

Morphological changes of an actinomycete in submersed culture and its correlation with antibiotic production

Kamaleshwar P Singh, Pramod P Wangikar and Sameer Jadhav

Indian Institute of Technology - Bombay, India

Actinomycetes, a class of filamentous bacteria, are well known for over 45% of secondary metabolite production. Several environmental factors including the media composition affect both biomass growth and product formation during submersed cultivation. Further, morphology and product formation have been observed to be closely related. Likewise, several studies have shown that environmental factors effect changes in cellular morphology. However, the relationship between morphology and product formation is not well understood. In this study, we report a strong correlation between morphology and balhimycin production in an actinomycete, *Amycolatopsis balhimycina* DSM 5908 during submersed cultivation. Several morphological parameters were systematically quantified as a function of phosphate and ammonia in defined medium. Concentrations of ammonium sulfate and phosphate were varied around their optimal values for balhimycin

production. Higher productivity of balhimycin was correlated with (i) higher pellet fraction in the biomass, (ii) small elongated pellets and (iii) shorter hyphae in the periphery of the pellets. Depending on the medium composition, balhimycin production starts at 72 h or later with maximum product observed at 144-168 h. Further, the profiles of concentrations of nutrients or biomass do not provide any distinction between producing and non-producing media combinations. However, we observe that morphological changes not only correlate with balhimycin productivity, these changes occur at 24-48 h, which is much before the actual production starts. Therefore, we argue that cellular morphology can be used as a monitoring tool to predict productivity of a given batch. While the actual nature of the correlation between morphology and productivity may vary from strain to strain, we hypothesize that a similar monitoring strategy can be developed for other products.

