

ΧΗΜΕΙΑ ΤΡΟΦΙΜΩΝ

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Diego Torrea, Cristian Varela, Maurizio Ugliano, Carmen Ancin-Azpilicueta, I. Leigh Francis, Paul A. Henschke

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► Fermentation nitrogen modulates Chardonnay wine aroma as well as volatiles composition. ► Inorganic or organic N type differently affects esters acids and higher alcohols. ► Low N wines have complex, but are low in fruity, aroma attributes. ► Moderate N produces wines with most pleasant

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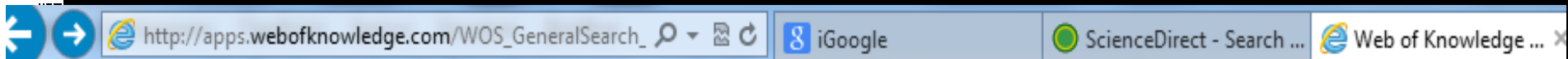
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Published: OCT 2012
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Author(s): Baiano, Antonietta; Terracone, Carmela; Peri, Giorgio; et al.
Source: COMPUTERS AND ELECTRONICS IN AGRICULTURE Volume: 87 Pages: 142-151 DOI: 10.1016/j.compag.2012.06.002 Published: SEP 2012
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Author(s): Milella, Rosa Anna; Antonacci, Donato; Crupi, Pasquale; et al.

1^ο βήμα: έρευνα της βιβλιογραφίας

- Συγκέντρωση σχετικών με το θέμα εργασιών
- Αναζήτηση σχετικών εργασιών και στη λίστα των βιβλιογραφικών παραπομπών (*References / Literature cited*) κάθε εργασίας
- Αναζήτηση άλλων σχετικών εργασιών του ίδιου συγγραφέα

Baohui Jin, Liqi Xie, Yanfeng Guo, Guofang Pang

Multi-residue detection of pesticides in juice and fruit wine: A review of extraction and detection methods. Review Article. *Food Res Int*, 46, 1, 2012, Pages 399-409

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References

S. Abbasi, H. Khani, L. Hosseinzadeh, Z. Safari. Determination of thiourea in fruit juice by a kinetic spectrophotometric method. *J Hazardous Mat*, 174 (1–3) (2010), 257–262

M.A. Alawi. Development of a New Approach for the Determination of Folpet in Grapes. *Analytical Letters*, 28 (2) (1995), 349–356

M. Albareda-Sirvent, A. Merkoci, S. Alegret. Pesticide determination in tap water and juice samples using disposable amperometric biosensors made using thick-film technology. *Analytica Chimica Acta*, 442 (1) (2001), 35–44

2^ο βήμα: ανάλυση των δεδομένων

- Ποιες εργασίες καλύπτουν ακριβώς το θέμα και υποστηρίζουν τα επιχειρήματα / ερωτήματα / συμπεράσματα που αναπτύσσει η εργασία;
- Ποιες εργασίες καλύπτουν το θέμα πιο περιφερειακά;
- Υπάρχει επιστημονική αντιπαράθεση ή γενική συμφωνία σχετικά με το θέμα;
- Ποιά διαγράμματα, σχήματα, πίνακες και εικόνες από τη βιβλιογραφία μπορούν να χρησιμοποιηθούν στην εργασία;

3^ο βήμα: πως γράφεται η εργασία

- Η εργασία πρέπει να περιλαμβάνει τις παρακάτω **διακριτές ενότητες**:
 - **Περίληψη** (προαιρετική στις βιβλιογραφικές εργασίες)
 - **1. Εισαγωγή**
 - **2. Κύριο μέρος**
 - **3. Συμπεράσματα**
 - **4. Βιβλιογραφικές παραπομπές**

3^ο βήμα: πως γράφεται η εργασία

■ Οργάνωση της εργασίας:

- Χρησιμοποιούνται **κεφαλίδες & υποκεφαλίδες** που πρέπει να περιγράφουν το αντικείμενο που αναλύεται στην κάθε ενότητα
- Περιγράφονται αρχικά και σύντομα οι **πιο γενικές έννοιες** σχετικά με το θέμα και μετά αναπτύσσονται τα **πιο ειδικά θέματα** που αναλύει η εργασία

3^ο βήμα: πως γράφεται η εργασία

- Τι περιλαμβάνει η κάθε ενότητα

1. Εισαγωγή:

- Σύντομη (1/5 του κειμένου)
- Αναπτύσσει το θεωρητικό υπόβαθρο ή αναφέρει γενικά επιτεύγματα σχετικά με το θέμα
- Παρουσιάζει το ειδικό θέμα της εργασίας
- Περιγράφει του στόχους της εργασίας
- Πρέπει να κεντρίζει το ενδιαφέρον του αναγνώστη

3^ο βήμα: πως γράφεται η εργασία



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Συνοπτικός & περιεκτικός τίτλος: Review Article

Immobilization technologies and support materials suitable in alcohol beverages production: a review

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Received 13 May 2003; received in revised form 24 October 2003; accepted 27 October 2003

Abstract **Συνοπτική & περιεκτική περίληψη (προαιρετικό):**

Various supports and immobilization techniques have been proposed and tested for application in wine-making, cider-making, brewing, distillates, potable alcohol and novel beverages production. Immobilization applications suitable for use by these alcohol-related industries are described together with an evaluation of their potential future impact, which is also highlighted and assessed. Topics in process engineering including immobilized cell bioreactor configurations and the scale-up potential of the various immobilization supports and techniques are also discussed.

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Keywords: Immobilization; Biocatalysts; Wine-making; Cider-making; Brewing; Potable alcohol; Malolactic fermentation; Bioreactors; Distillates

3^ο βήμα: πως γράφεται η εργασία

Contents Περιεχόμενα: ανάπτυξη από το γενικότερο στο ειδικότερο αντικείμενο που αναλύεται στην εργασία

1. Introduction	378
1.1. Cell immobilization supports and techniques ←	378
1.1.1. Immobilization on solid carrier surfaces	378
1.1.2. Entrapment within a porous matrix	378
1.1.3. Cell flocculation (Aggregation)	379
1.1.4. Mechanical containment behind a barrier	380
1.2. Prerequisites for cell immobilization ←	380
1.3. Effect of immobilization on microbial cells ←	380
1.3.1. Effects on growth and physiology	380
1.3.2. Effects on metabolic activity	381
1.3.3. Effects on stress tolerance	381
1.3.4. Effects on flavour formation	382
1.4. Advantages of immobilized cells over free cell systems ←	382
2. Immobilization supports and techniques applied to alcoholic beverage production ←	382
2.1. Immobilization for wine-making ←	382
2.1.1. Inorganic supports for cell immobilization in wine-making	382
2.1.2. Organic supports for cell immobilization in wine-making	383
2.1.3. Membrane systems for cell immobilization in wine-making	384
2.1.4. Natural supports for cell immobilization in wine-making	384
2.2. Immobilization in malolactic fermentation ←	384
2.3. Immobilization in brewing ←	386
2.3.1. Alcohol free beer	386
2.3.2. Maturation and aroma control	387

1. Introduction

An upsurge of interest in cell immobilization for alcoholic beverages and potable alcohol production has been taking place recently. This is mainly due to the numerous advantages that cell immobilization offers including enhanced fermentation productivity, feasibility of continuous processing, cell stability and lower costs of recovery and recycling and downstream processing (Margaritis and Merchant, 1984; Stewart and Russel, 1986). Cell immobilization may also protect cells against shear force. Industrial use of immobilized cells is still limited however further application will depend on the development of immobilization procedures that can be readily scaled-up.

The overall objective of this review, hence, is to analyse and assess data available in the literature on supports and techniques of viable cell immobilization for application in alcoholic beverages production.

1.1. Cell immobilization supports and techniques

Whole cell immobilization was defined as “the physical confinement or localization of intact cells to a certain region of space with preservation of some desired catalytic activity” (Karel et al., 1985). Immobilization often mimics what occurs naturally when cells grow on surfaces or within natural structures. Many microorganisms own the ability to adhere to different kinds of surfaces in nature.

Numerous biotechnological processes are advantaged by immobilization techniques and therefore several such techniques and support materials have been proposed. These techniques can be divided into four major categories based on the physical mechanism employed (Fig. 1): (a) attachment or adsorption on solid carrier surfaces, (b) entrapment within a porous matrix, (c) self-aggregation by flocculation (natural) or with cross-linking agents (artificially induced), and (d) cell containment behind barriers (Pilkington et al., 1998).

1.1.1. Immobilization on solid carrier surfaces

Cell immobilization on a solid carrier is carried out by physical adsorption due to electrostatic forces or by covalent binding between the cell membrane and the carrier. The thickness of cell film usually ranges from one layer of cells to 1mm or more. Systems using immobilized cells on a surface are popular due to the relative ease of carrying out this type of immobilization. The strength with which the cells are bonded to the carrier as well as depth of the biofilm often varies and is not readily determined. As there are no barriers between the cells and the solution, cell detachment and relocation is possible with potential establishment of equilibrium between adsorbed and freely suspended cells. Examples of solid carriers used in this type of immobilization are cellulosic materials (DEAE-cellulose, wood, sawdust, delignified sawdust), inorganic materials (polygorskite, montmorillonite, hydromica, porous porcelain, porous glass), etc. Solid materials like glass or cellulose can also be treated with polycations, chitosan or other chemicals (pre-formed carriers) to enhance their adsorption ability (Norton and D’Amore, 1994; Navarro and Durand, 1977).

1.1.2. Entrapment within a porous matrix

In this type of immobilization, the cells are either allowed to penetrate into the porous matrix until their mobility is obstructed by the presence of other cells, or the porous material is formed in situ into a culture of cells. Both entrapment methods are based on the inclusion of cells within a rigid network to prevent the cells from diffusing into the surrounding medium, while still allowing mass transfer of nutrients and metabolites.

Characteristic examples of this type of immobilization are the entrapment into polysaccharide gels like alginates, κ -carrageenan, agar, chitosan and polygalacturonic acid or other polymeric matrixes like gelatin, collagen and polyvinyl alcohol (Norton and D’Amore, 1994; Park and Chang, 2000). Cell growth in the porous matrix depends on diffusion limitations imposed by the porosity of the material and later by the impact of

3^ο βήμα: πως γράφεται η εργασία

- Τι περιλαμβάνει η κάθε ενότητα

2. Κύριο μέρος:

- Παραθέτει **πειραματικές αποδείξεις** και **σημαντικά αποτελέσματα** από την πρόσφατη βιβλιογραφία και εξηγεί πως αυτά διαμορφώνουν την σημερινή κατανόηση μας για το θέμα
- Αναφέρει **τύπους πειραματικών διεργασιών** αλλά δεν περιγράφει λεπτομερώς τις πειραματικές τεχνικές
- Τονίζει ενδεχόμενες **διαφωνίες** στο πεδίο
- Χρησιμοποιεί **συγκεντρωτικά σχήματα & πίνακες** για να παρουσιάσει σύμφωνα με την άποψη του συγγραφέα τη **σύνθεση** των δεδομένων που έχει συλλέξει

Βιβλιογραφική εργασία

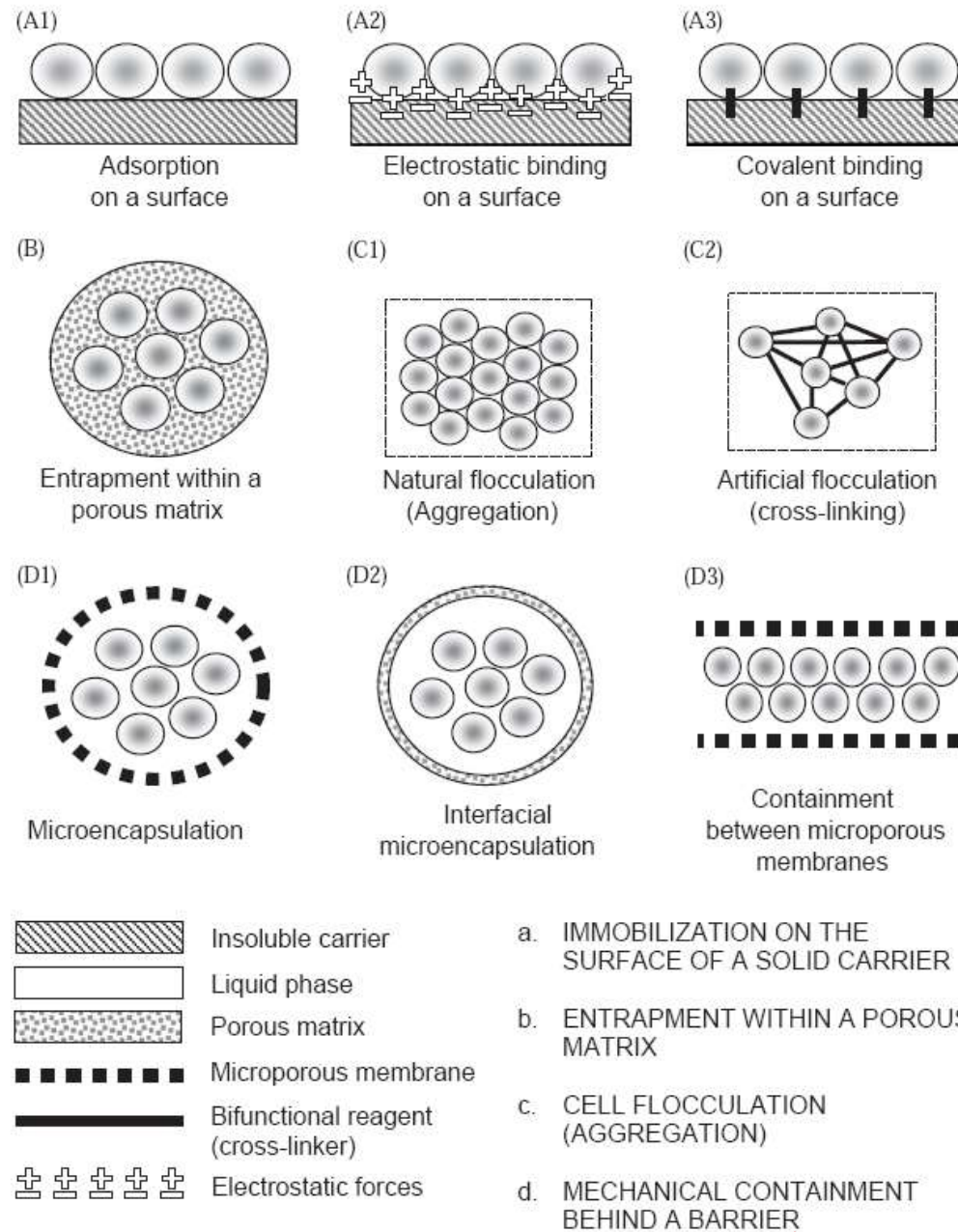


Fig. 1. Basic methods of cell immobilization.



Το σχέδιο αυτό είναι πρωτότυπο (Α. Μπεκατώρου) και απεικονίζει τις κυριότερες μεθόδους ακινητοποίησης κυττάρων

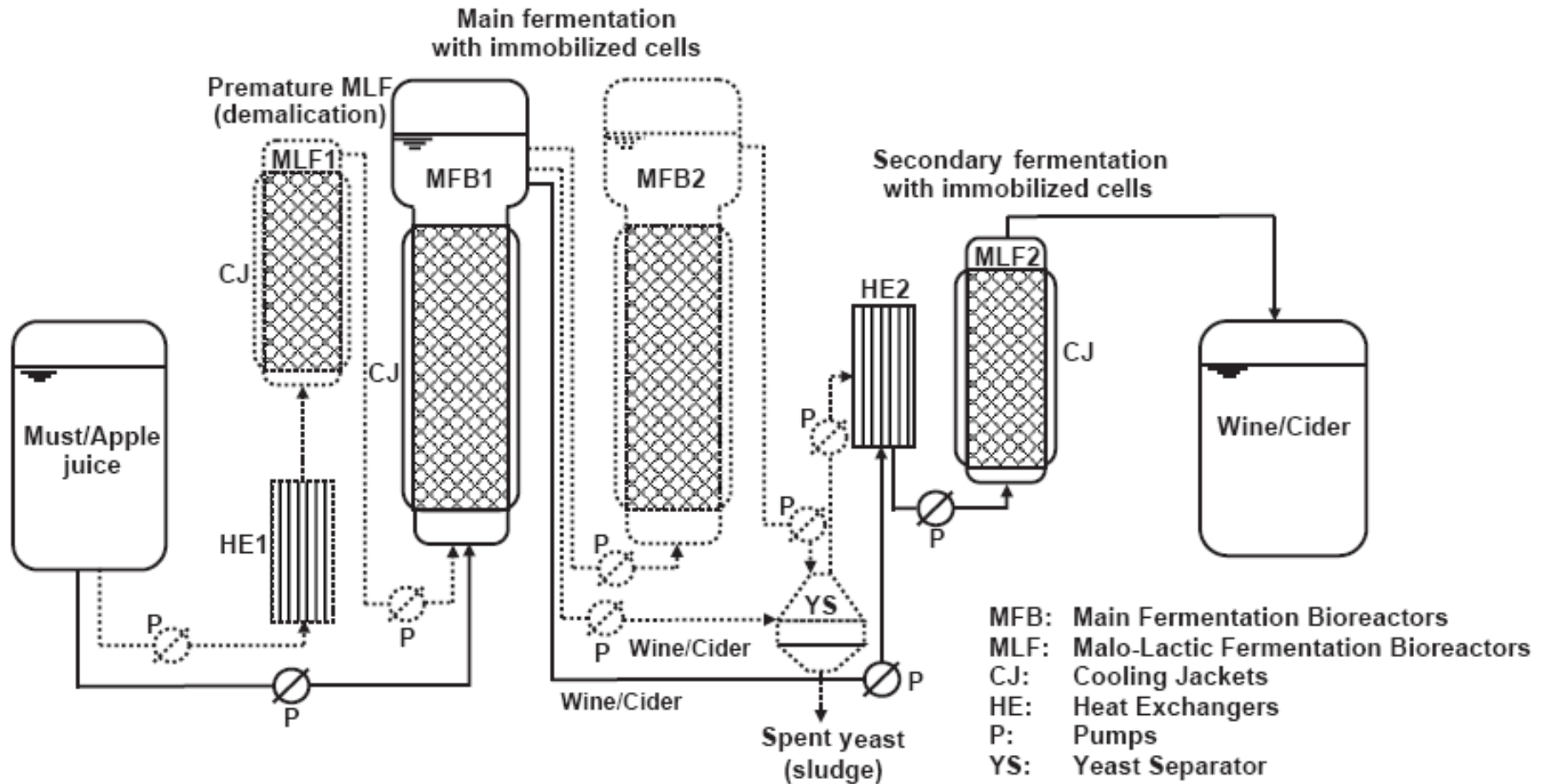
Εάν χρησιμοποιηθεί σχήμα από άλλη πηγή τότε απαιτείται οπωσδήποτε αναφορά της πηγής στη λεζάντα του σχήματος!

Table 2
Summary of the main immobilization supports and techniques proposed for alcoholic beverages production

Micro-organism	Immobilization support/technique	Type of fermentation	Process/bioreactor	Substrate/product	Reference
<i>S. cerevisiae</i> + <i>S. cerevisiae</i> <i>f.r. bayanus</i>	Alginate beads	Secondary AF	10 ⁹ immob. cells l ⁻¹ wine; 12–14°C	Wine/sparkling wine	Fumi et al., 1987
<i>S. cerevisiae</i>	Mineral kissiris	AF	Batch-stationary; 300 ml, 30°C	Glucose; raisin extracts/ethanol	Kana et al., 1989a
<i>S. cerevisiae</i>	γ-alumina pallets	AF	Batch-stationary; 110 ml, 30°C	Glucose; raisin extracts/ethanol	Kana et al., 1989b
<i>S. pombe</i>	Double-layer alginate beads	MLF	FBR; continuous; 580 ml; 25°C	Grape must/de-acidified grape must	Taillandier et al., 1994
<i>S. cerevisiae</i>	Microfiltration membranes	Secondary AF	Millispark cartridge; “in the bottle”	Wine/sparkling wine	Lemonnier and Duteurtre, 1989; Ramon-Portugal et al., 2003
<i>S. cerevisiae</i>	Delignified cellulosic material	AF	Batch-stationary; PBR; 500 ml; 0–30°C	Glucose; grape must/ethanol; wine	Bardi and Koutinas, 1994
<i>S. cerevisiae</i>	Mineral kissiris	AF	Two PBRs; continuous; 1500 ml; 5–16°C	Grape must/wine	Bakoyianis et al., 1992
<i>S. cerevisiae</i>	Mineral kissiris	AF	Industrial-scale pilot-plant; multistage fixed-bed tower reactor; 7,000L–100,000L; 30°C	Molasses/ethanol	Bakoyianis and Koutinas, 1996; Koutinas et al., 1997
<i>S. cerevisiae</i>	Porous, spherical glass beads	Secondary AF	Pilot-scale; up-flow tubular PBR; 500 L; 0–60°C	Green beer/mature beer	Yamauchi et al., 1995a, b
<i>S. cerevisiae</i>	Wood blocks	AF	Vertical PBR; continuous; 100 ml; 33°C	Glucose-fructose mixtures/ethanol; fructose enr. syrup	Guenette and Duvnjak, 1996
<i>S. cerevisiae</i> + <i>L. plantarum</i>	Sponge-like, neutral, acidic and basic cross-linked cellulose	Post-primary AF; MLF	Up-flow, PBR; continuous; 2000 ml; 20°C	Fresh cider/mature cider	Scott and O'Reilly, 1996
<i>S. cerevisiae</i>	Delignified cellulosic material	AF	Batch-stationary: 400 ml; continuous: 2100 ml; 0–30°C	Wort/beer	Bardi et al., 1996a
<i>S. cerevisiae</i>	Gluten	AF	Batch-stationary: 400 ml; continuous: 2170 ml; 0–30°C	Wort/beer	Bardi et al., 1997
<i>S. cerevisiae</i> + <i>Candida brassicae</i>	<i>Luffa cylindrica</i> sponge; chitosan	AF	PBR; continuous; 1500 ml; 30°C	Glucose/ethanol	Ogbonna et al., 1997
<i>S. cerevisiae</i> + <i>Candida shehatae</i>	Agar layer; microporous membrane filters	AF	Two-chambered reactor; batch; symmetrical and asymmetrical aeration; 30°C	Glucose; xylose/ethanol	Lebeau et al., 1997
<i>L. casei</i>	Calcium pectate; modified chitosan	MLF	Batch-shaken flasks; 100–170 ml; 20–36°C	Wine/wine	Kosseva et al., 1998
<i>S. cerevisiae</i>	Calcium pectate; κ-	AF	Batch-stationary: 320–400 ml; 5–20°C	Wort/beer	Smoorovicova and

Ο Πίνακας είναι πρωτότυπος (Α. Μπεκατώρου) και αποτελεί σύνοψη των κύριων τεχνικών ακινητοποίησης κυττάρων και των εφαρμογών τους στην παραγωγή αλκοολούχων ποτών

Βιβλιογραφική εργασία



Το σχέδιο αυτό είναι πρωτότυπο (Α. Μπεκατώρου) και αποτελεί ολοκληρωμένη απεικόνιση των εφαρμογών ακινητοποιημένων κυττάρων στη βιομηχανία οίνου σε συνδυασμό με προτεινόμενες εφαρμογές από το συγγραφέα.

3^ο βήμα: πως γράφεται η εργασία

- Τι περιλαμβάνει η κάθε ενότητα

3. Συμπεράσματα:

- Περιγράφει **περιληπτικά** τα **κυριότερα αποτελέσματα** σχετικά με το θέμα
- Τονίζει τη **σημασία** αυτών των αποτελεσμάτων
- Συζητά τα **ερωτήματα** που παραμένουν στο πεδίο και τις μελλοντικές **προοπτικές**

4. Conclusions

Available literature shows the high number of immobilization supports proposed by various researchers for alcoholic beverages production. The advantages associated with the production of potable alcohol using immobilized cell systems (increased rates of productivity, reduced risk of contamination, biocatalyst recycling, rapid product separation and ease with which the product may be recovered) are well established. However, attention should be also focus on the improvement of quality of the products. Therefore, efforts should be concentrated on cheap, abundant, non-destructive and food-grade purity immobilization supports, which will improve quality and give a distinctive aroma profile and a fine taste to the final product.

3^ο βήμα: πως γράφεται η εργασία

- Τι περιλαμβάνει η κάθε ενότητα

4. Βιβλιογραφικές παραπομπές:

- Ο **αριθμός** ποικίλει ανάλογα με το θέμα και το όριο που θέτει ο υπεύθυνος της εργασίας ή ο εκδότης
- **Ομοιομορφία** στυλ γραφής μέσα στο κείμενο αλλά και στην τελική λίστα

1. Introduction Παράθεση βιβλιογραφικών αναφορών εντός του κειμένου:

An upsurge of interest in cell immobilization for alcoholic beverages and potable alcohol production has been taking place recently. This is mainly due to the numerous advantages that cell immobilization offers including enhanced fermentation productivity, feasibility of continuous processing, cell stability and lower costs of recovery and recycling and downstream processing (Margaritis and Merchant, 1984; Stewart and Russel, 1986). Cell immobilization may also protect cells against shear force. Industrial use of immobilized cells is still limited however further application will depend on the development of immobilization procedures that can be readily scaled-up.

The overall objective of this review, hence, is to analyse and assess data available in the literature on supports and techniques of viable cell immobilization for application in alcoholic beverages production.

Bakoyianis and Koutinas (1996) described the development of an industrial-scale, multistage fixed-bed tower bioreactor using the promoter mineral kissiris for industrial alcohol production using free cells. Pilot-plant operations were carried out in a 7000l total working volume bioreactor and was operated in batch mode, firstly as a one-stage and consequently as a two-stage fixed-bed system. Operational stability of the process was excellent for a long period and the support was easily regenerated by washing with hot water. The fermented product was directly pumped into the distillation unit. The process was estimated to require 30% less energy and 10–20% less capital. Scale-up at industrial scale of the previous system was achieved with a pilot-plant of a multi-stage fixed bed bioreactor with 100,000l capacity (Koutinas et al., 1997).

Ogbonna et al. (1997) found the use of loofa (*Luffa cylindrica*) sponge, for yeast immobilization efficient for ethanol production in the packed-bed bioreactor, and

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ΧΗΜΕΙΑ ΤΡΟΦΙΜΩΝ

Βιβλιογραφική εργασία

Ευχαριστώ !!