

## Effect of Nanoparticles Concentration, pH and Agitation on Bioethanol Production by *Saccharomyces cerevisiae* BY4743: An Optimization Study

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**Abstract :** Nanoparticles have received attention of the scientific community due to their biotechnological potentials. They exhibit advantageous size, shape and concentration-dependent catalytic, stabilizing, immunoassays and immobilization properties. This study investigates the impact of metallic oxide nanoparticles (NPs) on ethanol production by *Saccharomyces cerevisiae* BY4743. Nine different nanoparticles were synthesized using precipitation method and microwave treatment. The nanoparticles synthesized were characterized by Fourier Transform Infra-Red spectroscopy (FTIR), scanning electron microscopy (SEM) and transmission electron microscopy (TEM). Fermentation processes were carried out at varied NPs concentrations (0 - 0.08 wt%). Highest ethanol concentrations were achieved after 24 h using Cobalt NPs (5.07 g/l), Copper NPs (4.86 g/l) and Manganese NPs (4.74 g/l) at 0.01 wt% NPs concentrations, which represent 13%, 8.7% and 5.4% increase respectively over the control (4.47 g/l). The lowest ethanol concentration (0.17 g/l) was obtained when 0.08 wt% of Silver NPs was used. And lower ethanol concentrations were observed at higher NPs concentration. Ethanol concentration decrease after 24 h for all the processes. In all set up with NPs, the pH was observed to be stable and the stability was directly proportional to nanoparticles concentrations. These findings suggest that the presence of some of the NPs in the bioprocesses has catalytic and pH stabilizing potential. Ethanol production by *Saccharomyces cerevisiae* BY4743 was enhanced in the presence of Cobalt NPs, Copper NPs and Manganese NPs. Optimization study using response surface methodology (RSM) will further elucidate the impact of these nanoparticles on bioethanol production.

**Keywords :** agitation, bioethanol, nanoparticles concentration, optimization, pH value

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