Variation of the antioxidant activity with the extraction method and solvent selection

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ABSTRACT

Extraction is a significant step in the processing of the crude drug to get its chemical constituents out and keep them of high and exportable quality. The plants have various chemical constituents that are responsible for various activities in which antioxidant activity is the important one. There is another step that is crucial in the extraction process that is the selection of the suitable for extraction. Various solvents are used for extraction. They too range from the highly non-polar solvents like benzene and chloroform to the highly polar solvents like Ethanol and distilled water. So, in this work, the focus has been put on to find the effect of the extraction method and the extraction solvent on the antioxidant profile of the guava leaves. The extracts of the solvent Water in the method of ultrasound showed the highest inhibition of the free radicals and the least was with the extracts of the pet ether and using soxhlation. This is indicative that the method of extraction is critical, and the solvent of extraction played a vital role in the content of chemical constituents and the pharmacological activity too. The results showed that the ultrasound method was beneficial in extracting the soft drugs like leaves, and the distilled water was effective in extracting the chemicals from the guava leaves.

INTRODUCTION

Extraction is a significant step in the processing of the crude drug to get its chemical constituents out and keep them of high and exportable quality. The plants have various chemical constituents that are responsible for various activities in which antioxidant activity is the important one. The extraction methods are of many types ranging from the basic maceration to percolation, and the advanced techniques like soxhlation and ultrasound-assisted extraction etc. they are advantageous over one another and also proven finer and beneficial. The extraction method is essential to extract out all the available chemical constituents from the plant. So the selection of the extraction method is essentially based on the part used for extraction [1].

There will be a lot of changes in the content of chemical constituents that vary with the method of extraction used. The drugs can be challenging and brittle, and few drugs can be softer. So, there need to be followed by various extraction techniques for achieving a more adequate and more significant number of chemical constituents. This also determines the quality of the extracts that are yielded from the plant parts [2].

There is another step that is crucial in the extraction process that is the selection of the suitable for extraction. Various solvents are used for extraction. They too range from the highly non-polar solvents like benzene and chloroform to the highly polar sol-
vents like Ethanol and distilled water [3]. The selection of the solvents for extraction is to be based on the chemical constituents that are extracted from the crude drug.

Guava is a native plant to India and other tropical countries which has medicinal properties other than fruits [4–6]. Various chemical constituents are isolated from the plant, and the significant moieties are the flavonoids. They possess antioxidant characteristics and are best when consumed daily [7, 8]. So, in this work, the focus has been put on to find the effect of the extraction method and the extraction solvent on the antioxidant profile of the plant.

Post harvesting protocol

Plant material drying

Leaves of guava were procured from the collector from the local area. They were appropriately dried under shade for about 6 days in January, and the dried leaves were collected and pulverized into a fine powder, and this powder was used for extraction.

Extraction and solvent parameter variables

Totally three methods of extraction were used like soxhlation, ultrasound-assisted extraction, and the microwave-assisted extraction.

1. Soxhlation

In this method, 5 gm of the powder was packed into a bag and then fitted into a Soxhlet apparatus. The apparatus set up was done, and the process of extraction was carried out for about 8 hrs with two solvents in 2 different setups. The extracts were collected, and the product was filtered. The filtrate was subjected to drying to get a thick paste-like extract.

2. Ultrasound-assisted extraction

In this method, the powder was macerated with two solvents in three separate beakers and are placed in the ultrasound apparatus. The standards were set according to the reference [9]. The temperature in the ultrasound bath was maintained at 40°C with a power of 70% at the frequency of the waves of 45 KHz. The system was let to run for about half an hour. The resultant liquid is then filtered, and then the filtrate was then subjected to evaporation, and the resultant was a thick paste.

3. Microwave-assisted extraction

In this method, the powder was packed and macerated in different solvents in beakers and subjected to the microwave. The beakers are put in the microwave machine, and the parameters were set [10]. The power was set to 400 W, and the temperature was set to 40, and the system was let to work for about 30 min, and the solution was filtered off. The filtrates were evaporated, and the thick extract was collected and dried.

The total phenols contents and flavonoids contents were determined in all the extracts using the folin-ciocalteau method [11]

Antioxidant evaluation

The antioxidant activity was measured in the H2O2 method as per standard procedure [12]. The serial dilutions were made with the extracts, and standard concentrations were prepared. The solutions were allowed to react with the hydrogen peroxide and then subjected to UV at 230 nanometers to measure the absorbance values. The measured absorbances were utilized to calculate the percentage of the free radical inhibition using a standard formula.

RESULTS & DISCUSSIONS

The leaves are adequately dried and extracted with solvents like Pet ether and water. The extractive values were noted and tabulated in table 1. The loss on Drying of the leaves was measured as 8.3% which was acceptable by the standards of IP. These extracts were subsequently named and extracted in three methods. The percentage yields were calculated after weighing the drugs and extracts. The values were tabulated, and the water extract showed a higher value than the Pet ether extract. In the comparison of the extraction methods, Ultrasound extraction method was leading, which gave a higher yield compared to other methods. Microwave took the next place and followed by soxhlation. The phenol and flavonoid contents were measured, and it was clear that the water extract gave the highest contents when compared to the Pet Ether extracts. In the extraction methods it gave similar results as the extract obtained from ultrasound gave the highest phenols content. The results were similar to the flavonoid content too which were also tabulated in [Table 1].

The antioxidant activity of these various extracts was measured in the H2O2 method, and the results were tabulated in Table 2. The extracts of the solvent Water in the method of ultrasound showed the highest inhibition of the free radicals and the least was with the extracts of the pet ether and using soxhlation. This is indicative that the method of extraction is critical, and the solvent of extraction played a vital role in the content of chemical constituents and the pharmacological activity too. The results showed that the ultrasound method was beneficial in extracting the soft drugs like leaves, and the dis-
tilled water was effective in extracting the chemicals from the guava leaves [Table 2].

CONCLUSION

As we know that the plant leaves are very effective in treating diseases and the chemical constituents in them will determine the activity. The guava leaves were extracted with the solvents pet ether and water using different extraction methods, soxhlation, ultrasound-assisted extraction and microwave-assisted extraction. The extracts showed that the best method of extraction is the ultrasound-assisted extraction and the solvent used for extraction is the water.

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Conflict of Interest

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