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Crude Glycerol: A Feedstock for Organic Acid Production by Microbial Bioconversion

Thomas P. West*

Department of Biology and Microbiology, South Dakota State University, Brookings, SD 57007, USA

Abstract

The global production of crude glycerol from biodiesel is rapidly expanding. There is opportunity to produce industrially important organic acids from crude glycerol using microbial bioconversion. Further investigations are warranted to explore the feasibility of microbial production of organic acids from crude glycerol.

As the global production of biodiesel as a fuel continues to increase, this will also result in a surplus of the co-products of this process. The co-product stream of biodiesel production usually includes glycerol, fatty acids and methylesters of fatty acids [1-3] which is referred to as crude glycerol. During the production of vegetable oil-based biodiesel, the transesterification of the oil results in crude glycerol being formed at about 10% in weight [3]. As the demand for biodiesel continues to increase, it will be necessary to learn whether the co-product crude glycerol, with a current price of $0.05/pound [3], can serve as a feedstock for subsequent microbial bioconversion into commercially valuable organic acids such as citric acid, oxalic acid, succinic acid, malic acid and fumaric acid. Recent articles have indicated that some of these industrially important organic acids can be synthesized from crude glycerol using microbial bioconversion [1-3]. It is known that species of the yeast *Candida* and *Yarrowia* can produce citric acid from crude glycerol [1-3]. Currently citric acid is commercially produced using the fungus *Aspergillus niger* [4]. The availability of large volumes of crude glycerol may mean the fungal citric acid production may be replaced by yeast citric acid production. Oxalic acid is another organic acid that can be produced from crude glycerol. Only recently has it been shown that fungus *Aspergillus ficuum* can produce oxalic acid after growth on crude glycerol from the biodiesel industry [5]. Succinic acid has also recently been shown to be produced by *Basfia succiniciproducens* following growth on crude glycerol [6]. Clearly, very few studies have examined microbial oxalic acid or succinic acid production from crude glycerol and further work will need to be done to learn whether their production from crude glycerol derived from other sources is feasible. Considering it has been shown that malic acid can be produced from a glycerol-containing corn processing product by species of *Aspergillus* [7], it should be possible to produce malic acid from crude glycerol. At present, the production of fumaric acid from crude glycerol does not appear to have been investigated. The opportunity exists to use crude glycerol as a feedstock for organic acid production to reduce reliance on petroleum-based feedstocks. In order to take advantage of this opportunity, it will be necessary to more fully explore how effectively organic acids can be produced by microbial bioconversion from crude glycerol obtained from different sources.

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***Corresponding author:** T. P. West, Department of Biology and Microbiology, South Dakota State University, Box 2104A, Brookings, SD 57007, USA, Tel: 605-688-5469; Fax: 605-688-6677; E-mail: Thomas.West@sdstate.edu

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