BIOCHEMICAL STUDY ON FAT PRODUCTION FROM YEAST

By

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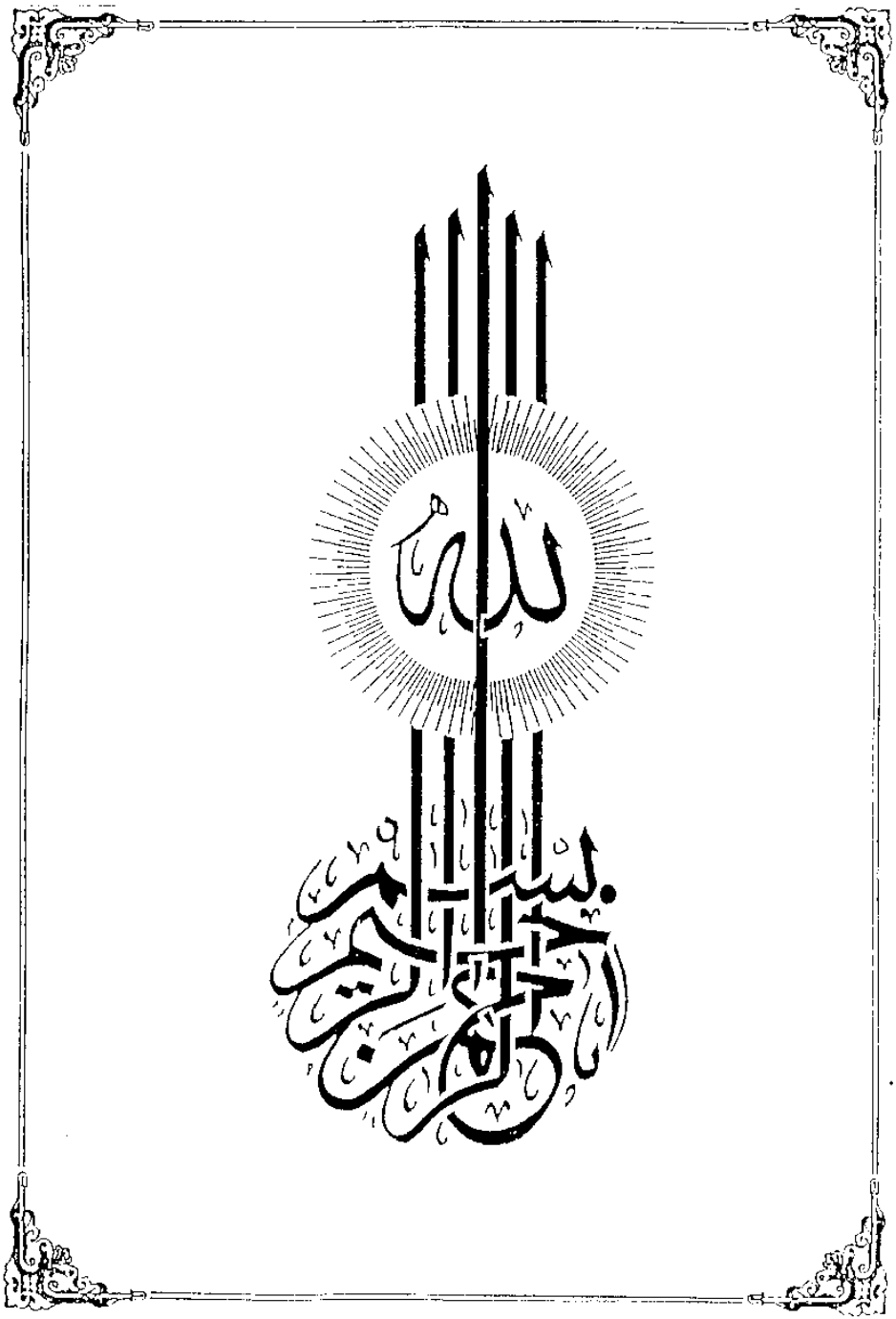

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Abstract

ATIAT ABD EL AZIZ ISMAIL. BIOCHEMICAL STUDY ON FAT PRODUCTION FROM YEAST

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In general, it is possible to recognize two groups of yeasts. The first group comprises the majority of yeasts which contain between 7 to 15% fat. Second small group sometimes known as fat yeast which contain much more fat ranging from 30 to 60%. Therefore, the possibility of fat production from yeast strains was tried. Rhodotorula glutinis, was selected as the most active fat-accumulating strain. Optimization of the nutritional (Carbon, nitrogen and phosphorus sources) and environmental (medium pH value, incubation temperatuare and aeration level) conditions were also tried. Optimal yield of fat being 56.2% with fat yield efficiency of 11.78% was achieved, when Rh. glutinis was cultured on medium containing 60 g/L of glucose, 0.065 g/L of nitrogen (in the form of corn steep liquor) and 0.05 g/L of phosphorus (in the form of KH_2PO_4) to bring C/N and N/P ratios of 369:1 and 1.3:1, respectively.

Qualitative and quantitative determinations of individual fatty acids of the extracted fat from Rh. glutinis, grown under different degrees of incubation temperatures (15, 20, 25, 30 and 35°C) as well as different levels of aeration (0.11, 0.2, 0.32, 0.52 and 1.10 mMO_2/L/min), were described. The total unsaturated fatty acids accounted 23.75, 28.35 and 33.45% at the growth temperatures of 15, 25 and 35°C, respectively. The corresponding figures for the saturated fatty acids were 76.25, 71.65 and 66.55%, respectively. Optimal amount (13.89%) of the short chain fatty acids was detected at growth temperatuare of 25°C. In addition, the growth

temperature of 25 C activated the biosynthesis of stigmasterol and β-Sitosterol, which amounted 2.92 and 8.73% (on the basis of the unsaponifiable matter) respectively.

The GLC analyses indicated that the unsaturated fatty acids were relatively high at the high aeration levels (0.52 and 1.10 mMO_2/L/min). Thus, the unsaturated:saturated fatty acids ratio shifted favourably towards the production of unsaturated fatty acids ($C_{18:1}$, $C_{18:2}$ and $C_{18:3}$) at the high oxygen absorption rate, OAR, which also enhanced the ability of Rh. glutinis to synthesis both stigmasterol and β-sitosterol.

The physical and chemical properties of the extracted fat from Rh. glutinis, were also studied. Besides, scaling up experiment for fat production by using cheap and abundant agroindustrial wastes (sugarcane and beet molasse, the acid hydrolyzate of akalona, sugarcane bagasse and cotton husk) to optimize the economics proposition was also done.

Kew words: Rhodotorula glutinis, batch culture, unsabonifiable matter, odd numbered, oxygen absorption rate, (OAR).

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