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Research Paper

Phytochemical screening of flaxseed (*Linum usitatissimum* L.)

Home Science

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ABSTRACT

Extensive research investigation and exploration are now carried out on plant based derivatives such as fruit pulp, seed, leaves and flowers whose phytochemistry exposesinnumerabletherapeuticand curative properties thus gaining significant importance in field of modern medicine and therapeutics. The present study aims at exploiting the presence of various phytochemical present in fermented and unfermented/aqueous extract of flaxseed (Linum usitatissimum L.). The extracts were evaluated for the presence of phytochemicals such as terpenoids, alkaloids, glycosides, steroids, phenols, tannins, flavonoids and saponins by standard protocol. The result clearly revealed the presence of secondary derived plant metabolites such as saponin, quinones, terpenoids, phenols, steroids, coumarins and betacyanin in both the extracts.The total phenol content of fermented and aqueous/unfermented extract of flaxseed was found to be 4.5mg (GAE/gm) and 3.4mg (GAE/gm) respectively indicating that fermented flaxseed have higher phenol content.

INTRODUCTION

The medicinal value of plants is attributed to the presence of some chemical substances which produce a definite physiological action on human body (Edeoga *et al*., 2005). These chemical substances are called phytochemicals. The word phyto is a Greek word *phyto* meaning plant. Some common examples of phytochemicals are flavonoids, alkaloids, saponins, glycosides, terpenoids, tannins, and sterols (Sood *et al*., 2012).

India is one of the countries which possess lot of medicinal plants that plays a vital role in the treatment of various diseases. Flaxseed *(Linum usitatissimum* L.) belonging to *Linaceae* family contain 35-45% oil which comprises mainly linoleic and linolenic acids and 20-25% protein, the seed also contains cyanogenic glycosides (prussic acid) in small quantities these glycosides stimulate respiration and improve digestion. They also offer cardio protective effects, anticancer effects, antiviral and bactericidal activity, anti-inflammatory effect, ion reduction, laxative effects, impact on bone health, management of diabetes (Oomah, 2001; Zhang *et al.,* 2008).

METHODOLOGY

Flaxseed procured from an organic store was cleaned to remove the impurities present in them. The seeds were grounded to a fine powder using a mixer. The resulting flax seed powder was then stored in an air tight container and utilized.

Preparation of extracts

Unfermented/Aqueous extract of flaxseed

Five gram of flaxseed powder was mixed with 100ml of distilled water which was boiled for a period of 5-10 minutes in a boiling water bath. This was then filtered through Whatmanfilter paper No. 1 in a Buchner funnel. The solution was stored at 18°C until use.

Fermented extract of flaxseed

Fermentation process was carried out in a sterilized conical flask by mixing 5 grams of flax seed powder with 100 ml of distilled water. This was then subjected to autoclaving. After autoclaving, it was allowed to cool to room temperature and was inoculated with *Lactobacillus* to initiate the process of fermentation. The fermentation process was carried out for a period of 24 hours at 37°C.This was then subjectedto centrifugation at 5,000 rpm for 15 minutes. The residue was discarded and the resulting supernatant was used for analysis.

Phytochemical Screening

The phytochemical screening was assessed by a standard method as described by (Brinda*et al.,*1981; Siddiqui and Ali, 1997 and Savithramma *et al.,* 2011).Phytochemical screening was carried out to identify the major natural chemical groups such as tannins, saponins,flavonoids,phenols, terpenoids, alkaloids, glycosides, cardiac glycosides, coumarins and steroids. General reactions in these analyses revealed the presence or absence of these compounds.

Estimation of total phenol content

Total phenolic content was determined usingFolin– Ciocalteau colorimetric method (Slinkard and, Singleton, 1977). For the analysis, 0.5 ml of aliquot of sample was added to 0.5 ml of Folin–Ciocalteau reagent (0.5 N) and the contents of the flask were mixed thoroughly. Later 2.5 ml of sodium carbonate (2%) was added, and the mixture was allowed to stand for 30 minutes after mixing. The absorbance was measured at 760 nm in a UV-Visible Spectrophotometer. The total phenolic content was expressed as mg gallic acid equivalents (GAE)/g extract.

RESULTS

The result pertaining to phytochemical analysis is presented in table 1. It was contended from the results that saponin, quinones, terpenoids, phenols, steroids, coumarins and betacyanin were present in both aqueous/unfermented and fermented flaxseed extract. Alkaloids and cardiac glycosides were present in the aqueous and fermented flaxseed extract respectively.Tannins, flavonoids, glycosides and anthocyanin were absent in both the extracts.

Table 1

Qualitative phytochemical analysis of flax seed (*Linum usitatissimum* L.)

Phytochemicals	Aqueous/ Unfermented extract of flaxseed	Fermented extract of flaxseed
Tannin	-	-
Saponins	+	+
Quinones	+	+
Flavonoids	-	-
Glycosides	-	-
Cardiac glycosides	-	+
Terpenoids	+	++
Phenols	++	++
Coumarins	+	+
Steroids	+	+

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Alkaloids	+	-
Anthocyanin	-	-
Betacyanin	+	+

+ Present - Absent

Phytochemicals (derived from the Greek word *phyto*, meaning plant) are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans further than those attributed to macronutrients and micronutrients.Phytochemicals accumulate in different parts of the plants, such as in the roots, stems, leaves, flowers, fruits or seeds (Costa*et al*., 1999).They have roles in the protection of human health such as antioxidant activity, antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation and modulation of hormone metabolism and anticancer property (Narasinga, 2003).

Alkaloids significantly possess pharmacological activities including antihypertensive effects, anti-arrhythmic effect, and anticancer actions(Molyneux *et al*., 1996).Saponins are a group of secondary metabolites that act as an immunostimulant, hypocholesterolemic, antioxidant, antifungal, antiviral and anticarcinogenic agent(Traore *et al*., 2000).Glycosides often have an intense bitter taste that act on gustatory nerves resulting in increased flow of saliva and gastric juices (Doughari, 2012).Terpenoidsshow significant pharmacological activities, such as antimicrobial, antifungal, antiparasitic, antiviral, anti-allergenic, antispasmodic, antihyperglycemic, anti-inflammatory, and immune modulatory properties (Shah *et al*., 2009).Tawheed and Monika (2014) in their study on phytochemical analysis of flaxseed showed the presence of flavonoids, terpenoids, tannins and phenols.

Estimation of total phenol content

The result pertaining to total phenol content is presented in table 2.Table 2 clearly portrays that the phenol content of fermented flaxseed and aqueous/unfermented extract of flaxseed was found to be 4.5mg (GAE/gm) and 3.4mg (GAE/gm) respectively indicating that fermented flaxseed have higher phenol content

Table 2
Total Phenol Content

Sample	Total Phenol Content Concentration (mg gallic acid equivalent/gm)
Aqueous/unfermented extract of flaxseed	3.4
Fermented flaxseed	4.5

In the last few years, fermentation has been employed to increase the content ofphenolic compounds in certain food products, thus enhancing their antioxidant activity. For example, black beans are well known for their high nutritional value as contain isoflavones, vitamin E, saponins,carotenoids and anthocyanins (Choung *et al*., 2001). In a recent study on the bioprocessing of these beans to prepare koji using fermentation with different food-grade filamentous fungi (in particular Aspergillus sp. and Rhizopus sp.), an enhancement of the antioxidant properties of the beans was observed due to the increase of phenol and anthocyanin contents (Lee *et al*., 2008). Similarly, fermentation of grass peas cooked seeds using Rhizopus oligosporus caused an increase in the phenolic compounds content which significantly improved the antiradical properties of the seeds (Starzynska-Janiszewska *et al*., 2008).

Phenols are a group of compounds with potential health benefits such as increasing bile acid secretion, reducing blood cholesterol and lipid levels and exhibiting antimicrobial activity against some strains of bacteria such as *Staphylococcus ssp.* In addition to this phenols also possess other health benefits such as antiulcer, anti-inflammatory, antioxidant, cytotoxic, antitumor, antispasmodic, and antidepressant activities (Silva *et al.,* 2007). Accumulating evidences suggests that flaxseed represent a valuable source of phenolic antioxidant.Flaxseed is a rich source of different types of phenolics such as lignans, phenolic acids, flavonoids, phenylpropanoids and tannins with lignans being the most biologically important class of phenolic compounds. (Willfor *et al*., 2006). The levels of lignans in food vary widely; the richest source being flaxseed. The prevailing lignan in the flaxseed is secoisolariciresinol diglucoside (SDG) (Cardoso *et al*., 2012). Besides lignan SDG phenolic acids such as p-coumaric acid and ferulic acid glucosides also contribute to antioxidant property. These compounds are accumulated at high concentrations in flaxseed andpossess antioxidant properties (Yuan *et al*., 2008).

CONCLUSION

The present study conclusively demonstrates that flaxseed (*Linum usitatissimum. L*) is a good source of various phytochemicals like alkaloids, flavonoids, phenol, steroids, coumarins, glycosides, saponins, tannins, terpenoids and also highlighting flaxseed as a natural food supplement with strong antioxidant property due to the high phenol content present in it.

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