

# Recent Advancements in Eco-Friendly and Economically Available Substrates for the Production of Citric Acid

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Citric acid ( $C_6H_8O_7$ ) is one of the major organic acids used in food industry, pharmaceuticals, beverages and cosmetics. Citric acid can be produced from various sources, like molasses, starch, brewery waste, oils, like coconut oil, olive oil, fruits, like pineapple, oranges, apple, etc. Citric acid can be produced by the fermentation process using fungi *Aspergillus niger* strains. It can also be produced by using yeast and bacteria, but *Aspergillus niger* is been extensively preferred choice. Various methods are being studied to enhance the production of citric acid in the easy and cheaper way. Due to its various advantages, submerged fermentation is widely used. The solid-state fermentation can also be used for the better production of citric acid. The consumption of the citric acid is gradually increasing by 3.5 to 4 % every year. To achieve the demand, studies are carrying out on the use of lower cost raw materials for reducing the production cost. In order to achieve higher yields the factors, like carbon, nitrogen, phosphorous sources, trace elements, pH, aeration, agitation, temperature are to be considered, studied and optimized. The recovery of citric acid from the fermentation broth is a major step, which includes precipitation, filtration, evaporation, solvent extraction, adsorption and drying.

## KEYWORD

Citric acid, Submerged fermentation, Solid-state fermentation, *Aspergillus niger*.

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# Watershed Impact Assessment Using Remote Sensing and GIS Application

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The watershed is a hydrological unit bounded by natural ridges. It allows the runoff due to drain in a well defined drainage pattern of streams within the watershed boundary. Watershed can be of different shapes and sizes. It integrates terrestrial, aquatic and geologic features. The watershed conserves water, provides sustainable water resources, enables a healthy soils for crops, provide a habitat for wildlife and plants. The GIS and remote sensing technology plays a vital role in the watershed management practices. The landuse and landcover detection will be carried out to identify the losses in vegetation cover of the watershed. The water quality and the soil condition of the watershed are also identified. This is important for effective landuse and water resource planning and management. The watershed impact assessment will be carried out in the Kannanar watershed. This covers the part of Thanjavur and Thiruvarur district. The main objective of the study is to assess the impact of landuse and landcover in the study area and to suggest suitable remedial measures for the watershed planning and management. The landuse and landcover change detection was carried out using the landuse change pattern map. The landuse pattern map for the year 1996, 2004 and 2012 was prepared. From this the changes in landuse and landcover was identified.

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# Studies on Ion Exchange Capacity of Phenol-Formaldehyde Resin Blended With Sulphonated *Tinospora cordifolia* Carbon

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The simple method of preparing cationic resins (CRs) from polycondensation of sulphonated *Tinospora cordifolia* (Thunb.) Miers. carbon (STCC) with phenol-formaldehyde resin (PFR) as a cross linking agent has been reported. A few composite ion exchangers were prepared by varying the amount of sulphonate *Tinospora cordifolia* carbon in the blends from 0 to 100% (w/w). The properties of the blends were determined and compared with the parent resin without sulphonate *Tinospora cordifolia* carbon content. It was found that the ion-exchange capacity or cation exchange capacity (CEC) of the composite resins decreased with increasing the percentage of blending phenol-formaldehyde resin matrix with sulphonate *Tinospora cordifolia* carbon. SEM images have well defined in micrometric structures of the 2 different magnifications. The composites upto 20% (w/w) blending of phenol-formaldehyde resin with sulphonate *Tinospora cordifolia* carbon 2 retain almost all the essential properties of the original phenol-formaldehyde resin (parent resin). Since *Tinospora cordifolia* is a freely available plant material, the blended composites of phenol-formaldehyde resin with sulphonate *Tinospora cordifolia* carbon could be used as low cost ion exchangers without affecting the physico-chemical, cation exchange capacity, thermal and spectral properties of the original parent cationic resins, namely phenol-formaldehyde resin.

## KEYWORD

Phenol-formaldehyde resins, Cationic exchange capacity, Sulphonated *Tinospora cordifolia* carbon, Ion exchangers.

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# Impact of Soil Compaction and Biodiversity of Soil Fauna

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Soil organisms have the potential to be used as biological indicators of soil health due to their sensitivity to changes in management practices. The soil fauna play a role in nutrient cycling, especially in undisturbed ecosystems. A knowledge of the role of the soil fauna in the decomposition could be effectively used in management of solid wastes- especially garbage and reclamation of wasteland. The purpose of the study is to determine the population dynamics of soil organisms, namely microarthropods in 3 different sites within the Stella Maris College campus and also to assess the impact of soil compaction on the incorporation of nutrients in the soil and the diversity of soil fauna. The various parameters that contribute to the quality of the soil were ranked for sites 1,2 and 3. The composite ranking test clearly indicated that the soil in the sites 2 and 3 were far superior in quality to that of site 1. The soils in sites 2 and 3 supported a high density of soil organism and vegetation which are excellent bioindicators of good quality soil.

## KEYWORD

Microarthropods, Nutrient cycling, Soil compaction.

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