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Production of Polyphenol from Phyllanthus Emblica using Soxhlet Extraction Process

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Abstract: ***Phyllanthus emblica contains rich vitamin C and polyphenol. In the present work, the potential anti oxidant polyphenols is produced from Phyllanthus emblica using soxhlet extraction process. For this purpose, 150 millimeter size of the phyllanthus emblica bark was collected and solvents such as ethanol, acetone and methanol is used for extracting polyphenols from the Phyllanthus emblica. The obtained extract is separated and total phenolic content is determined from the product. From the study it was observed that maximum yield of polyphenol obtained from 80 volume % of ethanol at a temperature of 70°C. The results will be useful in understanding this amla fruit, hence large scale production can be improved industrially.***

Keywords: Polyphenol, soxhlet, extraction

I. INTRODUCTION

Polyphenols are a great group of chemicals found in plants. Polyphenols are plentiful consumable micronutrients in our diet, which prevents degenerative diseases.

The analysis conducted by Xiangjiu et al. [1], for the bio active constituents of Red apple peels shows there is a potent antiproliferative and antioxidant property. Twenty-nine compounds, including triterpenoids, flavonoids, organic acids and plant sterols, were isolated using gradient solvent fractionation. C. Manach, G. et al [2] performed the analysis of phenolic content and properties of phenols using their absorbance with Folin-ciocalteu calorimetric method to quantify the amount obtained in final extract. Renuka Chaphalkar et al. [3] investigated the protective effect of the hydroalcoholic extract of Phyllanthus emblica bark (PEE) in ethanol-induced hepatotoxicity model. Total phenolic, flavonoid, and tannin content and in vitro antioxidant activities were determined by using H_2O_2 scavenging and ABTS decolorization assays. Fuh-Juin Kao [4] reported Phyllanthus emblica to have hypolipidemic and hypoglycemic activities and acts as an important constituent of many hepatoprotective formulas. Extractions have shown strong anti-oxidative and radical scavenging activity. They determined the amount of the Total Phenolic Contents, Total Flavonoid Content, hydrolysable tannin content and to evaluate the antioxidant activities of extracts with different extracting solvent (50% methanol, 50% ethanol, 95% ethanol). Andrew Waterhouse [5] method for testing of polyphenols. The procedure is also used for analysis of total phenol in tea. It uses the minimum volume of reagents and almost eliminates wasted reagent.

The aim is to extract the polyphenol from phyllanthus emblica in larger quantity by making use of the different solvents. The polyphenol is already present in some fruits like apple, orange, grapes etc., but the quantity is too low. In this method the size of the bark of the phyllanthus emblica is reduced to 150 mm size for the better extraction of the polyphenol. Different solvents like Ethanol, acetone, methanol, and analysing the quantity of polyphenol extracted in different process. The effect of process temperature and solvent concentration on the yield of polyphenol was also analysed in this study.

II. MATERIALS AND METHODS

2.1 Plant collection of Phyllanthus emblica:

Phyllanthus emblica were collected from local market of erode, tamilnadu. Bark of the amla tree is collected, cleaned and dried. It is then fed into the pulveriser, obtained powder product is sieved in 100 mesh size screen to get a homogenised product in the size of 150 mm. The powdered material is suitable to obtain maximum of desired material in the product. Figure.1 and 2 shows the bark collection and sieving of powdered bark respectively.

Fig -1: Bark collection

Fig -2: Sieving of powdered bark

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2.2 Raw materials used:

Ethanol, methanol and acetone are used as solvents and Gallic acid, Folin ciocalteu reagent and Sodium carbonate chemicals were used for standardization and extraction processes.

2.3 Soxhlet extraction method:

In many laboratories, Soxhlet apparatus is widely used method for the extraction of oil [6] from different materials. The step by step procedure of extraction and separation is given below:

- Bark of the amla tree is collected, cleaned and dried.
- It is converted into powder using pulveriser, the powder is in 100 micro mesh size(150mm).
- Soxhlet Extraction method is used for Polyphenol extraction.the Soxhlet Apparatus is shown in Figure.3.
- of raw material of 50gm bark is filtered through filter paper and it is added inside apparatus.
- The selected solvents (Ethanol, Methanol and Acetone) . of 150 ml is taken in the ratio of 7:3 with water.
- The extraction time is 30 minutes which is necessary to get minimum of three refluxes.
- The prepared extract is placed in refrigerator till getting the powder form.
- Then the product is evaporated at a temperature of 60^{o}C to get a paste form of extract.
- The paste is dried in oven (below 70^{o}C), which results powdered extract.
- The prepared product is analysed for total polyphenol content

Fig -3: Soxhlet apparatus

2.4 determination of total phenolic content:

As shown in Figure.4, Ciocalteu (FC) colorimetric method [7] was employed to determine the total phenolic content in the product based on Folin. The absorbance of the blue color was measured using spectrophotometer (at 760 mmHg). From the calibration curve of gallic acid the total phenolic content was calculated and the yield(in %) was determined based on this results.

Fig -4: determination of total phenolic content

III. RESULTS AND DISCUSION

3.1 Effect of process temperature on yield of polyphenols:

The process temperature is one of the key factors with respect to the yield of polyphenols [8,9]. It was noted from the Figure.5 that at higher temperature, yield of polyphenols is higher than the lower temperature. This is due to the fact that the solvent at high-temperature will promote polysaccharides on cell wall to distribute to solvent on the extraction rate of polyphenols. It was also noted from the graph that the solvent ethanol shows maximum yield of polyphenol followed by methanol and acetone.

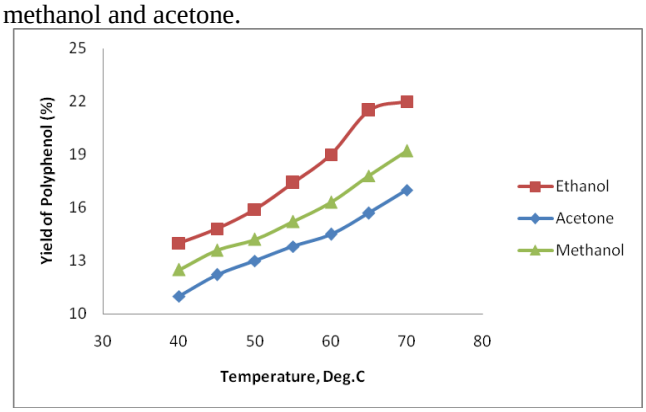

Fig -5: Effect of process temperature on yield of polyphenols

3.2 Effect of solvent concentration on yield of polyphenols:

One of the important factors which affects the yield of polyphenol is the solvent concentration [10-13]. The Figure.6 shows the effect of different volume fraction of solvent on the yield of polyphenols from the bark of P.emblica. It was observed from the study that the yield increases with respect to the solvent concentration and at higher volume fraction, a higher yield of polyphenol is obtained. The yield for ethanol shows higher yield of 21% at a concentration of 80 volume %.

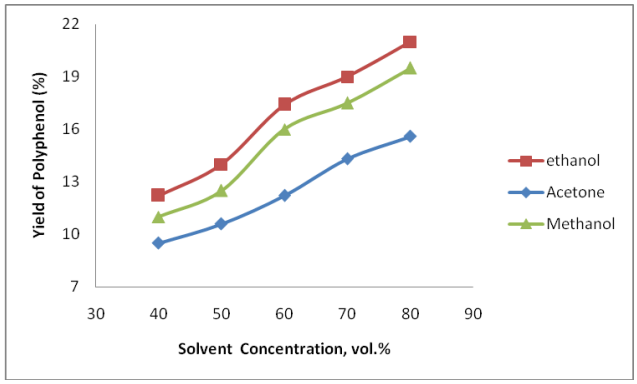

Fig -6: Effect of solvent concentration on yield of polyphenols

IV. CONCLUSIONS

Phenolic extracts of plants consists of mixture of different classes of phenols, which are selectively soluble in the solvents. Soxhlet extraction is mostly used method to extract phenolic compounds from their plant sources. Soxhlet extraction depends on the nature and properties of solvent and operating conditions of the process. Hence the extraction study was conducted with bark of Phyllanthus Emblica, which is rich in polyphenols.

The process temperature and solvent concentration was varied and three solvents were used such as ethanol, methanol and acetone. The study reveals that extraction temperature and concentration of solvent had the most significant effect on the yield of polyphenol. The study shows that the yield of polyphenol increased with respect to the process temperature as well as the solvent concentration, however ethanol shows the maximum yield followed by methanol and acetone.

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