NEW FERMENTATION PROCESSES FOR PRODUCING ITACONIC ACID AND CITRIC ACID FOR INDUSTRIAL USES

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Itaconic acid is an important industrial chemical that we have produced by fermentation of simple sugars using the yeast *Pseudozyma antarctica.* Itaconic acid is priced at ~$4 per kg and has an annual market volume of about 15,000 metric tons. Itaconic acid is used in the polymer industry and for manufacturing synthetic fibers, coatings, adhesives, thickeners and binders. Presently, a filamentous fungus, *Aspergillus terreus,* is used for commercial production of itaconic acid. However, growth of filamentous fungi is complex and the ability to obtain and maintain a particular growth stage is critical to maximum product output. Additionally, fermentation with filamentous fungi often leads to high broth viscosity causing various operational problems. Our production of itaconic acid by using yeasts, which grow as single cells, circumvents the technological limitations often associated with filamentous fungi.

Citric acid is a widely used industrial chemical with an annual world market of about 400,000 metric tons for use in foods, beverages, confectionery, toxic waste treatments and other industrial applications. It is presently produced by *Aspergillus niger*, a common fungus that is also used for the industrial production of many other substances. However, we have produced citric acid from biodiesel glycerol using the yeast *Yarrowia lipolytica.* Under our newly defined growth conditions, the yeast produced citric acid from glycerol with good conversion (~56%) and with minimal amounts of the undesirable coproduct isocitric acid.

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