



“Gheorghe Asachi” Technical University of Iasi, Romania



---

## HIGH YIELD OF ETHANOL FROM WASTE APPLE JUICE by IMMOBILIZED CELLS OF *Saccharomyces cerevisiae* S-3S ON SUGAR CANE BAGASSE IN FED BATCH SYSTEM

Arifa Tahir\*, Sidra Sarwar

Environmental Science Department, Lahore College for Women University, Lahore, Pakistan

---

### Abstract

The aim of present study was the effective utilization of waste apple for high yield of ethanol using immobilized cells of *Saccharomyces cerevisiae* S-3S through fed-batch fermentation. Low cost biomaterial was also developed for immobilization. Immobilization was carried out on different inert supports (agar-agar, k-carrageenan, Ca-alginate, sugar cane bagasse and apple bagasse). The results revealed that immobilized cells of *S. cerevisiae* S-3S gave high yield of ethanol as compared to free cells. Maximum ethanol (9.5% v/v) was produced with *S. cerevisiae* S-3S immobilized cells on sugarcane bagasse. The effects of different glucose concentration feeding rates on ethanol fermentation were investigated for fed batch culture. The fed batch culture at 40% glucose concentration feeding rate was proven to be a better fermentation system than the batch culture. Our findings suggest that fed-batch fermentation improves the efficiency of ethanol production in terms of ethanol concentration and product yield.

**Keywords:** apple juice, ethanol, fermentation, *Saccharomyces cerevisiae* S-3S, sugar cane bagasse

*Received: November, 2012; Revised final: November, 2013; Accepted: December, 2013*

---

---

\* Author to whom all correspondence should be addressed: e-mail: [arifa.tahir@yahoo.com](mailto:arifa.tahir@yahoo.com); Phone: 92- 042-9203091