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Onion Peels: Review on Composition and Wellness

Dr. Sankar Prasad Paik

Associate Professor Department of Chemistry Sundarban Mahavidyalaya Kakdwip, 743347, West Bengal, India

paik.sankar@gmail.com

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ABSTRACT:

Onion is one of the most consumed foods in the world. Gradually the demand of onion in the Globe increases due to increasing in population, agricultural-based industries, hotels and restaurant businesses etc. That used onion generates a huge amount of waste from their peels and unused part of onion. The dry skin of onion (peels) is thrown out in the land which creates a huge problem in solid waste management. With the rise in the discourse around zero-waste cooking, more and more people are looking for alternatives to use the peels and skins of vegetables that are often tossed out in the making. Brown onion skin and also the external layers are rich in fiber, polyphenolics compounds, flavonoids and the discarded bulbs contain sulfur compounds and fructans. Flavonoids are polyphenolic compounds that may improve cholesterol levels and also have different biological prosperities. The flavonoids can improve the bad cholesterol or low-density lipoprotein in people suffering from obesity. The brown skin of onion (peels) could be used as a functional ingredient in dietary foods with high functional value because this is rich in compounds that can provide benefits for human health. In this review, we mainly highlight the chemical components present in dry onion skins and how it can be used for wellness and be a part of circular economy.

Keywords: Onion waste, Chemical Composition, Polyphenolic compounds, Flavonoids and Wellness.

Introduction:

According to Mary Ann Lila, Director the Plants for Human Health Institute at North Carolina State University; "**Plants are the master chemists,**" Because plants can't move around, they have to manufacture what they need, not merely to grow, but to defend, protect, and heal themselves. It makes sense that the compounds plants produce in response to stress would help a human under similar circumstances (surroundings) (Quintero and Cárdenas. 2021).

Onion (*Allium cepa* L) is the most common vegetable used in kitchens for preparing most of the dishes in a day. Imagine how many onions are used worldwide and how much onion skin is trashed out. Onion is quite a versatile vegetable and is beneficial in so many (Sidhu et al. 2019). Not only it enhances the flavour of a dish, but it is also known for its medicinal properties (Maritinez and Villamiel. 2012). It can be consumed either in cooked form or even in raw form. We have always believed that onion peels are of no use. With the rise in exchange of ideas around zero-waste cooking, more and more people are looking for alternatives to use the peels and skins of vegetables that are often tossed out in the making. Interestingly, the concept of zero-waste cooking is not alien to India. Indians have been expert at using every part of the vegetable in their diet - from pulp to skin, even the root, stem, and leaves of the plants are not spared in Indian cooking. Most of us have used potato skins and carrot skins to make a quick stir-fry or sabzi. Similarly, when you are chopping onions, you need not discard the skins at once, you can use the peels to brew yourself an amazing detox tea. The literature survey provides complete knowledge that the onion peels are more nutritional as compared to the onion itself (Mounir et al. 2023). Onions are rich in bioactive compounds and have been found to prevent various chronic diseases, including obesity (Stoica et al. 2023). Literature reveals that in China, onion tea has been recommended for several pathologies, such as fever, headache, cholera and dysentery and even in northern India onion be used for preventive measure of heat wave. Evidence comes from several investigations suggests that the biological and medicinal activity of onion are mainly the high content of organo-sulphur compounds (Nakayama et al. 2020).

Due to increasing population, onion waste generation has risen over the recent years. More than 500,000 tons of onion waste is generated in the European Union in a year, above all in Spain, Holland, and the United Kingdom, where it has become an environmental problem. The onion waste includes the dry brown skin, the outer layers, roots, and stalks, as well as onions that are not big enough to be of commercial use or onions that are damaged. India is the second-largest onion producer globally and about 2.3 to 4.5 million tons of onion peels are produced per year in India. The literature survey reveals that the onion peels provide a wealthy source of plant compounds called flavonoids which are used in wellness.

Several scientists and researchers in the Globe concluded that onion skin (peels) have been used as a functional food ingredient. Several studies have

claimed that onion brown skins are highly rich in antioxidants, fiber, vitamins A, C, and E, and heart-friendly flavonoids (Kumar et al. 2022). The discarded bulb of onion contains organo-sulfur compounds, which have several health benefits. Onion skins can show to be beneficial for boosting immunity promoting heart health and maintaining blood sugar levels and fructans (Gupta et al. 2025). All of these substances are beneficial to health. A literature survey reveals that Flavonoids are polyphenolic compounds that may improve cholesterol levels. According to one study, flavonoids can improve the bad cholesterol or low-density lipoprotein in people suffering from obesity. According to the study, the onion brown skin could be used as a functional ingredient high in dietary fiber (principally the non-soluble type) and phenolic compounds, such as quercetin and other flavonoids (plant metabolites with medicinal properties). The two outer fleshy layers of the onion also contain fiber and flavonoids. Eating of onion peels reduces the risk of suffering from cardiovascular diseases, gastrointestinal complaints, colon cancer, type-2 diabetes, and obesity (Mounir et al. 2023).

The Composition of onion peels

On literature survey reveals that the Onion waste (Peels) contains 88.56% carbohydrates, 0.88% of protein and dietary fiber 0.15%. In addition, the peel also a rich source of calcium (1.8–16.5 mg/g), potassium (11.1–15.9 mg/g), zinc (0.0162–0.0538 mg/ g), magnesium (0.6–1.5 mg/g), manganese (0.0065–0.0288 µg/g), iron (0.0196–0.8889 mg/g), selenium (0.00003–0.00093 µg/g), phenolic compounds (9.4–52.7 mg) gallic acid and flavonoids (Srinivasan. 2014). Onion includes several compounds of sulfur including thiosulphine, thiosulfone, S-oxide, cepain, and S-dioxide as well as mono-, di-, and disulfide. Onions contain a number of vitamins (B₂, C, and B₁), (Kumar et al. 2022, Sagar et al. 2022).

The name and structure of different bioactive polyphenolic compounds which are obtainable in onion peels are as follow (Ren and Zhou. 2021) Figure-1.

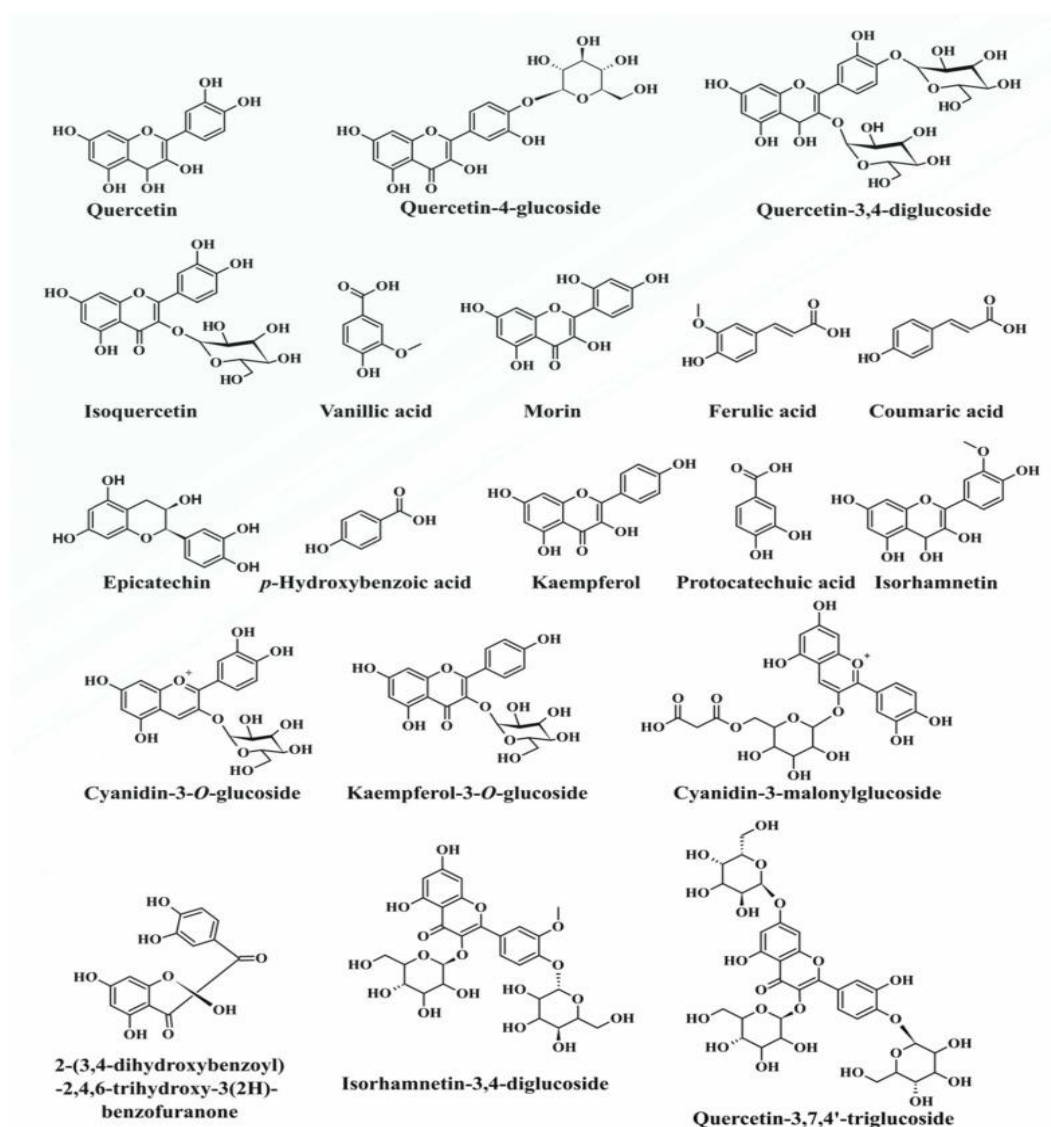


Figure –1: Different bioactive polyphenolic compounds available in Onion peels.

Application of onion peels and wellness

On literature survey, Onion peels can be used in the following ways and have good health implications.

- **For Oral and Dental Health**

Since onion peels have antibiotic effects as well as antioxidant properties. It is good for teeth as well gum care. Onion peels prevent cavities and help in getting rid of bacteria present in the mouth (Jokovic et al. 2024).

- **Clears Throat Path**

Onion peels contain germicidal substances and do the task of clearing inflammation in the throat pain. Besides, it can also help in getting rid of respiratory problems. Especially in winter, it can help in getting rid of throat infections.

- **Cardio Vascular Diseases**

Biological properties may be associated with its alkyl cysteine sulfoxide content as well as its polyphenolic compounds available in onion peels, especially quercetin and its derivatives (Tanomrat et al. 2025). The anti-aggregation activity of the extract was correlated with that of its main component. The phenolic compound called quercetin beside that the extract of onion peels rich in calcium, sodium, potassium and other minerals which stimulate the cardio-vascular activities (Mustafa et al. 2025). Onions contain flavonoids which are used for treatment and prevention of heartburn and cardiovascular disease (Beata Olas. 2019). Quercetin reduces blood pressure in hypertensive subjects, activates platelets, and shows cardiovascular benefits. Onion includes several compounds of sulfur including thiosulphine, thiosulfone, S-oxide, cepain, and S-dioxide as well as mono-, di-, and trisulfide (Nakayama et al. 2020). Onions contain a number of vitamins (B₂, C, and B1), selenium, and potassium (Chakraborty et al. 2022). Onions can cure diabetes mellitus, CVDs, and stomach cancer. Atherosclerosis or inflammation of the vascular system, leading to coronary heart disease, hypertension, and stroke is commonly associated with elevated cholesterol level (Chakraborty et al. 2022).

- **Add Smokiness**

Smoked spices are popularly used to add some heat and depth to foods. Onion ash can be prepared by roasting onion peels in the oven till they turn dark (almost black) in color and then grinding them to make a fine powder and sprinkle away. Figure-2 is representing the types of onion peels



Figure-2 : Onion peels

- **Wound Healing**

Prostaglandins, β -sitosterol, kaempferol, myricic acid, and ferulic acid are contained in the *A. cepa* bulb. Onion is commonly used to make Ayurvedic wound curing formulations. Onion peels have a cell-repairing effect and can provide immediate cures for aches and wounds (Mounir et al. 2023). Now a day's onion peels can be used in cosmetic industries. The quercetin in the onion peels helps fight off inflammation and free radicals, two things that can contribute to aging, fine lines, and development.

- **Improve Sleep and Relieve Stress**

Onion skin tea is known to soothe the mind and also improve the immune system. Onion tea can be prepared by taking hot water in a cup containing tea bag/green tea leaves and onion peels and letting both seeps for some time. Strain the tea and relax with a healthful cup of tea (Figure-3).



Fig-3: Onion peels tea.

Onion peels have L-tryptophan, which is an amino acid that acts like a natural sedative. Due to the presence of both magnesium and potassium which can help relax your muscles (**Chakraborty et al. 2022; Sagar et al. 2022**). Onions can not only help you fall asleep but can also help to keep you asleep throughout the night. Drinking onion peel tea can calm your nerves and promote good sleep. Onion skins are an excellent source of vitamins, such as vitamins A, vitamin C, and E, so this tea could help boost eyesight and skin too(**Sagar et al. 2022**).

- **Anticancer Effects**

Several studies suggest that *A. cepa* (onions) and its peels have anticancer and similar biological properties, which are reflection to be recognized to the presence of different organ sulfur derivatives, quercetin, flavonoids, polyphenols and its glycosides (**Mounir et al. 2023**). Many cellular experiments and in vivo studies showed that the organ sulfur compounds present in onions peel are powerful anti-carcinogens which are due to their function in the activation of detoxifying enzymes that significantly eliminate cancer-causing substances (**Ali et al. 2022; Jeong et al. 2009; Nakayama et al. 2020**).

- **Thirst with Onion Peel Water**

Onion peel-infused water may provide anti-inflammatory properties and may also take care of the lingering muscle cramps.

- **Soup, Gravy and Flavors Rice**

Add onion peels while boiling soup, stock, and gravies. It will help thicken the gravy and will also infuse a beautiful purple hue into it. It increase the potassium, calcium, magnesium contain in soup and gravy. Biryani, pulao, fried rice, jeera rice - almost all rice dishes can be enhanced by cooking the rice along with a few onion skins.

- **Beneficial for Houseplants**

The onion peels contain so many vitamins. These vitamins are beneficial not only for humans but for plants. The juice of onion peels and put it in your plants, the plant's flowers will look more vibrant and healthier. Most significantly, onion peels can prevent the formation of insects (**Zhang.et.al, 2024**).

CONCLUSION

The food industry generates a huge amount of onion waste and there is a need to search for possible ways of their utilization. The onion peel (dry skin) will be used in the food and pharma industries; due to high content of carbohydrate, flavonoid, polyphenolic compounds, bioactive compounds, vitamins and minerals in it. It may be suggested that after proper cleaning, onion peel may be included in food processing and pharmacy industries and would be part of circular economy instead of discarding it and would be reduced the solid waste management and landfills problem. More and more research work is necessary to utilize the onion waste (peels) in wellness. Lastly recommended that more researcher groups should involved in advanced studies in this field and to explore the capability of onion peel in functional food items and pharmacy also.

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