ABSTRACT

The identification of components present in the plants is very important to the pharmaceutical and food industries. Phytochemical screening revealed the presence of alkaloids, flavonoids, steroids, anthroquinone, phenols, quinone and carbohydrates in petroleum ether extract of cauliflower leaf. In chloroform extract, flavonoids, steroids, anthroquinone, phenols, and carbohydrates were present. Flavanoids, protein, quinine and carbohydrate were present in the ethanol extract. The fine particles were characterized by XRD for structural determination and estimation of crystallite size.

KEYWORDS: Brassica oleracea, Phytochemicals, Petroleum ether, Flavanoids.

1. INTRODUCTION

Brassica vegetables such as cauliflower and broccoli are popular and are among the most consumed vegetables in the world. Many epidemiological studies have indicated that a diet rich in these vegetables is associated with reduced risk of a several type of cancers, type 2 diabetes, and cardiovascular diseases.\[^{1,2,3}\] Brassicas are known to possess antioxidant activity.\[^{4,5}\] Such beneficial health properties of these crops are due to the presence of health-promoting compounds such as vitamins, carotenoids, phenols, flavonoids, minerals, and glucosinolates.\[^{6,7,8,9,10}\] Among these, glucosinolates are one of the most important phytochemicals in Brassica crops, a large group of sulfur containing compounds possessing anticancer activity that are known to be responsible for the pungent flavor of the plants.\[^{11,12}\]
Cruciferous vegetables are one of the dominant food crops which have high vitamin C, soluble fibre and contain multiple nutrients and phytochemicals with potential anticancer properties. Cauliflower contains several phytochemicals which are beneficial to human health and it contains sulforaphane which protect against cancer, glucosinolates, carotenoids, indole-3-carbinol, isothiocyanates, dithiolethiones and phenols that enhances DNA repair and acts as an estrogen antagonist, slowing the growth of cancer cells. A high intake of cauliflower has been associated with reduced risk of aggressive prostate cancer and the leaf juice of cauliflower was found to possess antibacterial activity.\cite{13}

Flavonoids and their derivatives are the largest and most prominent group of polyphenols and are ideal scavengers of peroxyl radicals due to their specific reduction actions relative to alkyl peroxyl radicals, making them effective inhibitors of lipoperoxidation.\cite{14} Phenolic compounds are a large group of secondary metabolites that are categorised into classes based on their structure. Thus, polyphenols are recognised as powerful antioxidants. Fruits and vegetables are the richest potential sources of these substances.

2. MATERIAL AND METHODS

2.1 Collection and Preparation of the powder

*Brassica oleracea* were collected in and around markets of Coimbatore. The leaves were washed with water to remove the dirt and shade dried. The shade dried samples were powdered separately using an electrical grinder. The powder was stored in screw cap bottles until further analysis.

2.2 Soxhlet Extraction

10g of the *Brassica oleracea* powder were weighed using an electrical balance (Denver, 210) and made into 8 packets using xerohaze filter paper (10 A grade SD’S). Soxhlet extractions of powder were carried out to obtain their extracts. Petroleum ether, chloroform and ethanol were used as solvents for soxhlet extraction in the increasing order of polarity. The distillation process was carried out at a low temperature of solvents corresponding residues were obtained and stored in the refrigerator for further use.

2.3 Phytochemical screening

Phytochemical analysis of the cauliflower leaf extract was carried out using the standard methods.\cite{15} The extracts were tested for alkaloids, phenols, flavonoids, Terpenoids, sterols, anthraquinones, proteins, quinines, and carbohydrate.
2.4 XRD Analysis-Particle characterization

The X-ray diffraction (XRD) patterns of the samples were recorded on a PANalytical X’Pert PRO X-ray diffractometer using Cu Kα radiation (λ = 0.15406 Å). The crystallite size of nanocrystalline samples was measured from the line broadening analyses using Debye Scherrer formula after accounting for instrumental broadening.

Figure 1: Cauliflower Leaf

3. RESULT AND DISCUSSION

Cauliflower contains several phytochemicals which are beneficial to human health. The phytochemical compounds such as alkaloids, flavonoids, steroids, terpenoids, anthraquinone, proteins, phenols, quinone, and carbohydrates were present in the cauliflower leaf (Table 1). The extract of the plant material were found to contain the required major phytocompounds and other nutritive compounds needed by the pharamaceutical companies as well as in food supplements. Cruciferous vegetables are one of the food crops which have high vitamin C, fibre and contain multiple nutrients with potential anticancer properties.

The presence of total flavonoid content in leaf suggests higher nutritional value of leaves, as flavonoids possess strong antioxidant activity and inhibit oxidative stress.\(^\text{[16]}\) This result was in agreement with\(^\text{[17]}\) who reported 346–638 mg·100 g\(^{-1}\) of vitamin C, though it was higher than the vitamin C content reported.\(^\text{[9]}\) The presence of total flavonoid content in leaf parts in both broccoli and cauliflower crops suggest that its leaf can be used as an alternative source of total flavonoids and are responsible for various beneficial health effects.\(^\text{[18,16,19]}\)

XRD can be used to characterize the crystallinity of nanoparticles and it gives the average diameters of all the nanoparticles. The fine particles were characterized by XRD for structural determination and estimation of crystallite size. All experimental peaks were matched with theoretically generated one and indexed. The XRD patterns of all the samples were shown in.
X-ray diffraction analysis of cauliflower leaf showed the XRD pattern of the dried particles obtained from colloid samples in (Figure 2 and Table 2). Nine peaks were observed at 11.660, 20.790, 21.490, 28.210, 29.170, 31.170, and 33.470, 40.670 and 43.500. These Braggs reflections clearly indicated the presence of 219.58, 299.22, 116.79, 49.92, 221.85, 184.02, 101, 33.21 and 48.52.

Table 1: Phytochemical constituents of cauliflower leaf

<table>
<thead>
<tr>
<th>S.NO</th>
<th>TEST</th>
<th>PETROLEUM ETHER</th>
<th>CHOLORO FORM</th>
<th>ETHANOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td>i) Mayers</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) Wagners</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii) Hagers</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Flavanoids</td>
<td>i) Sod.Hydroxide test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) Sulphuric acid test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Steroids</td>
<td>i) Libermann-Burchard</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Terpenoids</td>
<td>i) Libermann-Burchard</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>Anthraquinone</td>
<td>i) Borntragers</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>Protein</td>
<td>i) Ninhydrin (Aq)</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) Ninhydrin (Acetone)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii) Biuret</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Phenols</td>
<td>i) Ferric Chloride</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) Libermann</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>Quinone</td>
<td>Conc HCl test</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Carbohydrate</td>
<td>i) Molish</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) Fehlings A &amp;B</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

+ Detected - Not detected
4. CONCLUSION
The studies have shown that phytochemical constituents have the potential of stimulate the immune system and prevent DNA damage. A high intake of cauliflower has been associated with reduced risk of aggressive prostate cancer and it is very helpful for the manufacturing of new drugs.

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5. REFERENCES


