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Phytochemical analysis of pulverised cabbage (Brassica oleracea) – An *invitro* study

Sandhya A[1], Priyadurairaj[1], Gomathi Kannayiram[2]
[1]Department of Biotechnology, Dr M.G.R Educational and Research Institute, Maduravoyal, Chennai-600095, Tamil Nadu, India. 0000-0003-0814-3383
[1] Department of Biotechnology, Dr M.G.R Educational and Research Institute, Maduravoyal, Chennai-95, Tamil Nadu, India. 0000-0002-7076-6402
[2*] Department of Biotechnology, Dr M.G.R Educational and Research Institute, Maduravoyal, Chennai-95, Tamil Nadu, India. 0000-0002-6247-0070
***Corresponding author**

Dr **Sandhya A[1]**

Assistant Professor,Department of Biotechnology,Dr M.G.R. Educational and Research Institute, Maduravoyal, Chennai-95,Email: sandhya.ibt@drmgrdu.ac.in, Cnt: 8778173146

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Abstract

One of the most important food crops in the world is cruciferous vegetables. Brassicaceae, often known as the Cruciferae family of plants, includes cruciferous vegetables. They are an excellent source of several phytochemicals that may promote health and provide possible protection, such as folic acid, phenolics, carotenoids, selenium, glycosylates, and vitamin C. Including these strong plant-based components in everyday diet is a secure, useful, and accessible strategy to prevent many of the most prevalent illnesses of the present. A cruciferous vegetable for the cold season is cabbage (Brassica oleracea). The goal of the current research is to evaluate the qualitative phytochemical characteristics of cabbage powder. Numerous phytochemicals, including alkaloids, glycosides, flavonoids, saponins, tannins, steroids, terpenes, and phytosterols, are found in the extract of cabbage powder. These vegetables isolated components have a number of significant biological properties, such as anti-diabetic, anti-oxidant, hypolipidemic, anti-hyperglycemic, cardioprotective, and anti-cancer properties. As a result, contemporary medication has several side effects and is not always safer for human intake. Therefore, it is preferable to consume natural foods, which are relatively safe and have no adverse effects.

Keywords: Brassicaceae, Phytochemicals, anti-oxidant, anti-diabetic, anti-hyperglycemic.

Introduction

"Vegetables of the Brassicaceae family, also called cruciferae". Broccoli, Brussels sprouts, kale, mustard, cabbage, turnips, cauliflower, boy choy, and Chinese cabbage are examples of commonly eaten cruciferous vegetables. The stem, root, leaves, seeds, and blossom of certain species are almost all used as food. Crude vegetables are one of the most widely grown food crops in the world. The nutritional value of brassica vegetables is highly respected, as they are a good source of vitamin C and soluble fibre, as well as several other minerals and phytochemicals [1-3]. The substances obtained from plants known as phytochemicals are found in a diet rich in fruits, vegetables, cereals, and plant-based drinks and are thought to be largely responsible for our bodies' ability to fend against illness. Because they include carotenoids, tocopherols, and ascorbic acid, cruciferous vegetables are a strong source of natural antioxidants, according to recent research [4,5]. According to epidemiological research, these substances may aid in defending the body against free radicals. The main benefits of these compounds are their antioxidant properties, which rid our bodies of free radicals and shield us from their damaging effects [6].

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A member of the Brassicaceae family is cabbage. It is a cruciferous vegetable from the cold season. The blooming plant cabbage is a dicotyledonous herbaceous biennial. Green in tint, its leaves are often eaten as salad [11]. Isothiocyanates, vitamins A, B, and C, and anthocyanins are the main "bioactive components of cabbage" [12]. An all-natural pigment found in cabbage called anthocynanins was shown to have the greatest antioxidant properties [13]. Depending on the pH, they are pigments that may dissolve in water. They are potent antioxidants with anti-inflammatory qualities that aid in cellular protection [14].

Polyphenols seem to be one of the "substances that seem to be responsible for the biological activities of cabbage." Antioxidants such as polyphenols are useful in correcting the issues brought on by oxidative stress of the walls of arteries. By reducing the oxidation of LDL cholesterol, you can promote heart health [15]. Additionally, since they have anti-inflammatory effects, they may help with conditions like rheumatoid arthritis that cause persistent discomfort. Many bioactive compounds are present in cabbage [16]. As a result, it is crucial for human therapeutic purposes. Insoluble and soluble fibres may both be found in abundance in cabbage. Insoluble fibres assist in avoiding constipation and lowering the risk of colorectal cancer [17].

The soluble fibre in cabbage lowers blood sugar and cholesterol levels, lowering the risk of diabetes and heart disease [18]. The capacity of cabbage extract to inhibit oxidative stress in vivo, which has been believed to have anticancer characteristics in cabbage, has been shown by several studies [19]. The study's findings imply that higher dietary consumption of cabbage may be advantageous for liver cancer patients as a preventative therapy.

The researchers found that cabbage had a protective effect against hepatocellular carcinoma in rats. According to several studies, cabbage has anti-inflammatory, analgesic, antibacterial, and anti-diabetic properties.

Materials and Methods

Plant material

Cabbage leaves were first shade dried, then hot air oven dried at 50 degrees Celsius, crushed to a fine powder, and then kept in an airtight container for examination.

Extraction process

With a 30:70 ratio of petroleum ether, chloroform, methanol, and water, the coarse powder of cabbage was extracted. Using Whatman filter paper, the extracts of cabbage powder were collected separately. All of the extracts were concentrated, and surplus solvents were vacuum-evaporated.

Qualitative Phytochemical Evaluation – Preliminary analysis

Using the following techniques, all plant extracts were further used to perform chemical tests to check for the presence of the following phytochemicals: phenolic compounds, alkaloids, saponin, glycosides, phytosterols, tannin, flavonoids, steroids, and terpenoids [20].

1. **Alkaloids**

Mayer's test

A drop or two of Mayer's reagent was added along the sides of the test tube to a few ml of filtrate. A precipitate that was white or creamy showed that the test was positive.

Wagner's test

A few drops of Wagner's reagent were added to a few millilitres of filtrate along the sides of the test tube. The test is positive when a reddish-brown precipitate is formed.

2. **Glycosides**

5 ml of Bendict's solution and a few drops of diluted HCl were added to 2 ml of the samples' aqueous extract before being boiled for minutes. As a result of the precipitate turning the solution crimson, glycosides were present.

Brontrager's Test

The presence of glycosides was detected by adding pink colour to the 10% ammonia solution after adding 3 ml of chloroform to 2 ml of filtered hydrolysate and shaking.

3. Terpenoids

Libermann-Burchard's test: 1 ml of petroleum ether extract of the drug in chloroform was mixed with 2 ml of acetic anhydride solution, then 1 ml of strong sulfuric acid. The formation of a violet-coloured ring indicated the presence of terpenoids.

4. Steroids

2 ml of chloroform and concentrated H2SO4 were added to 5 ml of extract. In the lower chloroform layer, if a red colour appears, it indicates the presence of steroids.

5. Saponins

A drop of sodium bicarbonate solution was introduced to a test sample containing 5 ml of an aqueous extract of the medication. After a three-minute wait, the mixture shook ferociously. A honeycomb-like foam started to emerge.

6. Tannins

1-2 ml of plant extract were mixed with a few drops of a 5% FeCL3 solution. Gallotannins were characterised by a green colour, and tannins by a brown colour.

7. Phytosterol

a. Libermann-Buchard's Test: 50 mg of the extract were diluted in 2 ml of acetic acid anhydride. One or two drops of concentrated sulfuric acid were then gently applied to this along the test tube's side. The presence of phytosterols was indicated by a wide range of colour changes.
b. Salkowski's reagent – treated extract: The objects yellowish hue and green fluorescence appearance suggested the presence of phytosterol.

8. Flavanoids

SHONODA TEST: Five to ten drops of diluted HCL and a few bits of magnesium were added to a test tube containing 0.5 ml of an alcoholic extract of the medication. A reddish pink or brown hue is formed, which indicates the presence of flavonoids.

Results and Discussion

In the current research, the phytochemical properties of cabbage powder were analysed. The results of a preliminary phytochemical analysis of cabbage powder extracts showed that they contained a variety of secondary metabolites, including alkaloids, gylcosides, steroids, flavonoids, saponins, tannins, terpenoids, and phytosterols (Tables 1 & 2).

Table 1: Preliminary Phytochemical Screening of Cabbage Powder Extract

Name of the chemical test	Petroleum ether extract	Chloroform extract	Methanol extract	Distilled water extract
Alkaloids	-	-	+	+
Gylcosides	-	+	-	+
Steroids	+	+	+	+
Flavonoids	+	-	+	+
Saponin	+	+	-	+
Tannin	-	-	+	+
Terpenoids	+	-	-	+
Phytosterols	-	-	+	+

Cabbage powder's phytochemical study revealed the presence of a number of different phytochemical components in the powder extract. While several phytochemicals were missing from the petroleum ether, chloroform, and methanol extracts, they were all present in the distilled water extract. These phytochemicals include alkaloids, glycosides, steroids, flavonoids, saponins, tannins, terpenoids, and phytosterols.

While certain phytochemical components were missing from other cabbage powder extracts, all of the phytochemicals were present in the water extract. The estimate of phytochemical components in powder extract revealed that the water extract of cabbage powder was rich in phytochemical components that may aid in the treatment of several diseases. Some phytochemicals were missing from other extracts, which may have been caused by the presence of substances that react with the component and render it invisible. And as a result, the powder had lost the phytochemical component that gave it strength and improved the quality of the powder. As a result, the research showed that cabbage powder has the ability to treat a wide range of illnesses.

Conclusion

Plants have been employed for illness therapy since the beginning of time. As a result, the current research found that cabbage has a variety of advantageous impacts, including all the phytochemical properties. There were discovered phytochemicals that are good for the body. Because of the presence of phytochemicals including alkaloids, glycosides, steroids, flavonoids, saponins, tannins, terpenoids, and phytosterols, the medicinal value of cabbage is increased, and it may be used to treat a variety of disorders. As a result, contemporary medication has several side effects and is not always safer for human intake. Therefore, it is preferable to consume natural foods, which are relatively safe and have no adverse effects.

Authors contribution

The first authors confirm sole responsibility for the following: design, data collection, analysis, and manuscript preparation. The second author confirms the study conception, interpretation of the results.

Conflict of interest

The authors have no conflict of interest to declare. The co-author has seen and agreed with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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