



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 Issue: I Month of publication: January 2020

DOI: <http://doi.org/10.22214/ijraset.2020.1099>

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Green Chemistry and Micro scale Technique: A Move towards Environment Friendly Approach

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Abstract: Green Chemistry and Microscale technique are of great importance in present global scenario with respect to environmental conditions. Green chemistry involves three basic principles of reduce, reuse and recycle which provides an opportunity to utilise various waste which are otherwise discarded. In microscale technique various benefits are observed as compared to traditional or macroscale grade techniques without compromising the quality or results. Thus, the present study is an effort in utilising both the above techniques which is a move towards environment friendly approach.

Keywords: Green Chemistry, Microscale technique, Reuse, Waste, Environment friendly.

I. INTRODUCTION

Orange fruit as whole is very useful which includes pulp, juice, extract, peel and oil. Citrus juice processing industry generates large amount of peels as waste materials which is needed to be disposed off. Citrus peels are rich in nutrients and phytoconstituents which can be reused, recycled for value added products from it. Cold pressed orange oil is used in fragrance, flavouring and aromatherapy. (1,2)



Fig 1. Orange peel



Fig 2. Orange peel powder

Citrus peel waste is prone to quick bacterial contamination owing to high moisture and sugar content. Thus, the costly waste treatment aspect is needed so as to prevent environmental pollution. So Green Chemistry is need of hour which reuses, recycle and reduces the waste so as to generate value added products from the waste. All the by-products obtained like fibres, pectin, oil, limonene etc are used as food supplements, as silage and as mosquito repellent. (3)

Many natural products isolations make it more complex as very low concentration of active constituents are present from natural source. Orange peel is one such natural waste of great potential use. It is a rich source of terpene that is limonene. There are various macroscale methods are available and are extensively used for extraction of orange peels. But it was thought of using microscale technique for preparation of extraction for carrying out the phytochemical analysis. (4)

As following are the advantages of benefits of Microscale technique

- 1) Quantity of chemicals used a few grams of solids and a few ml. of solutions are used and few milligrams and drops of solutions are used.
- 2) A typical microscale experiment will consume only, say less than 1% of the required quantity of the reagents used in a corresponding traditional macroscopic experiment.
- 3) Environmental Protection
- 4) In a traditional chemistry laboratory lot of chemicals are drained. Lot of toxic fumes cause pollution.

- 5) In microscale chemical lab use of sink may not be necessary and as such drainage of chemicals is minimized.
- 6) Reduction of waste.
- 7) Reduction in Accidental Hazards
- 8) Breakage of glass ware Glassware is minimized.
- 9) Time taken for a experiment is reduced that is decreases reaction time as well as saves times for preparation .
- 10) Cost effective technology
- 11) Requires smaller storage area (5)



Fig 3 . Principles of Green Chemistry

Source: <https://followgreenliving.com/green-chemistry-longer-mystery/>

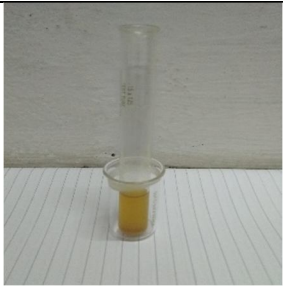





II. PREPARATION OF EXTRACT

Orange peel were first collected and then thoroughly washed and dried and converted into powder . As microscale technique is opted only 6gm of powdered material is extracted with 100 ml of methanol for three hours using apparatus which is designed in microscale grade. After 3 hrs the residue was dissolved in 50 ml of water and filtered. Then used for phytochemical analysis.



Fig .4 Microscale grade apparatus

Table No 1. Phytochemical analysis

S.No	Test	Result	Observation
1	Test for Terpene: To 5ml of extract add 2ml of chloroform and 3 ml of conc H ₂ SO ₄ , formation of reddish-brown ring confirms the presence of terpene	formation of reddish-brown ring confirms the presence of terpene.	
2	Test for chalcone: To 2ml of extract add 1ml of AlCl ₃ solution in methanol formation of yellow colour indicates presence of flavonoids or chalcones	formation of yellow colour indicates presence of flavonoids or chalcones.	
3.	Test for chalcones: 2ml of Ammonium hydroxide was added formation of reddish brown colour confirms presence of chalcone	formation of reddish-brown colour confirms presence of chalcone.	
4	Test for chalcone: To 2ml of filtrate in a test tube 1ml of 1% potassium hydroxide, formation of bright yellow indicates the presence of chalcone or flavanone	formation of bright yellow indicates the presence of chalcone or flavanone.	
5	Test for chalcone: to alcoholic extract add Mg filings and conc H ₂ SO ₄ formation of green colour confirms presence of chalcone	formation of green colour confirms presence of chalcone	
6	Test for Hesperidin: To 2ml extract add 1ml of ferric chloride solution formation of green colour confirms presence of chalcone	formation of green colour confirms presence of hesperidin methyl chalcone chalcone.	

(6,7)

Thus, above phytochemical analysis confirms the presence of phytoconstituents present in extract obtained from microscale technique which are same as compared to documented works from macroscale technique. Thus, microscale extraction of orange peel powder using microscale grade apparatus not only saves time but also prevents usage of quantity of solvents required for extraction and thus provides cost effectiveness also eliminates the use and generation of hazardous without comprising the quality of results. The above phytochemical analysis confirms the presence of terpene that is limonene, hesperidin methyl chalcone which is an organic compound is classed as both ketone as well as polyols which has the property of antioxidant. (8,9,10)

III. CONCLUSIONS

Recycling of fruit waste is one of the most important means of utilizing it in a number of innovative ways, yielding new products and meeting the requirements of essential products required in human, animal and plant. Microscale technique is promising solution for generation of chemical waste and its subsequent disposal thus going more towards green chemistry to achieve environment friendly approach. As no wastage of costly chemicals, samples, solvents and time required is also less. Recycling, reuse and reduction of waste is achieved and at the same time potential phytoconstituents of great potential are utilised for development of value addition-based products.

IV. ACKNOWLEDGEMENT

The author Dr.Sonal Sanjay Dhabekar acknowledges Department of Science and Technology (DST) India for financial support under Women Scientist Scheme- B for research fellowship grant no SR/ WOS-B/645/2016.

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