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Introduction

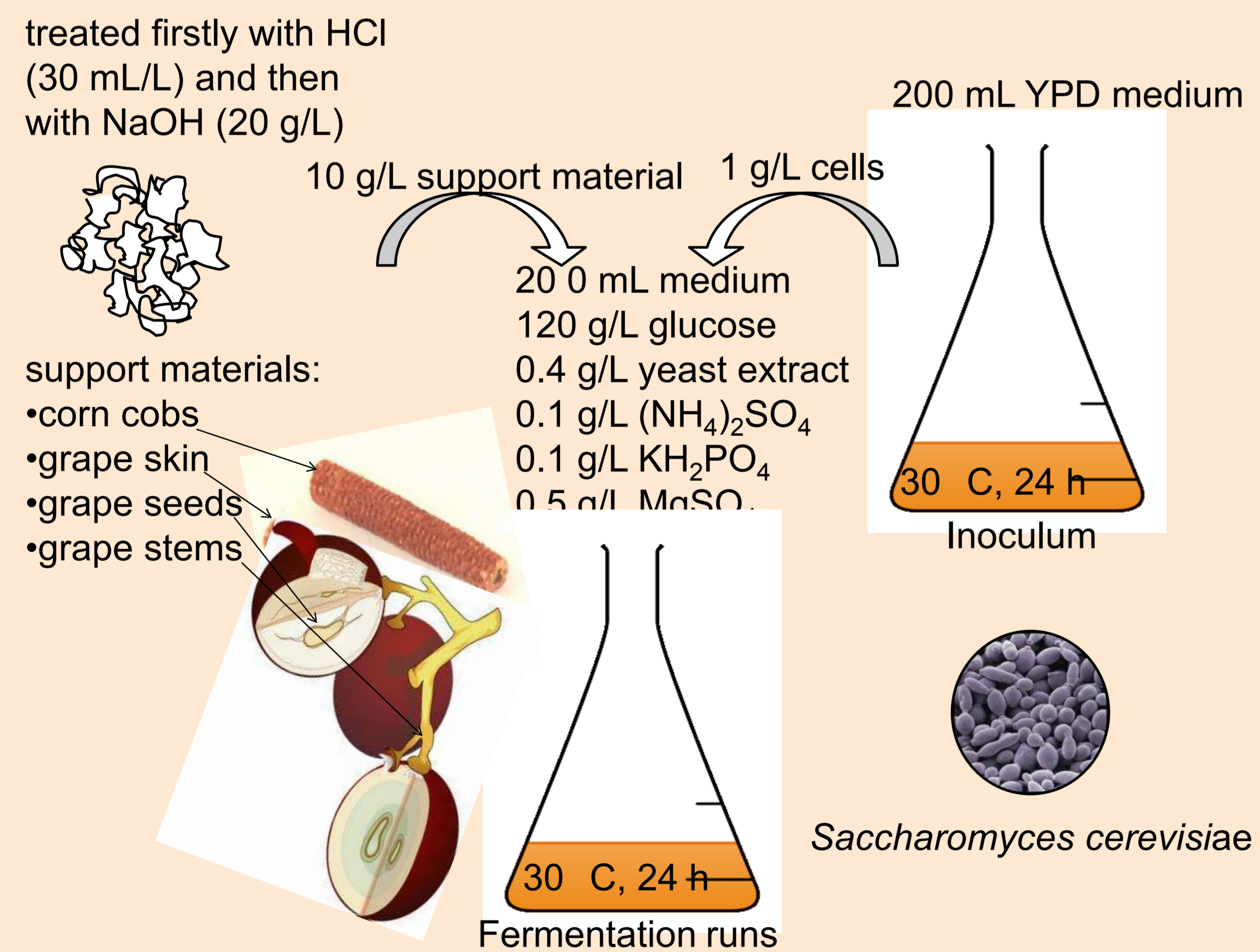
Immobilized cells systems have been considered as a promising alternative to improve the performance of biotechnological processes, since in these systems, immobilized cells completely maintain their biological functions with increased stability that may often lead to increased cell productivity. However, the correct selection of immobilization carrier is essential to design an effective system to each particular purpose.

Objectives

The objective of the present study was to find a cheap and abundant natural material suitable for immobilization of *Saccharomyces cerevisiae* yeast, which is usually used in fermentation processes for wine production. Four different carriers were evaluated, namely grape seeds, grape skin, grape stems and corn cobs.

Materials and methods

Fermentations were carried out in duplicate, and samples were taken periodically for estimation of biomass, glucose consumption and ethanol production. Immobilized cells concentration was determined at the fermentation end.



Results

Table 1. Multiple comparison analysis (Tukey's test) at 95 % confidence level for the concentration of immobilized cells ($C_{i,biom}$) and ethanol (C_{eth}), ethanol yield ($Y_{P/S}$) and productivity (Q_p)

Support	$C_{i,biom}/(mg/g)$	$C_{eth}/(g/L)$	$Y_{P/S}/(g/g)$	$Q_p/[g/(L/h)]$
corn	19.95 ^b	52.24 ^a	0.40 ^b	3.27 ^a
stems	2.83 ^a	53.30 ^a	0.40 ^a	3.33 ^a
skin	9.28 ^b	51.37 ^a	0.50 ^b	3.21 ^a
seeds	2.38 ^a	48.26 ^a	0.39 ^b	3.02 ^a

Conclusions

- The four supports showed no differences in terms of produced ethanol (Figure 1) and ethanol productivity (Q_p) (Table 1).
- Corn cobs and grape skins were the best material carriers for *S. cerevisiae* immobilization.
- Fermentation with these immobilized cells gave elevated ethanol yield ($Y_{P/S}$) and productivity (Q_p)
- These results are of great interest since the used materials are important solid wastes of the agriculture and of the wine industry (Figure 2).

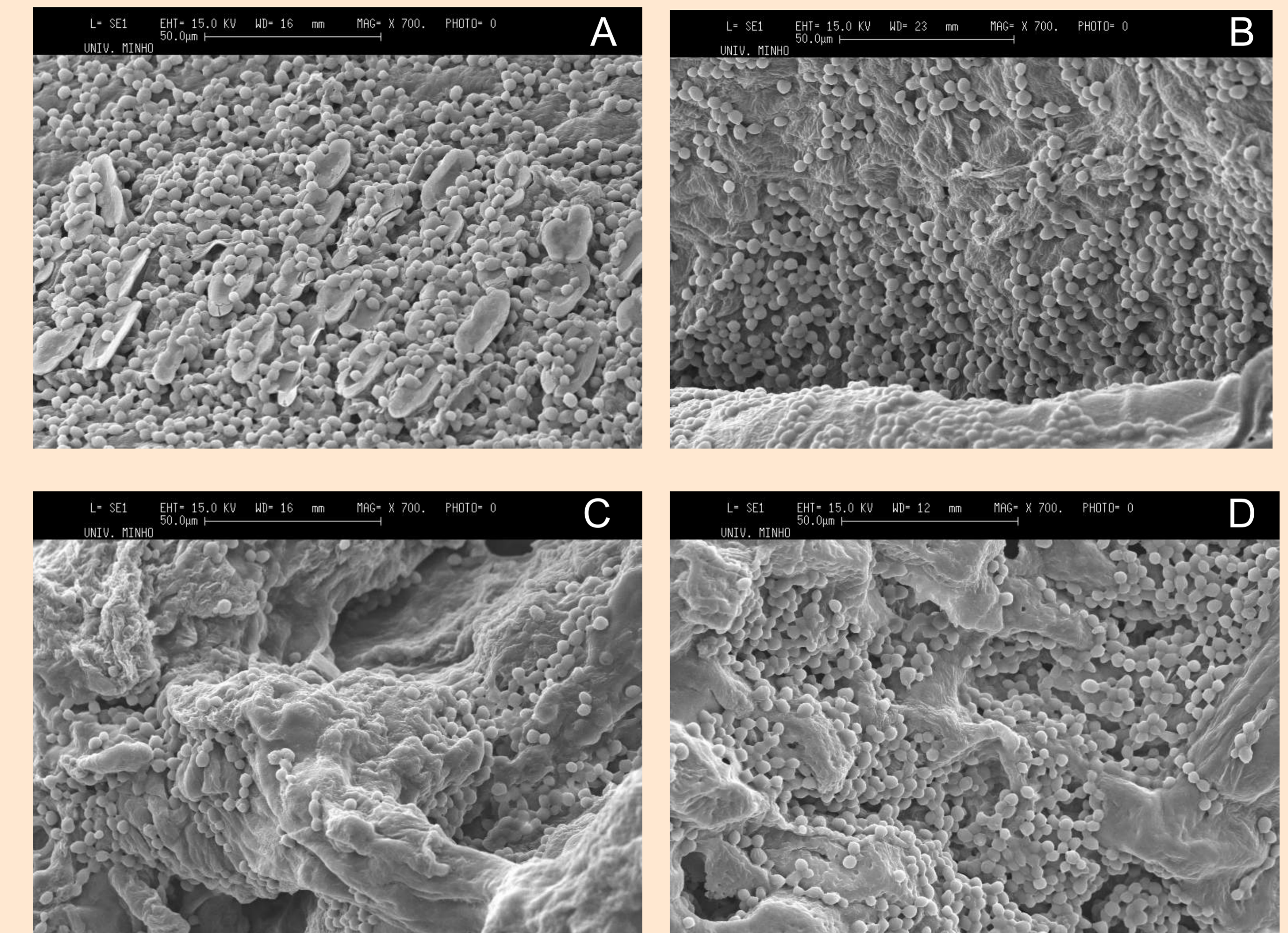


Figure 2. Photographs (SEM) of supports with immobilized cells A - corn cobs, B - grape skins, C - grape stems, D - grape seeds.

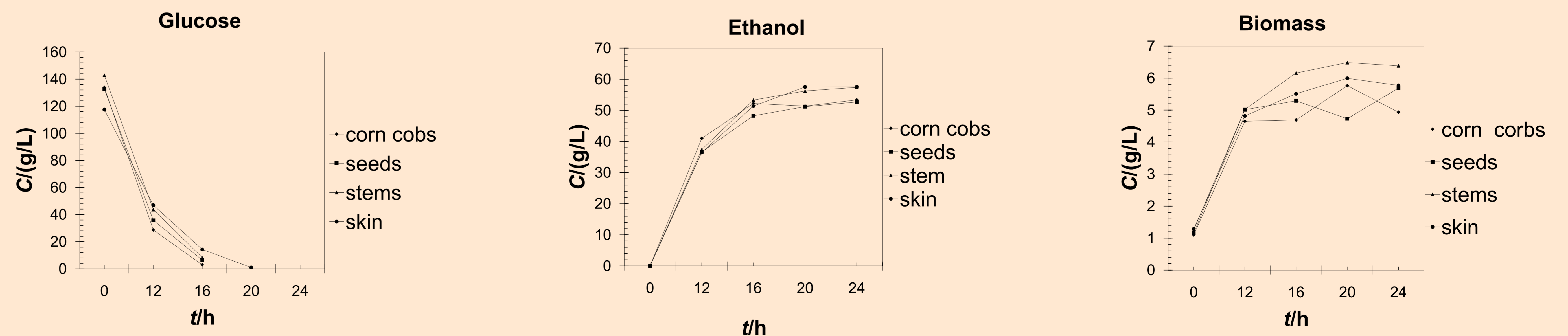


Figure 1. Ethanol production, glucose consumption and concentration of free biomass during the fermentation runs