Allium cepa* L., Alliaceae) and dried onion peel powder; They are the dried and ground forms of the products obtained as a result of production using fresh onions. Spring onions contain approximately 91% water before they are dried. By drying, the water content in the dried fresh product is reduced to very low values. 20-30 grams of 1 kg of medium-sized onion is onion peel (1).

The annual level of onion by-products produced in the European Union Countries is estimated to be approximately 450,000 tonnes. Onion peels, the major by-products obtained by industrial peeling of onions, have brownish skin; It consists of two watery layers: upper and lower. It has strong odor and flavor characteristics; It is not suitable to use onion waste peels as feed because onion peels, in addition to being a source of flavor components and fiber compounds, are very rich in quercetin glycosides. Onion peel also contains vitamin C (ascorbic acid), Vitamin E and B group vitamins. Besides being a source of carotenes, onion peel is rich in potassium (K), manganese (Mn) and phosphorus (P) minerals (1).

Onion Peel Phytochemicals and Bioactives

The antioxidant major flavonoids present in onion peels, especially quercetin 3,4',O-diglucoside and quercetin 4,O-monoglucoside, constitute 85% of the total flavonoids. Quercetin taken from onion consumption is rapidly absorbed and slowly eliminated; Therefore, it shows significant antioxidant activity. In addition, onion core and onion skins (in terms of their upper and lower parts) are important sources of prebiotic fructans and fructooligosaccharides (FOS); Food supplements, alcohol and snacks can be produced from onion powder (1,2) (Table 1; Figure 1.)

General Health Effects of Onion Peel

It has been revealed that onion peels are an important source of antioxidants due to the powerful flavonoids and flavonols they contain, and it is stated that they help prevent the risk of cardiovascular diseases by accelerating blood flow (1).

Onion peels have antibiotic, antiseptic and antioxidant effects, have anti-inflammatory

properties, support muscle development and a very important feature is that the sulfur (S) in onions triggers collagen production.

It is reported that consuming raw onions and onion peels can help produce high-density fatty protein and balance cholesterol. In a related study, it was found that cholesterol was balanced in 30% of individuals who consumed onion peels for a certain period of time (1,2).

Scientific research has determined that onion has antibacterial properties. The high level of sulfur (S) in onion juice increases blood circulation. Onion and onion peel improve blood flow and therefore can help improve hair follicles; Its healing effects have been determined on dermatitis, dandruff, seborrhea and scalp irritations. Due to its sulfur content, it has been shown that onion peel strengthens hair follicles and accelerates hair growth (1).

It is reported that onion juice has a therapeutic effect against chocolate cyst (endometriosis) and myoma formations in women and can help in the treatment of polycystic ovary syndrome.

Quercetin is effective in inhibiting allergic reactions and chronic inflammation, and it has been reported that quercetin is effective in helping prevent the oxidation of fatty acids in the body.

Studies have shown that the minerals contained in onion peel balance blood pressure and have therapeutic properties for blood pressure patients (1,2).

Protective Health Effects of Onion Peel Against Types of Cancer and Type-2 Diabetes

It has been found that onion peel is effective in helping prevent colon cancer and Type-2 diabetes. It is emphasized that the risk of developing colon and ovarian cancer is lower with the consumption of onion peels, which have high quercetin content.

Consumption and Usage Methods

Onion peels can be turned into powder (powder) form and consumed in salads and meals. It is also suggested that onion peels can be used in ready-made soup mixtures, chicken, meat and meatball mixtures, ravioli and flour.

The separated onion peels can be consumed by washing and cleaning in cold water and then boiling them in boiled water for 5 minutes (1,2).

The easiest method to extract the nutritional ingredients in onion peels is to add the peels to soup or sauce and cook over low heat. After the food or sauce is cooked, the shells are removed, and with the effect of heat treatment, the food components and bioactives in the shell can be transferred to the food / sauce.

Onion peels boiled for 5 minutes through a tea ball strainer can be consumed as tea; The product, boiled for 15-20 minutes and filtered, has a positive effect on leg cramp problems. After boiling 30-35 g of onion peel in 1 glass of water and straining, the washed hair is dyed naturally and brightly (1,2).

References

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Table 1. Contents of Total Phenolics (mg GAE g⁻¹ DM), Flavonoids (mg QE g⁻¹ DM) and Flavonols (mg g⁻¹ DM), and Antioxidant Capacity (µmol Fe⁺² g⁻¹ DM) in Whole Onion and Its Industrial Onion Wastes

	Whole Onion	Inner Scales	Outer Scales	Top-Bottom	Brown Skin
Total phenolics	17.3 ± 1.3 ^a	9.4 ± 0.6 ^b	19.7 ± 1.6 ^a	30.5 ± 2.0 ^c	52.7 ± 0.9 ^d
Total flavonoids	10.3 ± 0.3 ^a	7.0 ± 0.1 ^b	19.5 ± 0.7 ^c	25.9 ± 0.7 ^d	43.1 ± 1.8 ^e
Total flavonols	8.84 ± 1.41 ^c	6.19 ± 0.23 ^b	19.27 ± 1.42 ^e	15.29 ± 1.39 ^d	7.89 ± 0.37 ^a
Quercetin 4'-glucoside	4.02 ± 0.53 ^a	2.00 ± 0.07 ^b	7.37 ± 0.53 ^d	6.35 ± 0.60 ^c	5.16 ± 0.34 ^c
Quercetin 3,4'-diglucoside	3.10 ± 0.68 ^a	3.70 ± 0.11 ^a	9.49 ± 0.68 ^d	5.90 ± 0.50 ^c	0.30 ± 0.03 ^b
Quercetin	0.91 ± 0.04 ^c	0.02 ± 0.00 ^b	0.59 ± 0.04 ^a	1.21 ± 0.09 ^d	1.61 ± 0.02 ^a
Quercetin 3-glucoside	0.16 ± 0.03 ^a	0.10 ± 0.01 ^b	0.42 ± 0.03 ^d	0.40 ± 0.03 ^d	0.31 ± 0.01 ^c
Isorhamnetin 3,4'-diglucoside	0.12 ± 0.02 ^b	0.12 ± 0.01 ^b	0.37 ± 0.02 ^c	0.57 ± 0.04 ^d	0.19 ± 0.01 ^a
Isorhamnetin 4'-glucoside	0.53 ± 0.07 ^c	0.25 ± 0.01 ^b	1.03 ± 0.07 ^a	0.86 ± 0.07 ^d	0.32 ± 0.02 ^a
Ratio Di:Mon ^f	1:1.3	1.8:1	1.3:1	1:1.1	1:17
Antioxidant activity (FRAP)	83.5 ± 1.8 ^a	28.7 ± 1.7 ^b	105.1 ± 0.6 ^c	156.1 ± 1.6 ^d	227.8 ± 3.2 ^e

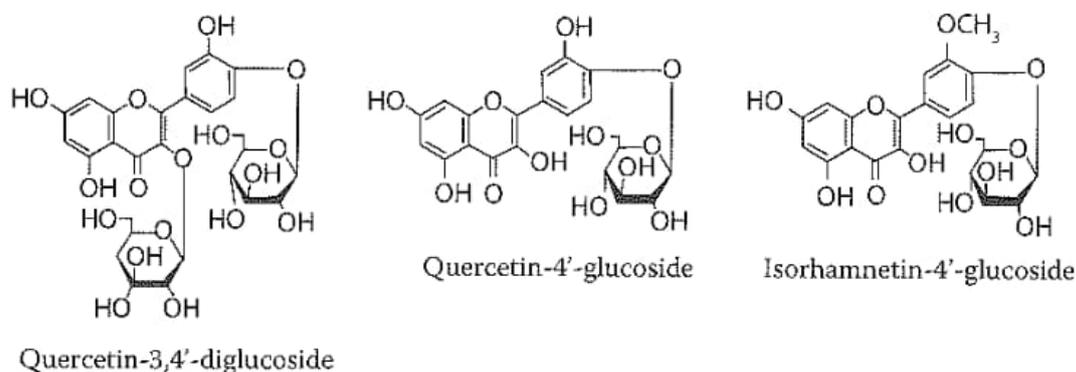


Figure 1. Quercetin Glycosides in Onion Peel Powders