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Validating a Mathematical Model Describing Two Antagonistic Parallel Ways for Optimum Biotransformation of β-Sitosterol to Testosterone

Mohamed Abdel Aziz Mohamed*

Natural and Microbial Products Chemistry Department, National Research Centre, 33 El Bohouth st. (former El Tahrir st.) - Dokki - Giza - Egypt. P.O. 12622.

Abstract : The current study aimed at optimizing microbial transformation of β-sitosterol to testosterone through statistical methods of modeling and optimization. Plackett-Burman design was employed to screen the significance of eleven factors in the biotransformation of β-sitosterol to testosterone by the strain *Rhizopus oryzae* nrc11. Ten factors were of a significance and three of them, namely yeast extract, β-sitosterol and β-carotene concentration, were the most affecting and were thus further studied through Box-Behnken design. The proposed model showed a strong interaction exerted by each of β-sitosterol and β-carotene with the role of yeast extract. Promotion of the biotransformation process could be attained by one of two ways that are antagonistic to each other and so only one of them should be applied to avoid antagonistic mechanisms. One of the two ways was attained by increasing yeast extract level while keeping β-sitosterol and β-carotene at the lowest levels. The other way was the inverse image of the previous form; increased levels of the later components while keeping the former, yeast extract, at lowest level. Both of the two ways were practically validated and the first was the most efficient as its molar conversion percent was two times higher than that of the second.
Keywords : β-sitosterol, Testosterone, Biotransformation, Plackett-Burman, Box-Behnken.

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