To Evaluate polyherbal (Phoenix dactylifera and Trigonella Foenum-graecum) Extract for antioxidant activity.

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Abstract:

This study investigated the antioxidant activity of a herbal extract made from two plants: Phoenix dactylifera (date palm) and Trigonella foenum-graecum (fenugreek). The extract has been laboratory tested using various methods to measure its ability to neutralize harmful free radicals and reduce oxidation. The results showed that the extract has strong antioxidant properties, similar to known antioxidants. It also contains high levels of phenolic compounds, which are thought to play a key role in these beneficial effects. Overall, the polyherbal extract of date palm and fenugreek has promising antioxidant potential and could be useful in health products such as dietary supplements or functional foods.

Key Words:

Phoenix dactylifera, Trigonella foenum-graecum,Polyherbal extraction,Antioxidant activity.

Introduction:

Oxidative stress, caused by an imbalance between free radicals and antioxidants in the body, is involved in the progression of a number of diseases, including cardiovascular disorders, cancer and neurodegenerative conditions. Antioxidants are compounds that can neutralize free radicals, reduce oxidative damage, and play a protective role in health. Recently, there has been a growing interest in natural antioxidants due to their potential health benefits and lower side effects compared to their synthetic counterparts.

The date palm is traditionally valued for its high nutrient content and therapeutic effects, which include anti-inflammatory, hepatoprotective and antioxidant properties. It contains various bioactive compounds such as phenols, flavonoids and vitamins that contribute to its antioxidant capacity.

Fenugreek is well known for its medicinal uses in the treatment of inflammation, diabetes and digestive problems. It contains a significant amount of flavonoids, saponins and other antioxidants that help fight against oxidative stress.

Despite their individual benefits, few studies have investigated the combined antioxidant properties of date palm and fenugreek. This study aims to evaluate the antioxidant potential of a polyherbal extract from these two plants and to determine whether the combined formulation provides enhanced antioxidant activity.

Benefits of polyherbal extracts:

1. Increased bioavailability

2. Increased antioxidant efficiency

3. Reduced toxicity

4. Improved therapeutic efficacy

Methods of preparation of polyherbal extracts:

1. Solvent extraction (e.g. ethanol, methanol)

2. Hydrodistillation

3. Soxhlet extraction.

Therapeutic applications

1.Cardiovascular health

2.Anti-inflammatory

3. Anticancer

Antioxidant activity refers to a substance's ability to neutralize or scavenge free radicals, unstable molecules that can damage cells and contribute to various diseases.

Types of antioxidants:

1. Endogenous (natural): Produced in the body (e.g. glutathione, superoxide dismutase).

2. Exogenous (from food): Obtained by diet (e.g. vitamins C and E, polyphenols).

3. Synthetic: Artificially produced antioxidants (eg butylated hydroxytoluene (BHT)).

Taxonomic classification

Kingdom: Plantae

Subkingdom: Viridiplantae

Superdivision: Embryophyta

Division: Tracheophyta

Class: Magnoliopsida

Family: Arecaceae

Genus: Phoenix

Species: Phoenix dactylifera

Common names

English: date, date palm;

French: palmier dattier;

German: Dattel palme;

Hindi: Khajur

Phytochemical components:

Flavonoids (quercetin, kaempferol) Phenolic acids (ferulic acid, sinapic acid)

Tannins

Glycosides

Volatile oils (date palm oil)

Pharmacological effects:- -

Antioxidant

Anti-inflammatory

Antibacterial

Antifungal

Hepatoprotective

Cardiovascular protection

Phoenix *dactylifera* or date palm is a tree that produces dates, which are sweet edible fruits. Commonly eaten fresh or dried, dates have many health benefits and are rich in nutrients.

Introduction to Fenugreek (Trigonella-Foenum Graecum):

Fenugreek (Trigonella-Foenum Graecum) is known as one of the traditional and most promising medicinal herbs from the legume family. The seeds and leaves of this plant are widely used in medicine as an anti-diabetic, antimicrobial, anti-inflammatory, anti-cancer and antioxidant agent. In addition, fenugreek seeds are reported to have strong free radical scavenging activity.

Pharmacognostic description of fenugreek seeds (Trigonella foenum-graecum):

Fenugreek (Trigonella foenum-graecum) is a popular herb belonging to the Fabaceae family, known for its medicinal, nutritional and culinary uses. Fenugreek seeds are particularly valued in both traditional and modern medicine due to their wide range of bioactive compounds. Below is a detailed pharmacognostic description of fenugreek seeds.

Chemical composition: Fenugreek seeds contain several bioactive compounds that contribute to their medicinal properties:

Alkaloids: Trigonelline (the main alkaloid) is one of the primary alkaloids found in fenugreek seeds. It has potential neuroprotective effects and may affect glucose metabolism.

Flavonoids: Apigenin and luteolin are the primary flavonoids found in fenugreek seeds that contribute to the antioxidant properties.

Glycosides: Trigonelline and other glycosides show antioxidant and anti-inflammatory effects.

Pharmacological properties:

Hypoglycemic (anti-diabetic): Fenugreek seeds help lower blood sugar levels, making them useful in treating diabetes. The seeds contain soluble fiber, which can improve insulin sensitivity and lower blood glucose levels.

Anti-inflammatory: Fenugreek seeds have anti-inflammatory activity due to the presence of saponins, flavonoids and alkaloids. They can help with conditions such as arthritis and other inflammatory conditions.

Antioxidant: Flavonoids and other phenolic compounds in fenugreek seeds have antioxidant properties that help fight oxidative stress in the body.

Material And Method:

Collection and processing of sample:

The seeds were collected from all date varieties, washed and shade dried. Coarse powder was prepared using a grinder. Then the extract was prepared by soaking the powdered sample in methanol (1:4 w/v) for three days at room temperature. temperature and frequent shaking. The procedure was repeated, filtered through Whatman No. 1 filter paper and concentrated using a rotary evaporator. The samples were finally complete dried in the oven.

Fenugreek seeds were purchased from a local retail market in Kashti, Shrigonda. The seeds were cleaned before drying put in the oven at 50 C for 24 hours. Then the dried seeds were ground using mill with an ultracentrifugal device with a ring sieve with trapezoidal holes of 0.5 mm. Humidity seed content was (5.51 ± 0.14% d.w. basis). For powder seeds were stored in a dark airtight container prior to extraction.

Analytical reagent and chemical:

Methanol, n-hexane, Folin-Ciocalteu reagent, sodium bicarbonate, gallic acid

Extraction Process:

To obtain the highest oil yield, select the appropriate time and particle size for oil extraction from the date seed. 50 g of ground seeds were weighed and transferred to a 30 mm x 200 mm cellulose thimble. It placed in the extraction chamber of a 250ml Soxhlet apparatus equipped with a condenser which was place in a 500 ml distillation flask containing 250 ml n-hexane solvent. Date oil was then extracted under reflux with n-hexane for 1, 2, 4 and 6 hours (10-12 cycles/h). Hexane was then removed using a heated rotary evaporator under vacuum conditions. All the extraction process was performed three times and average values were reported. Oil recovery Extracts were expressed as a percentage of the weight of extracts obtained by extraction relative to weight of date seeds used for extraction. Oil production yield = (mass of oil extracted)/ (weight of date seeds used) ×100%

100 g of crushed fenugreek seeds were extracted using n- hexane (600 mL) and a Soxhlet extractor for 3 h at (65–70 °C). The solvent/oil mixture was then filtered through No. 1 paper filter (Whatman). The extract was transferred to a round flask and the solvent was evaporated on a rotary evaporator at 40 °C. Finally, the oil extract was stored at 4 °C to prevent degradation of compounds for further analysis. The extraction yield was calculated per use

Extraction yield=[Amount of oil extracted (ml)/Weight of dry sample use (gm)]100

Method:

1)Total phenolic content:

The determination of TPC of extracted oil was carried out based on the minor modifications. In short, 1 ml of oil was mixed with 0.2 ml of Folin-Ciocalteu reagent and 2 ml of meta- nol was shaken thoroughly and then allowed to rest for 5 minutes in a dark place at room temperature. Then 1 ml of 20% (w/v) solu- ion prepared from sodium carbonate (Na_2CO_3) was added and incubated in the drawer for another 2 hours. Then absorbance of the sample was measured at 765 nm using a UV-Vis spectrophotometer tometry (Hitachi U-1800, Japan). The sample concentration was calculated and obtained from the gallic acid standard curve (100-500 mg/ml) equation ($Y = 0.0003x + 0.0391$; $R2 = 0.9662$) equation and results were expressed as mg of gallic acid equivalent lent per gram of oil (mg GAE/g. oil). Total phenolic content extract was obtained based on equation Methanol was used as blank sample against the prime sample.

$TPC=c.V/m$

where in the above equation c represents the concentration sample taken from gallic acid calibration curve (mg/ml), V is volume of solvent (n-hexane) used for oil extraction (ml), and m denotes the mass (g) of extracted oil.

2) Assessment of free radical scavenging potential

2,2-diphenyl-1-picrylhydrazyl (DPPH) was used as a stable radical with a strong absorbance at 517 nm. to investigate the ability of the samples to absorb this free radical. The test was performed according to the previous one described method with minor modification .A reaction mixture consisting of sample and DPPH solution was incubated at room temperature for one hour in the dark. The absorbance was then measured at 517 nm. Vitamin C was used as a standard cleaning chemical. The following formula was used to determine the percentage of rescue activity:

$\%SA = (1-ODS/ODNC) \times 100$

SA: Scaveging activity; ODS: optical density of sample; ODNC: optical density of negative control.

Result:

The class of phytochemicals and their amount in the extracts depends on the nature of the solvents. It is generally assumed that the biological potential of plants depends on the phytochemical profile such as e.g polyphenol components and flavonoids. For this reason, the quantification of phenolic and flavonoid components in each date palm cultivar was measured by in vitro assays using a calibration curve of the corresponding standards.

The determination of TPC in vegetable oil is considered necessary because one of the important indicators of oil quality is phenol compound. These compounds are responsible for capacitance scavenging of free radicals and lipid peroxidation. In this study TPC was determined using the Folin-Ciocalteau test and the result expressed as gallic acid equivalent. It turns out that fenugreek seed oil phenol content 38.97 ± 0.34 mg/g gallic acid equivalent.

The results showed a positive relationship between the antioxidant activity of the oil and its total phenolic content.

Conclusion:

In this study, fenugreek seed oil was extracted using Soxhlet extraction technique and n-hexane as extraction solvent. FTIR analysis of fenugreek seed oil revealed that the oil is rich in essential omega-6 fatty acids (linoleic acid), which are highly effective in preventing ischemic heart disease, inflammation and cancer. In addition, the main components of the oil namely linoleic acid, palmitic acid, pinene and other components with lower proportions have been found to be very useful in reducing free radicals thanks to its natural antioxidant properties. This study also demonstrated that the radical scavenging assay was more useful compared to the DPPH assay. Overall, based on the results obtained in this study it could be suggested that it could be fenugreek seed oil effective against many diseases such as cancer, inflammation, asthma, sexual disorders and urinary tract infections.

Date palm (P. dactylifera L.) seeds are considered problematic waste, contain secondary chemicals which have biological activities and have initiated a research direction for promising applications in various fields. This research highlights the antioxidant value and phytochemical evaluation of different varieties of date seeds. All samples differ significantly in terms of antioxidant activities and amount of secondary metabolites (phenol and flavonoid content). Comparing all samples, As was shown to have the highest amount of phenolics and flavonoids, while AJ(S) had the lowest levels. KP samples had the highest total antioxidant and reducing potential, while AJ(K) and Am samples showed the lowest and Further research is recommended to characterize, isolate phytochemicals and investigate other properties for possible use in the food and biomedical industry.

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