

# Optimized Production of Second-Generation Bioethanol from a Spent C4 Grass: Vetiver (*Chrysopogon zizanioides*)

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**Abstract:** Vetiver grass (*Chrysopogon zizanioides*) is well-known for its contaminant phytoextraction potential and its capacity to reduce soil erosion owing to its massive, dense root system. However, the shoots are not major contributors to either of these processes and are either not utilized at all or they become part of the waste stream. It is well-recognized that lignocellulosic biomass can serve as a source of raw material to produce second-generation bioethanol. This study investigated the simultaneous saccharification and fermentation (SSF) of acid-alkali pretreated vetiver (VG) shoots by *Saccharomyces cerevisiae*. Vetiver shoots were obtained from three sources: 1) Shoots from VG grown in clean potting soil, 2) Shoots from VG used for antibiotics phytoextraction from a constructed wetland setup, and 3) Shoots from VG used for lead phytoextraction during soil remediation. Bioethanol yield from the shoots from clean soil was the highest (19.58 g/L), followed by the one used for lead phytoextraction (19.50 g/L) and the one used for antibiotics phytoextraction (19.17 g/L). Bioethanol yield obtained from these three VG shoots was superior or similar to other C4 grasses used for bioethanol generation. This study successfully demonstrated that spent vetiver biomass after phytoextraction applications can be repurposed to generate high-quality bioethanol.

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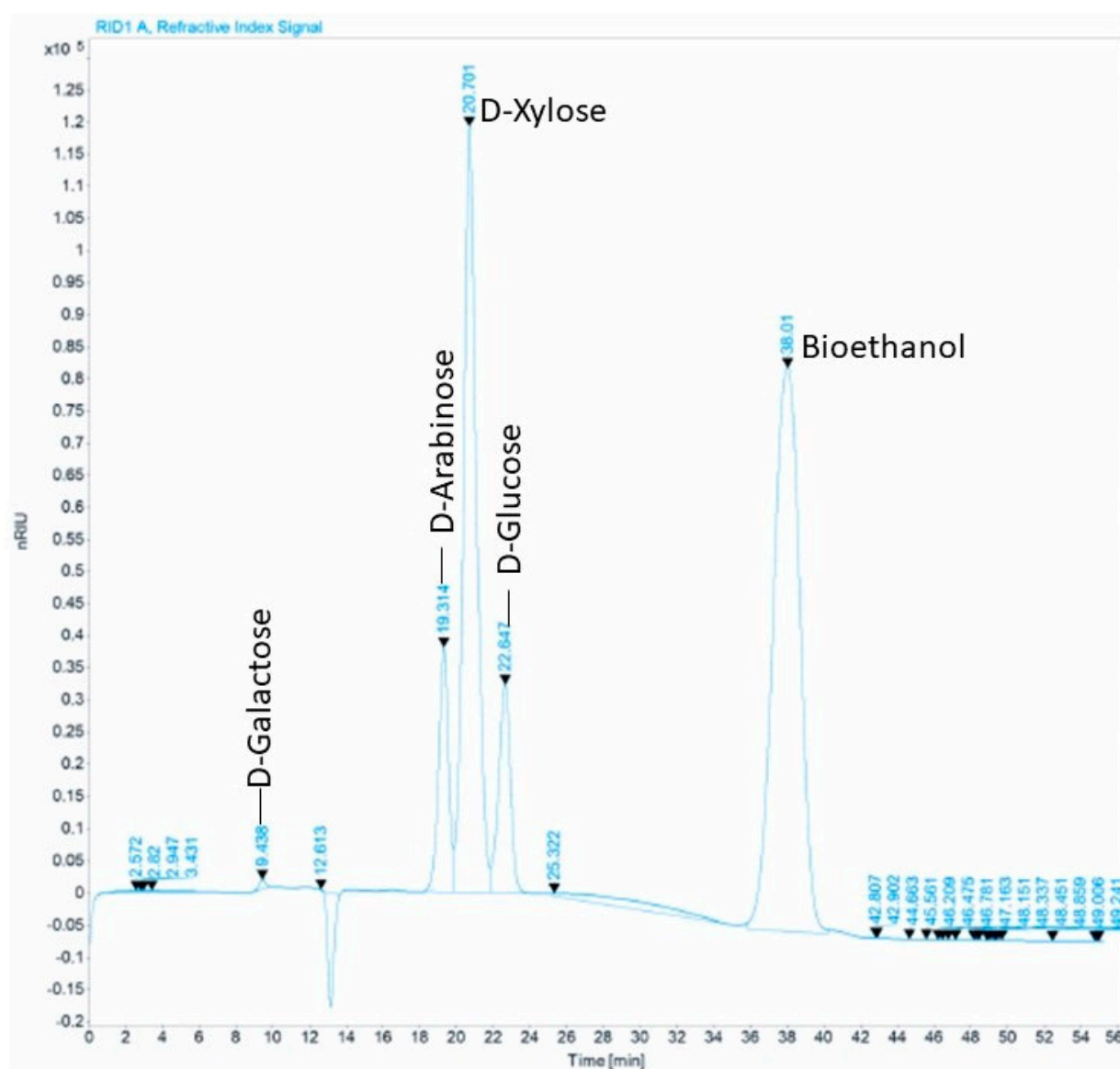
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**Figure S1.** A representative HPLC chromatograph showing the monosaccharide and bioethanol peaks.