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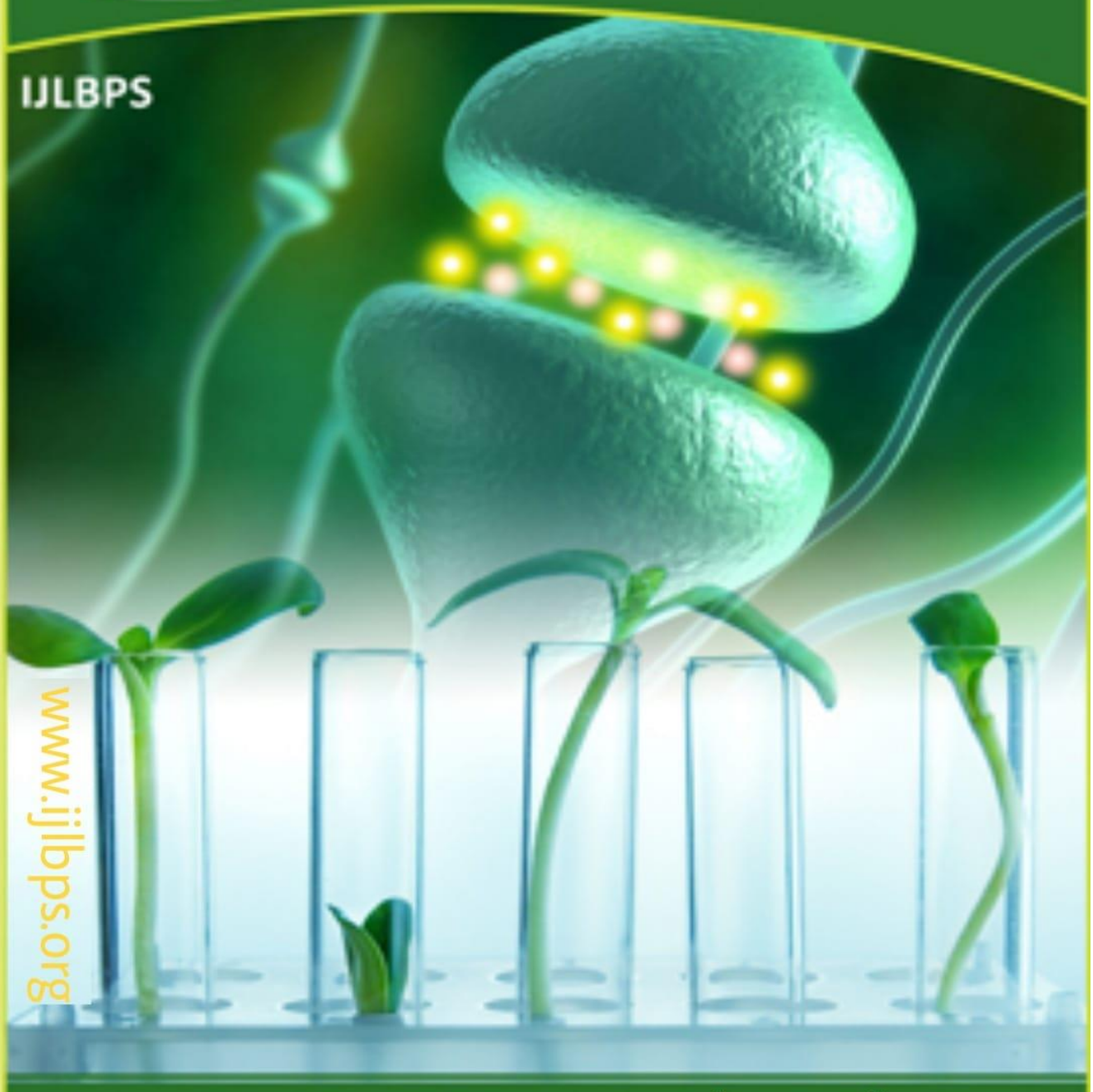

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Value addition scenario of arid foods of desert area and evaluation of their nutritional and phytochemical potential

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Abstract

The desert's natural riches, especially its dry fruits and vegetables, are highly sought for. Indigenous communities rely heavily on arid-adapted fruits for sustenance, and these foods often have significant cultural significance. The security of people's livelihoods may be increased by the processing of historically essential desert foods into more useful and handy product. Therefore, its nutritional content, phytochemicals, and antioxidant properties have been reported upon, and research into its potential for value addition has also been conducted. The analysis also looked at how different solvents affected the extraction process and the activities they were involved in. The research showed that the dry fruits of Rajasthan, such the Kair and Kachri, were high in protein and carbs.

Key-Words: *Capparis deciduas, Cucumis callosus,* solvent extraction, phenolics and antioxidant activity

Introduction

Free radicals are generated by a small number of factors, including metabolic activity, UV light, and environmental pollutants. Many carcinogens and mutagens exert their effects by causing the production of free radicals. Antioxidants in the diet protect us from damage caused by free radicals. Scavenging free radicals is one way antioxidants help keep us healthy. Free radicals may damage proteins and DNA, which can in turn contribute to conditions like cancer, heart disease, and accelerated aging.3. The antioxidant activity of fruits and vegetables is attributed to the presence of phenolics, flavonoids, vitamins, caretenoids, and secondary metabolites4, making them a naturally excellent antioxidant source. Capparis decidua, a member of the Capparidaceae5 family and better known as 'Kair' in Hindi, is used as a medicinal herb. Researchers have found tocoferols and sterols in Capparis decidua seeds, as well as studied their amino acid composition and fatty acid profile. Members of the family Cucurbitaceae include Cucumis callosus (Kachri). Both are crucial components of aristocratic and celebrity status

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regional Indian cuisine from the state of Rajesthan. The DPPH7 free radical is inhibited by an aqueous extract of Cucumis callosus seeds. To learn more about the nutritional value and other health advantages of Kair and Kachri fruit, researchers are analyzing C. deciduas and Cucumis callosus to evaluate their diverse nutritional, phytochemical, and antioxidant activities.

Substances and Techniques

Kachri (Cucumis callosus (Rottler) Cogn.) and Kair (Capparis decidua(Forssk.) Edgew) dried fruits were brought to NISCAIR from Delhi, India. Several measurements were taken from the partly crushed samples.

Extractio by Solvent

Ethyl acetate, methanol, n-hexane, and water were used to extract partially crushed materials. The extracts were vacuum-dried and kept at 4 degrees Celsius for further use.

Analytical chemistry

We calculated the total amount of protein using the Macrokjeldhal method8. For twenty-four hours, we baked crushed dry fruit samples at 105 degrees Celsius. Difference in weight indicates the moisture content9. AOAC technique Ref. 942.05. was used to determine the ash content. PE as a solvent. Estimates of crude fiber10 were made. Also determined were the number of calories and the total amount of carbohydrates.

Examination of plant chemicals

Determination of Unprocessed Alkaloids

2.5g sample combined with 100ml 10% acetic acid in ethanol and incubated for 4h at RT. After filtering and concentrating the sample to only one-fourth its original volume, water bath. Concentrated ammonium hydroxide added drop wise to the extract until the precipitation was complete. The precipitate washed with dilute ammonium hydroxide solution and filtered. Crude alkaloid was weighed[11].

Saponins determination

g of sample mixed with 50ml of 20% ethanol. The suspension was heated over a hot water bath for 4 h with continuous stirring at about 55°C.The mixture was filtered and the residue re-extracted with another 50ml of 20% ethanol. Combined extracts were reduced to 10 ml over water bath at about 90°C. The concentrate transferred to a separating funnel and 20ml of diethyl ether added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. The purification process was repeated. 15 ml of n-butanol was added. The combined n-butanol extracts washed twice with 10ml 5% aqueous sodium chloride. The remaining solution heated over water bath, the samples were dried in the oven to a constant weight. The saponins content was calculated in percentage[12].

Tannin determination

5g of the sample was weighed into plastic bottle. 50ml distilled water was added and shaken for 1h in a shaker. This was filtered into a 50 ml of the volumetric flask and made up to mark. 5ml of the filtrate was pipette out into a tube and mixed with 3ml of 0.1M $FeCl_3$ in 0.1 N HCl and 0.008M potassium ferrocyanide. The absorbance was measured at 605nm wavelength within 10 min. A blank sample was prepared and the color developed and need at the same wavelength. A standard was prepared using tannin acid to get 100 ppm and measured[13].

Total phenolics determination (TPH)

Folin Ciocalteu reagent method was used to determined total phenols[14]. 100µl of sample mixed with 1.150 ml of distilled water and 250µl of FC reagents and vortexed and added 1.5ml of 20% Na_2CO_3. After 2h added 2 ml DW and absorbance was measured at 765 nm. Gallic acid (0-100 µg/ml) was used as standard for preparation of calibration curve. Total phenol values were expressed in terms of gallic acid equivalent (mg g^{-1} of dry extract).

Total flavonoids determination

Aluminum chloride colorimetric method was used for flavonoids determination[15]. 250µl extract mixed with

4.5ml DW and 0.3ml $NaNO_2$ (5 %). After 5 min added 0.3ml of $AlCl_3$ (10%). Added 2ml of NaOH (1M) after

min. Volume made upto 10 ml with DW and absorbance was taken at 510 nm. Rutin was used as standard for preparation of calibration curve. Determination of Total Flavonol Content

Combine 250 ml of extract with 1 ml of ethanol, then add 1 ml of aluminum chloride solution (2%). After adding 3ml of a 5% sodium acetate solution, the mixture was incubated at 20°C for 2.5 hours. The 440 nm absorbance measurement was taken. The calibrating curve was based on rutin concentrations. The flavonol concentration was reported as the amount of rutin equivalents (RE) per gram of dry sample16.

The Role of Antioxidants

Removal of DPPH free radicals

DPPH (1 ml) and extract (0.1 ml). After 30 minutes of incubation, the absorbance was measured at 517 nm25. Reference materials included ascorbic acid and trolox (6-hydroxy-2,5,7,8- tetramethylchromane-2-carboxylic acid).

The ABTS test

After incubation for 10 minutes, 10 l of extract was combined with 990 l of ABTS reagent. At 734nm, we observed a maximum absorbance. Trolox and ascorbic acid were utilized as benchmarks18.

A FRAP test

A total of 900 l of FRAP reagents were combined with 100 l of extract. Absorbance was measured at 593nm27 after 4min of incubation at RT. Trolox equivalents per milligram of extract (TE) were used to determine FRAP values.19. What We Learned and Why

Analytical chemistry

The nutritional characteristics of Kair and Kachri (Table 1) indicated their possible advantages. In recent investigations, Kair and Kachri were discovered to be rich in proteins and carbs. However, a significant absence of kair was seen in crude fat. Because of this direct relationship, it is crucial that the moisture content and dry matter analysis be reported during nutritional analysis. On a dry weight basis, there is a big difference between the two samples in terms of ash and moisture content.

Examination of plant chemicals

Table 2 displays the results of an analysis of the phytochemical composition of Kair and Kachri, including the values for tannins, saponins, and crude alkaloids calculated on a dry weight basis (g/100g). The amount of alkaloids in Kachri was discovered to be rather high. The tannin content of Kair and Kachri was shown to be virtually same. Both samples were found to have almost identical saponin values. Alkaloids at high concentrations act as spasmolytics and anesthetics. Saponins improve immunological function, decrease blood cholesterol, and protect against intestinal cancer.

Reactive oxygen species (ROS) may cause molecular damage to plants, although phenolic chemicals (Table 3) can support the plant's defensive system by neutralizing ROS.20.Total

The phenolic content of kair and Kachri in various solvent extracts was between 49 and 154 g GAE/mg extract and 56 and 72 g GAE/mg extract, respectively. Research investigations have revealed that phenolic chemicals add to quality and nutritional value in terms of influencing color, taste, fragrance, and flavor and also in giving health benefit effects. Plants rely on phenolics, which operate as a kind of protection against microbes, insects, and herbivores by neutralizing reactive oxygen species (ROS)20. N-hexane extracts of Kair yielded the most phenolic chemicals, indicating that the main components are less polar and are therefore recovered in n-hexane. The greatest concentration of flavonoids and flavanols was discovered in n-hexane extracts of both kair and Kachri (Table 3).

DPPH scavenging activity is a measure of antioxidant activity.

Since DPPH produces free radicals, it is often used to test how well antioxidants neutralize these dangerous molecules. when may be seen in Fig. 1, when the concentration of the extracts increases,

percent of DPPH free radicals neutralized by the compound also rises. MeOH > Ethyl acetate > n-hexane (Kair) and DPPH > DCM > Acetone > Aqueous (Kachri) were shown to have the highest antioxidant activity. The standard was to use Trolox.

Scavenging in the ABTS

Both lipophilic and hydrophilic antioxidants may be screened using the ABTS scavenging test. Table 3 displays the IC50 values for ABTS radical inhibition by various Kair and Kachri extracts. Water > Acetone > DCM > n-hexane (Kair) and methanol > ethyl acetate > n-hexane (Kachri) had the highest ABTS-measured antioxidant activity.

A FRAP test

The FRAP standard curve was constructed using Trolox. Extrapolating the standard curve (y = 0.011X, R2 = 0.983), we were able to determine the Trolox equivalent values for each sample. N-hexane extract exhibited high yield for both the samples while DCM extract showed approximately identical values as those of n-hexane in case of Kair (Table 3).

Nutritional, phytochemical, and antioxidant potential were evaluated for two key Panchkuta constituents to determine their suitability as functional foods and nutraceuticals. Panchkuta is a very protein-rich diet since both of its main components, dal and chickpeas, contain significant amounts of protein. The minimal quantity of fat in kair makes it a great choice for anyone trying to lose weight. It may also be used into meal plans for slimming down. Kachri fruits have a significant quantity of alkaloids, making them a candidate for future testing.

muscle relaxants and pain killers. There is a lot of saponin in both samples. Saponins improve immunological function, decrease blood cholesterol, and protect against intestinal cancer. Both of Panchkuta's components demonstrated moderate antioxidant activity.

There is enormous potential in the area of value addition, and much traditional information is available on many medicinal and nutritional benefits of desert fruits and vegetables. The future of functional foods is bright because of the medicinal potential of dry-climate fruits and vegetables.

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