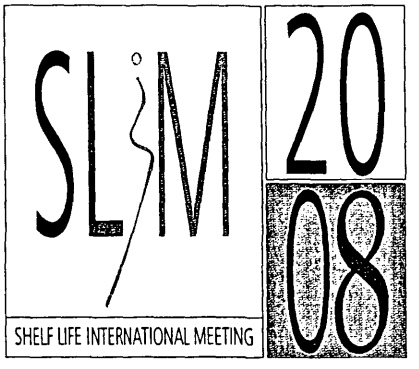
GSICA
THE ITALIAN SCIENTIFIC GROUP
OF FOOD PACKAGING

DSA e DIMP
UNIVERSITY OF NAPLES
"FEDERICO II"

IMCB
NATIONAL RESEARCH COUNCIL



SLIM 2008

Shelf-life International Meeting

Ischia, June 25-27th 2008

Edited by

GIOVANNA G. BUONOCORE & ELENA TORRIERI

Special Issue

ITALIAN JOURNAL
OF
FOOD SCIENCE

CHIRIOTTI EDITORI

This Special Issue of the Italian Journal of Food Science collects the presentations given at the "SLIM 2008, Shelf Life International Meeting" organized by GSICA, National Research Council – IMCB, University of Naples – DSA and DIMP, held at Ischia on June 25-27th 2008.
These papers were reviewed by the Scientific Committee of the congress before their presentation but they did not undergo the conventional reviewing system of the Italian Journal of Food Science.

Chiriotti Editori s.a.s. - Pinerolo - Italy

ISSN 1120-1770

ITALIAN JOURNAL OF FOOD SCIENCE

(RIVISTA ITALIANA DI SCIENZA DEGLI ALIMENTI)

Property of the University of Perugia
Official Journal of the Italian Society of Food Science and Technology
Società Italiana di Scienze e Tecnologie Alimentari (S.I.S.T.Al)
Initially supported in part by the Italian Research Council (CNR) - Rome - Italy
Recognised as a "Journal of High Cultural Level"
by the Ministry of Cultural Heritage - Rome - Italy

Editor-in-Chief:
Paolo Fantozzi
Dipartimento di Scienze Economico-Estimative e degli Alimenti, Università di Perugia,
S. Costanzo, I-06126 Perugia, Italy
Tel. +39 075 5857910 - Telex 662078 UNIPG - Telefax +39 075 5857939-5852067
E-mail: paolofan@unipg.it

Scientific Editor:
S. Mary F. Traynor, F.S.E., Ph.D.
Dipartimento di Scienze Economico-Estimative e degli Alimenti, Università di Perugia,
S. Costanzo, I-06126 Perugia, Italy
Tel. +39 075 5857912 - Telex 662078 UNIPG - Telefax +39 075 5857939-5852067
E-mail: ijfs@unipg.it

Publisher:
Alberto Chiriotti
Chiriotti Editori s.a.s., Viale Rimembranza 60, I-10064 Pinerolo, Italy
Tel. +39 0121 393127 - Telefax +39 0121 794480
E-mail: info@chiriottieditori.it - URL: www.chiriottieditori.it

Aim: The Italian Journal of Food Science is an international journal publishing original, basic and applied papers, reviews, short communications, surveys and opinions in food science (chemistry, analysis, microbiology), food technology (engineering, processing) and related areas (nutrition, safety, toxicity, physiology, dietetics, economics, etc.). Upon request and free of charge, announcements of congresses, presentations of research institutes, books and proceedings may also be published in a special "News" section.

Review Policy:
The Advisory Board with the Editor-in-Chief will select submitted manuscripts in relationship to their innovative and original content. Referees will be selected from the Advisory Board and/or qualified Italian or foreign scientists. Acceptance of a paper rests with the referees.

Frequency: Quarterly - One volume in four issues. Guide for Authors is published in each number and annual indices are published in number 4 of each volume.

Impact Factor: 0.518 published in the 2007 Journal of Citation Reports, Institute for Scientific Information

Subscription Rate: 2009: Volume XXI

PDF version	€ 40.00
Ordinary	€ 150.00
Supporting	€ 1,000.00

IJFS is abstracted/indexed in: Chemical Abstracts Service (USA); Foods Adlibra Publ. (USA); Gialine - Ensia (F); Institut Information Sci. Acad. Sciences (Russia); Institute for Scientific Information; CurrentContents®/AB&ES; SciSearch® (USA-GB); Int. Food Information Service - IFIS (D); Int. Food Information Service - IFIS (UK); EBSCO Publishing; Index Copernicus Journal Master List (PL).

IJFS has a page charge of € 20.00 up to 5 pages; extra pages are € 30.00.
Reprints (100) will be sent free of charge.

EFFECTIVENESS OF ACTIVE AND MODIFIED ATMOSPHERE PACKAGING ON THE SHELF-LIFE EXTENSION OF A CHEESE TART

A.M. SANGUINETTI[1], N. SECCHI[2], A. DEL CARO[1], P. CATZEDDU[2], T. ROGGIO[2], G. STARA[2], M.A. MADRAU[1] and A. PIGA[1]

[1]Dipartimento di Scienze Ambientali Agrarie e Biotecnologie Agro-Alimentari, Università degli Studi di Sassari, Sassari, Italy

[2]Porto Conte Ricerche Srl, Alghero (SS), Italy

ABSTRACT

The shelf life extension by MAP and AP of a typical cheese tart was studied. Baked tarts were packaged inside barrier to gas trays and wrapped with a barrier to gas and water film. Four batches were prepared: 1) Control; 2) MAP with different N_2/CO_2 ratios (70/30 and 20/80); 3) Trays with an iron oxide-based oxygen absorber. Tarts were stored at 20°C and sampled for analysis at 0, 7, 14, 27, 35 and 48 days. Determinations included microbiological analyses (total bacterial count, moulds, yeast and staphylococci), chemical-physical parameters (pH, water activity and dry matter), gas changes (CO_2, O_2 and N_2) inside MAP and AP trays, texture evolution and sensory analysis at our laboratories.

AP allowed a shelf life of 48 days, MAP shelf lives were of 14 and 34 days for 70/30 and (20/80), respectively, while control tarts spoiled after only 7 days.

Key words: active packaging; modified atmosphere packaging; pastry products; shelf life.

INTRODUCTION

Ambient cakes are intermediate to high moisture bakery products, as they have about 20% moisture and water activity (a_w) ranging from 0.65 to 0.95 (Smith and Simpson, 1995; Jones, 2000). The main causes affecting their shelf-life are first of all microbial spoilage, mostly by moulds, and secondly staling (Smith *et al.*, 2004).

The reduction of microbial spoilage of bakery products is preferably obtained by control of post baking contamination, mainly by using modified atmosphere (MAP) or active packaging (AP) (Smith and Simpson, 1995; Guynot *et al.*, 2003a; Guynot *et al.*, 2003b).

Extensive studies have been done on the effect of MAP and AP on the shelf life of different bakery products (Smith *et al.*, 1988; Ooraikul, 1991; Smith and Simpson, 1995; Guynot *et al.*, 2004), but, at our knowledge there are no reports on tarts with a cheese filling.

The aim of the present study was to verify the effects of MAP or AP packaging on extending the shelf life of a cheese tart.

MATERIALS AND METHODS

Cheese tarts were prepared following a traditional local recipe. Short pastry was prepared and pastry circles of 12 cm in diameter were obtained. The filling was obtained by mixing the different ingredients, mainly fresh grated ewe's cheese. An adequate amount of filling was layered in the center of the short crust circle, that was subsequently shaped to give a 8 cm in diameter tart. The tarts were baked at 180°C for 15 minutes in a rotor oven, cooled and packaged inside barrier to gas trays (two for each tray) and wrapped with a barrier to gas and water film. Four batches were prepared, the 1st being the control, the 2nd and the 3rd (MAP) by using different N_2/CO_2 ratios (70/30 and 20/80) and the 4th (AP) by placing a sachet of a iron oxide-based oxygen absorber inside trays. Tarts were stored at 20°C and sampled for analysis at 0, 7, 14, 27, 34 and 48 days. A ten-gram sample was homogenized in 90 mL of sterile water, and serial dilution was performed before plating. Total bacterial count, staphylococci, moulds and yeast were detected on appropriate media (CFU/g). Dry matter (dm), water activity (a_w) and pH were measured both on homogenized short pastry and filling. Texture was determined with a texture analyser (TA-XT2, Stable Microsystems, Surrey, UK) with a 50 kg load cell. Textural determinations were made in three tarts per each lot by using a blade set with knife edge for a cut test (HDP/BS), and a 5mm diameter cylinder probe (P/5), for a puncture test. Two indexes were used for both tests: a) maximum rupture force (as g); b) area under the curve (as g · mm) up to the maximum rupture force. The gas composition of at least three packages per each thesis were sampled and analyzed using a Combi Check 9800-1 gas analyzer (PBI-Dansensor, Denmark). Sensory analysis involved asking thirty-two untrained consumers to evaluate the overall acceptance of the samples by using an hedonic scale from 1 to 7 (1, terrible; 4, acceptable; 7, excellent) for colour, olfactory intensity, taste and consistency

RESULTS AND DISCUSSION

The O_2 concentration inside MAP and AP packages was close to 0% at the start of the experiment and increased only on MAP, which did not exceed 0.40%. The product has an a_w value higher than 0.9, thus is very susceptible to mould growth (Guynot *et al.*, 2003b). Control tarts evidenced mycelia after seven days of storage, while inhibition of mould growth was dependent on CO_2 concentration inside packages (Table 1). In fact, tarts spoiled after 14 and 34 days in 70/30 and

Table 1 – Total bacterial count (PCA)[x], yeast and mould (GYPD) and staphylococci (BP) growth (as CFU/g) during storage of a cheese tart packaged with MAP or AP.

Microbial media	Packaging	Storage time (days)					
		0	7	14	27	34	48
PCA	Control	$1.4x10^2$	$2.2x10^5$	-[w]	-	-	-
	70/30[y]	$1.4x10^2$	$9.8x10^3$	$2.1x10^4$	-	-	-
	20/80	$1.4x10^2$	$1.1x10^4$	$1.2x10^4$	$5.9x10^5$	$1.2x10^4$	$2.5x10^5$
	Absorber	$1.4x10^2$	<10	<10	<10	<10	<10
GYPD	Control	<10	$4.2x10^2$	-	-	-	-
	70/30	<10	<10	<10	-	-	-
	20/80	<10	<10	<10	<10	<10	$7.0x10^3$
	Absorber	<10	<10	<10	<10	<10	<10
BP	Control	<10	<10	-	-	-	-
	70/30	<10	<10	<10	-	-	-
	20/80	<10	<10	<10	<10	<10	<10
	Absorber	<10	<10	<10	<10	<10	<10

[x]PCA, Plate count agar; GYPD, Glucose yeast peptone dextrose agar; BP, Baird Parker Agar.
[y]70/30 = 70% N_2 and 30% CO_2; 20/80 = 20% N_2 and 80% CO_2.
[w]Sampling has been stopped due to visible mould growth on tarts.

20/80 MAP packages, respectively, while the use of oxygen absorber prevented mould growth up to the end of storage. The number of total viable cells increased in tarts inside MAP packages up to 10^5 CFU, while no colonies were found on AP packaged samples. Staphylococci were not detected. Tarts evidenced a strong hardening of control samples after 7 days in storage, MAP tarts hardened after 14 days (only in the external part in 70/30 samples), while tarts with absorber did not show significant changes in texture at the end of the 48 days in storage (data not shown). Sensory analysis gave values over the acceptability threshold for all the storage period and no significant differences were detected among samples (data not shown).

REFERENCES

Guynot M.E., Marin S., Sanchis V. and Ramos A.J. 2003a. Modified atmosphere packaging for prevention of mold spoilage of bakery products with different pH and water activity levels. J Food Protect 66: 1864.

Guynot M.E., Sanchis V., Ramos A.J. and Marin S. 2003b. Mold-free shelf-life extension of bakery product by active packaging. J Food Sci 68: 2547.

Guynot M.E., Marin S., Sanchis V. and Ramos A.J. 2004. An attempt to minimize potassium sorbate concentration in sponge cakes by modified atmosphere packaging combination to prevent fungal spoilage. Food Microbiol 21: 449.

Jones H.P. 2000. Ambient packaged cakes. In: Shelf-life evaluation of food (Man D. and Jones A., Eds), p 140. Aspen Publishers Inc, Gaithersburg, Maryland.

Ooraikul B. 1991. Modified atmosphere packaging of food, p. 49. Ellis Horword, New York.

Smith J.P., Khanizadeh S., Van De Vort F.R., Harding B., Ooraikul B. and Jackson E.D. 1988. Use of response surface methodology in shelf life extension of a bakery product. Food Microbiol 5: 83.

Smith J.P. and Simpson B.K. 1995. Modified atmosphere packaging of bakery and pasta products. In: Principles of modified atmosphere and sous vide product packaging, p 207. Eds. J.M. Farber and K.L. Dodds, Technomic publishing company, Lancaster.

Smith J.P., Daifas D.P., El-Khoury W., Koukoutsis J.and El-Khoury A. 2004. Shelf life and safety concerns of bakery products- A review. Food Sci Nutr 44: 19.