

# Vegetable matrix for functional food products development



Antonella E. Miletti, Carolina E. Genevois, Marina F. de Escalada Pla, Silvia K. Flores

Industry Department of School of Natural and Exact Sciences (FCEN), Buenos Aires University (UBA), Argentina.

marina@di.fcen.uba.ar

## ABSTRACT

The aim of our project is to study the vegetable matrices as probiotic support. As an example, pumpkin (*Cucurbita moschata* Duchesne ex Poiret) was used in the present work to support a Lactobacillus Casei (LC) strain. Different drying technologies: dry impregnation, forced air convection or vacuum dehydration and dry impregnation followed by vacuum dehydration were applied to stabilize the final product. Edible coating technology was also used. According to the results, the application of edible coating extended the shelf-life product till 14 days. The dehydration processes also contributed to prolong the storage time. The vacuum dried product reached 28 days. All products were storage at 18-20°C. The LC viability depended on dehydration process applied, reaching a level of microbial load  $\approx 10^6$ -10<sup>7</sup> CFU/g product throughout the storage period (vacuum dried). This level is appropriate for a functional food containing the beneficial microorganism. The presence of the LC did not alter the color changes of the pumpkin, nevertheless the stabilization process applied to matrix enriched with LC, significantly affected the color of the final product.

### **OBJECTIVE**

• To study a vegetable matrix as support of LC and to stabilize final product applying different drying technologies and using edible coating.

• To evaluate the effect of the LC presence and the process applied on the color of the final product.

SAMPLES PREPARATION						DETERMINATIONS		
<b>Pumpkin impregnation</b>	Application of different treatments				🖌 🗸 Via	✓ Viable count of LC: MRS agar		
Washing Variable Cutting Variable Cutti		SystemsTreatmentAgar agar coatingA: coating with reduction of pH plus forced			<ul> <li>Microbiology stability: coliform, and</li> <li>fungi and yeasts counts</li> <li>Water activity and pH</li> <li>Microscopic analysis: Optic and ESEM</li> </ul>			
Blached with water vapor Cooled (physiological solution)	(2% p.p.)air convection drying (40°C 3h)B1: vacuum dehydrationDryingB2: Osmotic drying							
(physiological solution)	B3: Osmotic drying + vacuum dehydration						iysis: Optic and ESEIVI.	
LC 9x10 <sup>9</sup> CFU mL <sup>-1</sup>				RESULTS				
LC viability during storage					neters during storage			
		System	Day	L*	a*	b*	A	
9.0		Α	1 7	56±4 54+1	27±3 28+2	79±1 77+1		
8.0 T			1	72±1	30±1	58±1 *	- B1	
III		B1	28	72±1	28±2	65±3 **		
		B2	1	54±3	32±1 *	48±1 *	B2	
			28	51±1	21±1 **	42±1 **		
		<b>D</b> 2	1	46±4 *	23±3	70±4 *	B3	
	SAMPL	SAMPLES PREPARAT	SAMPLES PREPARATION         Pumpkin impregnation       Application of differ         Lactobacillus casei       Systems         (ATCC 393, Microbiologics °)       Biomass generation         Biomass generation       Agar agar coating         in MRS broth       Agar agar coating         Washing       B1: vacuum de         (physiological solution)       B1: vacuum de         Impregnation solution       B2: Osmotic dr         Ic 9x10° CFU mL <sup>4</sup> System         A       B1         I       I	SAMPLES PREPARATION         Application of different treatment         Lactobacillus casei         (ATCC 333, Microbiologics *)         Biomass generation in MRS broth Washing (physiological solution)       Systems       Treatment         Washing (physiological solution)       Drying       B2: Osmotic drying       B3: Osmotic drying + vacuum         Solution       System       Color       System       A         Milty during storage       *       B1       1       2         Milty during storage       *       B1       1       2         Matrix       B1       2       1         Matrix       B1       2       2       1	SAMPLES PREPARATION         Application of different treatments         Lactobacillus casei         (ATCC 393, Microbiologics *)         Biomass generation in MRS broth Washing (physiological solution) Impregnation solution       Systems       Treatment         Magar agar coating (2% p.p.)       A: coating with reduction of pH plus forced air convection drying (40°C 3h)       B1: vacuum dehydration         Drying       B2: Osmotic drying B3: Osmotic drying + vacuum dehydration       RESULTS         Sility during storage         *         *         A       1         *         *         *         *         *         *         *         *         *         *       *         *         *         *         *         *         *         *         *         *       *	SAMPLES PREPARATION         Pumpkin impregnation       Application of different treatments         Lactobacilius casei (ATCC 393, Microbiologics *) Biomass generation in MRS broth Washing (physiological solution) impregnation solution       Systems       Treatment (Agar agar coating A: coating with reduction of pH plus forced air convection drying (40°C 3h) B1: vacuum dehydration Drying       B1: vacuum dehydration B3: Osmotic drying + vacuum dehydration       ✓ Wait ' Wait         Impregnation solution       B1: vacuum dehydration B3: Osmotic drying + vacuum dehydration       FESULTS         sility during storage       A       1       56±4       27±3         Impregnation       System       Day       L*       a*         Impregnation       Impregnation       Impregnation       Impregnation       Impregnation       Impregnation         Impregnation       Super CPUmt <sup>1</sup> Impregnation       Impregnation	SAMPLES PREPARATION       DETERM         Pumpkin impregnation       Application of different treatments       ✓ Viable count of II         Lactobacillus casei (ArcC 33, Microbiologics *) Biomass generation in MS broth Washing (physiological solution)       Systems       Treatment (2% p.p.)       ✓ Microbiology states air convection drying (40°C 3h)         Drying       B1: vacuum dehydration Drying       B1: vacuum dehydration B3: Osmotic drying + vacuum dehydration       ✓ Water activity all ✓ Microscopic anal         sillity during storage       Kesultrs       Kesultrs         *       1       56±4       27±3       79±1         *       1       7       54±1       28±2       77±1         B1       1       72±1       30±1       58±1*         B1       28       72±1       28±2       65±3**         B2       1       54±3       32±1*       48±1*         B2       1       54±3       32±1*       48±1*         B2       1       46±4*       23±3       70±4*	



Optic microscopic of free LC cells in MRS broth (1000x)

ESEM of system B3 (3499x)

\* End of microbiological stability.

#### CONCLUSIONS

> The LC was succesfully supported in pumpkin matrix showing high viability of the probiotic during the shelf-life.

> Application of osmotic dehydration and vacuum drying increase the food stability, however LC viability decreased.





#### >The food colour was affected by the process stabilization but not by the



