# EFFECT OF SOLVENT POLARITY ON PHYTOCHEMICALS DETECTED IN *SYNSEPALUM DULCIFICUM* LEAVES EXTRACTS

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**Abstract:**. Prioritizing medicinal plants with fewer side effects is of utmost importance for the human population to address a wide range of disorders, in contrast to recently created allopathic medications. *Synsepalum dulcificum*, also called miracle fruit, has unique characteristics of modifying sour flavours to sweet. This study investigated the qualitative analysis of the phytochemicals of *S. dulcificum*. leaves. The leaves were extracted with three different polarities of solvents (petroleum ether, ethyl acetate, and methanol). The phytochemicals studied were tannins, saponins, phenolic derivatives, flavonoids, and terpenoids. The result shows that methanol extract indicated the presence of all phytochemicals studied. Meanwhile, the result indicated the absence of all phytochemicals studied for petroleum ether extract. For ethyl acetate extract, the result showed the presence of phenolic derivatives, flavonoids, and tannins and the absence of saponin and terpenoids. In conclusion, the methanolic extract of *S. dulcificum*. is a potential source of phytochemicals that may be used for further research in bioactivity.

***Keywords:*** *Synsepalum dulcificum, phytochemıcal, leaves, polarity*

## INTRODUCTION

*Synsepalum dulcifium* (*S. dulcificum*) is also known as miracle berries. It is grown native to tropical West Africa (Lim, 2013). The height of this shrub is not more than 5.5 meters. The consumption of these berries induces a temporary sweetening effect on sour meals when the pulp is swirled within the oral cavity (Swamy et al., 2014). Furthermore, the FDA has approved miracle fruit as a food ingredient (Small & Catling, 2006). *S. dulcificum* has been used as a traditional cure for various diseases, including diabetes, malaria, stomachache, obesity, anemia, and prostate problems (Oumorou et al., 2010). Phytochemicals are any of the various biologically active compounds found in plants. Phytochemicals can be separated from the plant material by different extraction techniques. Maceration, percolation, infusion, digesting, decoction, and hot continuous extraction are the most popular conventional procedures. Recently established eco-friendly methods include Ultrasound-Assisted Extraction (UAE), Microwave-Assisted Extraction (MAE), Supercritical Fluid Extraction (SFE), and Accelerated Solvent Extraction (ASE). Extractions can employ water, ethanol, methanol, acetone, ether, benzene, and chloroform (Shaikh & Patil, 2020). However, in this study, we used the solvent extraction method as a conventional method.

For *S. dulcificum*, different parts have been reported to contain various primary and secondary metabolites. For instance, phenolics and flavonoid tannin were present in the methanol skin, pulp, and seeds extract of *S. dulcificum* (Consolacion Y. Ragasa et al. 2015). Besides polyphenols and saponin were also detected in aqueous extracts of *S. dulcificum* leaves and roots (Nkwocha et al. N. (2014). However, other studies showed alkaloids, flavonoids, saponins, tannins, glycosides, phenolics, and anthraquinone were present in aqueous extracts of *S. dulcificum* leaves. (Olamilekan Lanre Awotedu and Paul Oluwatimilehin Ogunbamowo, 2019). Thus, these findings provide the overview that the origin or experimental method may affect the presence of phytochemicals in plants. Therefore, in this project, the *S. dulcificum* leaves collected from Herbs Camp in Hulu Langat, Malaysia, were used for extraction to determine the presence of phytochemicals in the leaves using different types of extraction solvents. The findings suggest that the methanolic extract of *S. dulcificum*. is a potential source of phytochemicals that may be used for further bioactivity studies.

## METHODOLOGY

### Sample collection and preparation

The fresh leaf samples of *S. dulcificum* were collected from Herbs Camp in Hulu Langat. The samples were washed and dried under the sunlight for 2-3 hours. After drying, the leaves were blended to powder with a laboratory blender.

### Preparation of extraction

30 g of leaves powder was homogenized in 120 mL of petroleum ether and stirred on the orbital shaker at 100 rpm for 3 days. After filtration, the remaining residue was extracted again successively with ethyl acetate and methanol. Finally, the organic phases obtained were concentrated by a rotary evaporator. Then, the extract was transferred to sample jars and kept in fridges at 4 ℃ before proceeding with the phytochemical screening tests.

### Phytochemical screening test

The three extracts were undergoing phytochemical screening. The procedure was adapted from Radhia et al., 2018.

**Saponins:** Two drops of extract were mixed with 3 drops of distilled water in a test tube. Then, the mixture was shaken vigorously and observed for persistent froth. The presence of saponins resulted in the forming of a foam layer on the top of the mixture.

**Phenolic derivative**: A few drops of 0.5% Ferric chloride were added to the extract. It resulted in the appearance of green or blue to indicate the presence of phenolic.

**Terpenoids**: The extract was mixed with 2 ml of chloroform and concentrated $H_2SO_4$ until it formed a layer. The presence of terpenoids can be seen with the formation of a reddish-brown interface coloration.

**Flavonoids**: 5 ml of ammonia was added to the extract flask. Then, changes in colour were recorded, which showed the presence of flavonoids.

**Tannins**: A few drops of 0.1% ferric chloride were added to the extract. The brownish-green colour of the solution appears, resulting in the presence of tannins.

## RESULTS AND DISCUSSION

The various types of extraction solvents used in this study were nonpolar (petroleum ether), intermediate polar (ethyl acetate), and polar solvents (methanol). Table 1 shows the results of the phytochemical screening of *S. dulcificum* leaf extract.

**Table 1**. Phytochemical screening of the leaf powder of *S. dulcificum*

| Phytochemical constituents | Petroleum ether extract | Ethyl acetate extract | Methanol extract |
|---|---|---|---|
| Phenolic derivatives | - | + | + |
| Saponins | - | - | + |
| Terpenoids | - | - | + |
| Flavonoid | - | + | + |
| Tannins | - | + | + |

*Note: (+): Present (-): Absent

Table 1 indicated that the petroleum ether extract was absent for all phytochemicals tested. However, Osabor et al. (2015) found that flavonoids and tannins are present without the saponin in the petroleum ether extract of the *S. dulcificum* leaves. This contradiction could be due to pre-extraction factors such as its origin, particle size, moisture content, method of drying, and degree of processing (Shaikh & Patil, 2020), even though we used the same plant parts and solvents. The ethyl acetate extract showed the presence of the phenolic derivative, flavonoids, and tannins but the absence of the saponins and terpenoids. For methanol extract, the result shows the presence of all of the phytochemicals studied. Intermediate polarity solvents like methanol can extract a broader range of phytochemicals. Polar solvents like water and ethanol efficiently extract polar molecules, including phenolic compounds, flavonoids, and glycosides. Selecting a solvent with a particular polarity is a crucial factor in the efficiency and selectivity of phytochemical extraction. Phytochemicals are naturally derived substances in plants and exhibit a wide range of polarity. The polarity of the solvent influences the extraction of these phytochemicals due to the distinct solubility properties exhibited by these compounds in polar and nonpolar solvents.

**CONCLUSIONS**

The phytochemical analysis holds significant importance in assessing the potential medicinal uses of a plant and identifying the active compounds responsible for the observed biological effects shown by the plants. The qualitative analysis of this present study showed that the methanolic leaf extract of *S. dulcificum* was rich in nutrients compared to ethyl acetate and petroleum ether solvent extraction, which suggests that methanol is the best extraction solvent for further biological activity studies. Extraction of a phytochemical from the plant material mainly depends on the type of solvent used.

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