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# A Brief Review on Peel Waste as Sustainable Corrosion Inhibitor

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***Abstract:*** ***Naturally occurring corrosion inhibitors can slow down the corrosion rate of metals without posing environmental hazards. Vegetable peels have proved beneficial in this regard. Their usage to effectively reduce corrosion rate is an eco- friendly approach which addresses the problem of waste disposal too. This brief review aims to present corrosion mitigation studies by few vegetable peels in different corrosive media and metals.***
***Keywords: peels, corrosion inhibitor, waste, metals, eco-friendly***

## I. INTRODUCTION

Corrosion of metals is universal and usually reveals itself in the form of structural, aesthetic and financial losses. The annual global economic loss due to corrosion of various metals is assessed to fall in the range of dollars 700 billion and dollars 1 trillion.[1]
The phenomenon of corrosion and its associated problems can be mitigated by addition of inhibitors to the immediate environment of the metals.[2]
Synthetic corrosion inhibitors generally possess conjugated system of bonds heterocyclic rings and functional group containing nitrogen, phosphorus, oxygen and sulphate.[3]
The electron density on these donor atoms is a favourable characteristic to function as adsorption centres.[4]
Their effectiveness, ready availability, easy usage and an extended shelf life makes them an ideal choice for reducing corrosion in pipelines nuclear power plant or offshore operations/ platform.[5]
However, toxicity of synthetic inhibitors like chromates have been well documented. [6,7]
This has given rise to replacing them with natural and green alternatives [8]
Various natural products and plant extracts can function as eco- friendly corrosion inhibitors. A number of reviewers have documented about the same. [9,10] Their inhibition efficacy arises due to the presence of different phyto components containing heteroatoms, aromatic and heterocyclic rings. The use of vegetable and fruit peels to reduce corrosion has also garnered interest over recent years. Owing to the perishable nature of fruits and vegetables their waste disposal has become a major challenge. [11] It is a sustainable approach leading to waste reduction as well as contributing to circular economy principles.[12]
Apart from this fruit waste is usually rich in polysaccharides and different phytochemicals.[13]
This short review aims to present the use of various vegetable and fruit peels for mitigating corrosion of metals in distinct environments.

Table 1: Vegetable peels as corrosion inhibitors of metals in different corrosive media.

| Inhibitor | Metal | Corrosive medium | Methodology | Inhibition efficiency |
|---|---|---|---|---|
| PPE [14] | Carbon steel | Formation water | Ion chromatography, FTIR, SEM, EDX weight loss, OCP measurement | 92.27% at 2.5% inhibitor conc |
| PPE [15] | Low carbon steel | 3.5% NaCl | FTIR, weight loss, potentiodynamic polarisation | 73.33% at 6ml inhibitor |
| PPE [16] | Mild steel | HCl, sea and distilled water | Weight loss | More than 70% at 2M HCl |
| Pisum sativum (PS) [17] | Aluminium alloy | 1M NaOH | Weight loss, SEM, AFM, EIS, Tafel plots, linear polarization | 94.5% at 1.5 g/l |

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|---|---|---|---|---|
| Pumpkin Peel Extract [18] | Aluminium | 1M HCl | Weight loss, EIS, AFM-XPS, EFM | 95.42% at 300ppm |
| Vicia faba peels [19] | Mild steel | 3.5% NaCl | GC-MS, Tafel plots, EIS, SEM, Quantum chemical calculations | 97.84% at 200ppm hexane extract,88.67% at 200ppm acetone extract. |

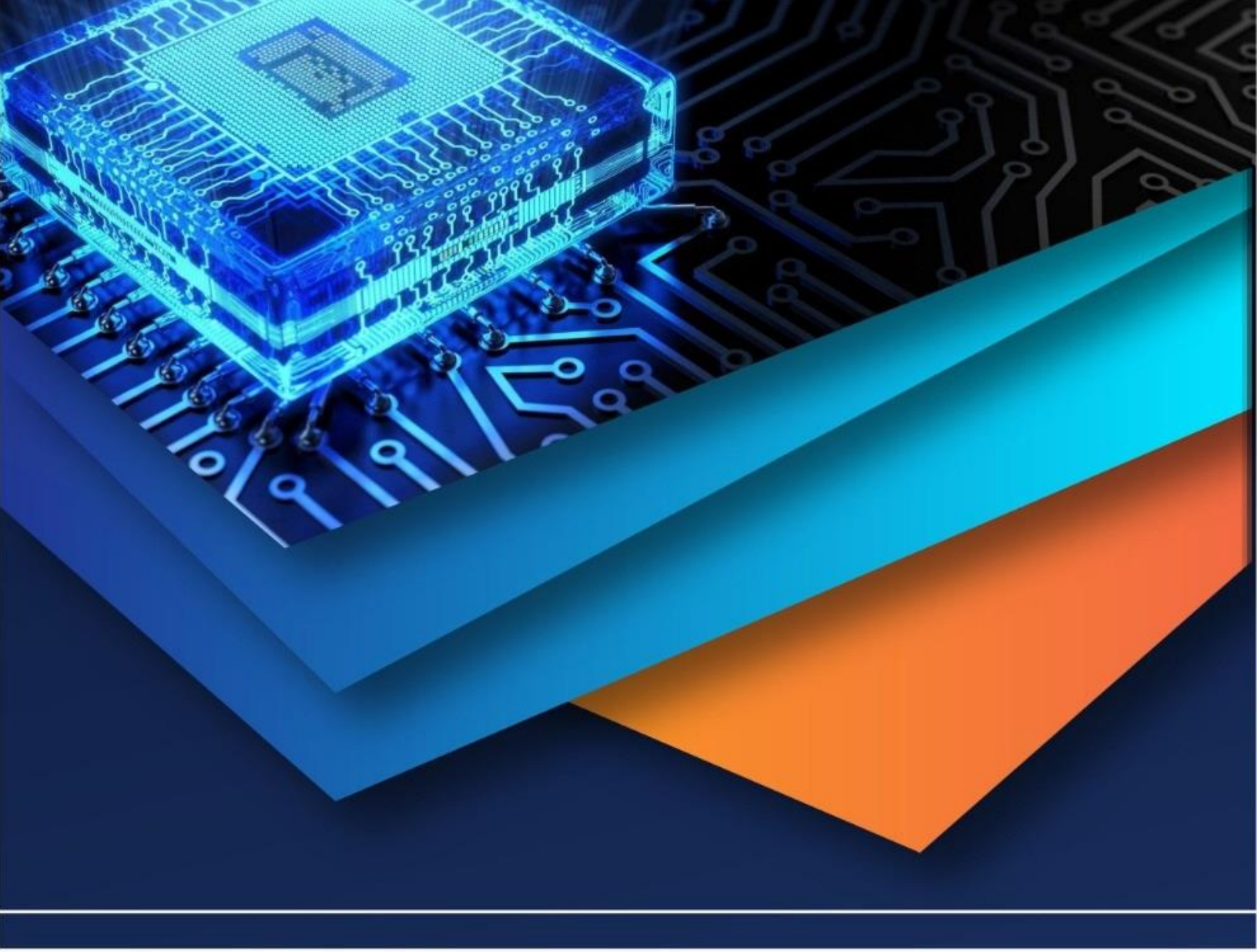
## II. CONCLUSION

The values of inhibition efficiencies of various vegetable peels in diverse corroding media as well as metals has been tabulated above. Fairly good results can be observed from the table. It can be concluded that vegetable peels can serve a dual purpose of hindering the corrosion process as well as that of waste disposal.

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