

ANALIZA PROFILA SAHARIDA, METABOLITA I AKUMULACIJE ALFA KISELINE U INTENZIVNIM CIKLUSIMA VRENJA SA MIKROZRNCIMA KVASCA

Ferrari, C.¹

Rutnik K.²
0000-0001-6577-2288

Ocvirk M.²
0000-0003-2814-6805

Košir I.²
0000-0002-2829-1335

Poklar Ulrih N.¹
0000-0002-2731-9973

Osojnik Črnivec, I.G.¹
0000-0002-7275-8705

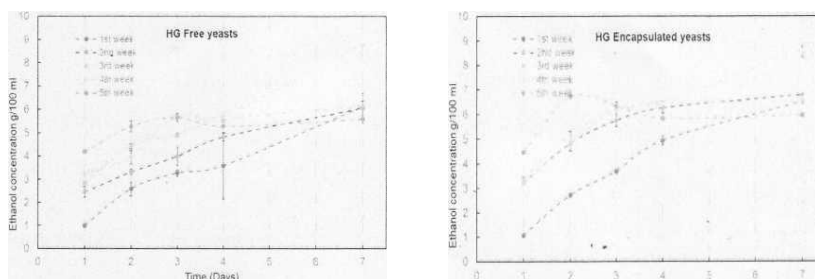
¹Biotechnical Faculty,
University of Ljubljana,
Slovenia

²Slovenian Institute of Hop
Research and Brewing,
Žalec, Slovenia

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Sažetak:

Uslovi okoline značajno utiču na preživljavanje ćelija kvasca tokom alkoholne fermentacije. Ova studija je pokušala da proceni zaštitne efekte različitih inkapsuliranih nosača na bazi alginata i ciklodekstrina na kvasce pod standardnom gravitacijom (10,4% ekstrakt, 35 JBU) i visokom gravitacijom (17,0% ekstrakt, 55 IBU), koristeći 30% izomerizovanih alfa kiselina hmelja ekstrahovanih iz Hopštajnera, Nemačka. Na početku, pivski kvasac SafAle US-05 (Fermentis Lesaffre, Francuska) je inkapsuliran u optimizovanom inkapsularom nosaču (1,5 % alginata) i testiran u standardnom i visokogravitacionom ekstraktu slada kao medijumu. Nakon toga, istražili smo dvokomponentne nosače (1,5% alginata sa 0,2% bilo nativnih, citratom modifikovanih ili maleatom modifikovanih beta ciklodekstrina) u uslovima visoke gravitacije. Sve fermentacije su vršene paralelno sa slobodnim kvascima kao kontrolnim. Proces fermentacije je obuhvatio pet ciklusa (5 nedelja) sa periodičnim uklanjanjem i dopunom ekstrakta slada. Studija je pratila gustinu suspendovanih/ odvojenih ćelija, pH, profile šećera (maltoza, maltotrioza, glukoza, fruktoza) (HPLC), sadržaj izo alfa kiselina (HPLC), kao i evoluciju etanola (HPLC) i aromata (izopentilni alkohol, butil etar, 3-metil-4-heptanon, 1-decen, etil heksanoat, 1-dodecen) (GC-MS).



Slika 1-Proizvodnja etanola u suspendovanoj kulturi i kvascima inkapsuliranim u 1,5 alginatnih mikroznaca

Rezultati su otkrili minimalne razlike između slobodnog i inkapsuliranog kvasca u pogledu OD i pH, što sugerise da je ciklus izvodljiv sa inkapsuliranim kvascem. Međutim, nastali proizvodi ukazuju na metaboličku promenu, o čemu svedoče razlike u proizvodnji etanola (slika 1) i specifičnih isparljivih materija (izopentilni alkohol, butil etar) posebno tokom fermentacije visoke gravitacije.

ANALYZING SACCHARIDE, METABOLITE PROFILES AND ALPHA ACID ACCUMULATION IN INTENSIVE BREWING CYCLES WITH YEAST MICROBEADS

Ferrari, C.¹

Rutnik K.²
0000-0001-6577-2288

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Košir I.²
0000-0002-2829-1335

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¹Biotechnical Faculty,
University of Ljubljana,
Slovenia

²Slovenian Institute of Hop
Research and Brewing,
Žalec, Slovenia

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Summary:

Environmental conditions significantly affect yeast cell survival during alcoholic fermentation.¹ This study sought to assess the protective effects of various alginate and cyclodextrin-based encapsulation carriers on yeasts under both standard gravity (10.4% extract, 35 IBU) and high gravity (17.0% extract, 55 IBU), utilizing 30% isomerized alpha acids hop extract from Hopsteiner, Germany. Initially, brewer's yeast SafAle US-05 (Fermentis Lesaffre, France) was encapsulated in an optimized encapsulation carrier (1.5 % alginate) and tested in standard and high gravity malt extract as a medium. Subsequently, we explored two-component carriers (1.5 % alginate with 0.2 % either native, citrate-modified or maleate-modified beta cyclodextrins) at high gravity conditions. All fermentations were conducted in parallel with free yeasts as controls. The fermentation process spanned five cycles (5 weeks) with periodically removal and replenishment of the malt extract. The study monitored suspended/detached cell density, pH, sugar profiles (maltose, maltotriose, glucose, fructose) (HPLC), iso alpha acids content (HPLC), as well as ethanol (HPLC) and aromatics evolution (isopentyl alcohol, buthyl ether, 3-methyl -4-heptanone, 1-decene, ethyl hexanoate, 1-dodecene) (GC-MS).

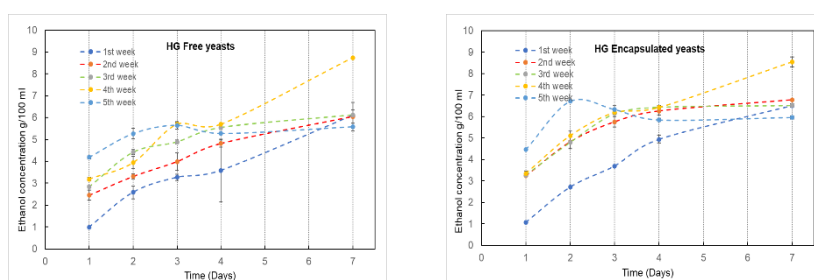


Fig 1. Ethanol production in suspended culture and yeasts encapsulated in 1.5 alginate microbeads

The results revealed minimal differences between free and encapsulated yeasts in terms of OD and pH, suggesting that cycling is feasible with encapsulated yeasts. However, the evolved products indicate a metabolic shift, as evidenced by differences in ethanol production (Fig. 1) and specific volatiles (isopentyl alcohol, buthyl ether) particularly during high gravity fermentation.