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Swine waste as a source of natural products: A carotenoid antioxidant

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ABSTRACT

Development of Environmentally Superior Technologies swine waste management has focused on extraction of products with relatively low unit values. Analyses of the bacterial composition of swine waste lagoon samples confirmed the presence of several purple non-sulfur bacteria (PNSB) species known to produce a variety of carotenoids. We examined a carotenoid naturally abundant in North Carolina swine waste lagoons dominated by PNSB. Analytical methods including high performance liquid chromatography (HPLC), mass spectrometry, and nuclear magnetic resonance (NMR) confirmed the identity of the dominant carotenoid as spirilloxanthin, $C_{42}H_{60}O_2$, with 13 conjugated double bonds. This structure confers antioxidant properties as good as those of carotenoids currently marketed as antioxidants. Visual estimates of the "redness" of swine waste lagoon liquids were highly correlated with carotenoid content. Spirilloxanthin concentrations in a lagoon with a strong PNSB bloom were approximately $0.5 \text{ grams} \cdot \text{m}^{-3}$. These results support further investigations into the potential for extracting commercially valuable natural products from swine waste lagoons.

KEYWORDS

Swine Waste; Purple Phototrophic Bacteria; Carotenoids; Spirilloxanthin

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