Desarrollos tecnológicos
para la industria alimentaria

REPORT:

Evaluation of liquid Proallium S in tomato sauce and its influence on the
on the microbiological stability of the product to different heat treatments.

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The main objective of food preservation is to preserve the nutritional and sensory properties of food for as long as possible, guaranteeing consumer safety. Therefore, in order to control deterioration phenomena, it is necessary to apply suitable preservation methods that avoid alterations without affecting the initial quality of the food.

Among the most widespread preservation methods are heat treatments. In most cases, they are based on stabilisation operations that aim to reduce the microbial load present in order to extend the shelf life of the product. However, the application of drastic heat treatments can lead to a loss of the sensory properties of the food, so there is a tendency to resort to mild treatments, which extend the shelf life in exchange for a moderate preservation of the nutritional value and organoleptic qualities. However, although most pathogenic micro-organisms are eliminated, only a fraction of the spoilage micro-organisms are reduced. Therefore, current preservation methods involve the combination of several techniques such as the addition of natural preservatives.

The use of preservatives that prevent food spoilage has undergone a major evolution in recent years, mainly due to consumer preferences for more natural foods with fewer chemical additives. For this reason, there is a current need to incorporate more effective preservatives of natural origin, as well as to optimise their use in order to adjust the application dose to a minimum.

PROALLIUM® , is a natural identical flavouring developed by DOMCA SA for the preservation and flavouring of sauces, ready meals and salads. It is based on organosulphur compounds present in *Alliaceae* (onion, garlic, leek,...) acting as an effective broad spectrum antimicrobial. Within the PROALLIUM range® several products have been developed, with different levels of protection and flavour profiles, to optimise applications in the food industry: Proallium DMC, Proallium S liquid, Proallium S or Aroma BN.

In the present study, the preservative potential of liquid Proallium S on the shelf life of fried tomato sauce as well as its influence on microbiological stability in combination with different heat treatments was evaluated.

2. METHODOLOGY

Shelf life studies

Shelf life studies allow us to evaluate the capacity of microorganisms to grow or survive in food under certain conditions; for this purpose, analytical monitoring is carried out during an established shelf life. This type of test is recommended when it is decided to modify the formulation of foods already on the market, or any of their production and/or preservation conditions, and is especially important in foods with long shelf lives, which have a certain microbiological stability.

In the present study, the microbiological quality of fried tomato sauce was evaluated by introducing the natural preservative Proallium S liquid into the formulation together with different sanitising heat treatments.

Treatments

The tomato samples were shipped in 5 kg unit packs by Heinz Ibérica SA. After checking the temperature and pH of the product at reception, different batches were made in sterile ISO bottles to which the different heat treatments were applied alone or in combination with liquid Proallium S at 250 and 350 ppm. An untreated control batch was also included. Each treatment was carried out in duplicate.

Heat treatments applied to fried tomato sauce.

Temperature (ºC)	Time (sec)
75	50
80	35
85	25
90	15
95	5

Monitoring of the trial

Sampling was carried out for a total period of 45 days at different storage times (0, 3, 7, 7, 14, 21, 28, 28, 35 and 45 days). The storage temperature during storage was 4± 1 ºC.

Determination of total mesophilic aerobic microorganisms.

For the enumeration of total mesophilic aerobes, the methodology according to ISO 4833 (General guideline for the enumeration of micro-organisms. Method by colony count at 30°C). This standardised method is based on the sowing in PCA - Plate Count Agar (Biokar Diagnostics) of a determined amount of sample as well as its decimal dilutions obtained from the stock solution. Subsequently, it is incubated at 30ºC for 72 hours and the result is expressed as number of colony forming units per gram of sample (cfu/g).

Determination of moulds and yeasts.

The standardised method ISO 7954 (General guideline for the enumeration of yeasts and moulds. Colony enumeration technique at 25°C). This method is based on sowing on a given selective culture medium (Saboreaud plate count agar, Biokar Diagnostics) with a given amount of stock solution as well as the corresponding decimal serial dilutions. The plates were incubated in aerobiosis at 25 °C for 5 days and subsequently the number of colony forming units per gram of sample (cfu/g) was estimated.

3. RESULTS

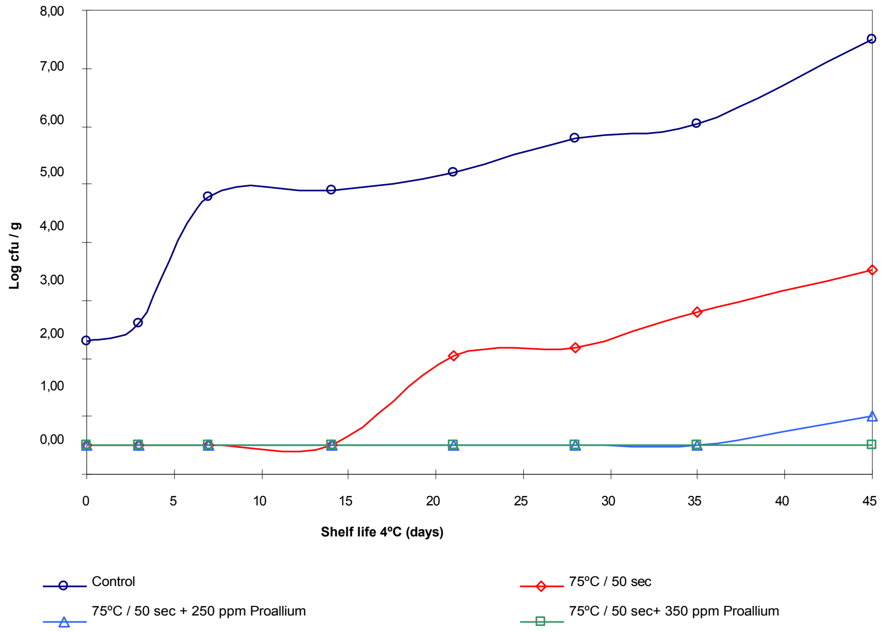
Table 1. Total mesophilic aerobic microorganisms in fried tomato sauce. Data expressed in log cfu/g

	Total mesophilic aerobes (Log cfu / g)							
Treatments	**Day 0**	**Day 3**	**Day 7**	**Day 14**	**Day 21**	**Day 28**	**Day 35**	**Day 45**
Check	2.30	2.60	4.77	4.90	5.20	5.79	6.05	7.51
75 º C / 50 sec.	< 1	< 1	< 1	< 1	2.05	2.17	2.81	3.53
75 º C / 50 sec.+ 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.02
75 º C / 50 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
80 º C / 35 sec.	< 1	< 1	< 1	< 1	< 1	1.52	1.81	1.74
80 ºC / 35 sec.+ 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
80º C / 35 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
85 º C / 25 sec.	< 10	< 10	< 10	< 10	< 10	< 10	0,78	1.35
85º C / 25 sec.+ 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
85ºC / 25 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
90 º C / 15 sec.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
90 º C / 15 sec. + 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
90 º C / 15 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
95 º C / 5 sec.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
95 º C / 5 sec.+ 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
95 º C / 5 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Table 2. Moulds and yeasts in fried tomato sauce. Data expressed in Log cfu /g

	Moulds and yeasts (Log cfu / g)							
Treatments	**Day 0**	**Day 3**	**Day 7**	**Day 14**	**Day 21**	**Day 28**	**Day 35**	**Day 45**
Check	< 1	< 1	2.11	4.32	5.68	4.60	4.78	5.53
75 º C / 50 sec.	< 1	< 1	< 1	< 1	0.8	1.52	1.80	2.30
75 º C / 50 sec.+ 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
75 º C / 50 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
80 º C / 35 sec.	< 1	< 1	< 1	< 1	< 1	< 1	1.03	1.45
80 º C / 35 sec.+ 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
80ºC / 35 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
85 º C / 25 sec.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
85 º C / 25 sec.+ 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
85º C / 25 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
90 º C / 15 sec.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
90 º C / 15 sec. + 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
90 º C / 15 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
95 º C / 5 sec.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
95 º C / 5 sec.+ 250 ppm Proallium S Liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
95 º C / 5 sec.+ 350 ppm Proallium S liquid	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Figure 1A. Evolution of total mesophilic aerobic microorganisms in fried tomato sauce at different heat treatments and doses of Proallium S liquid.



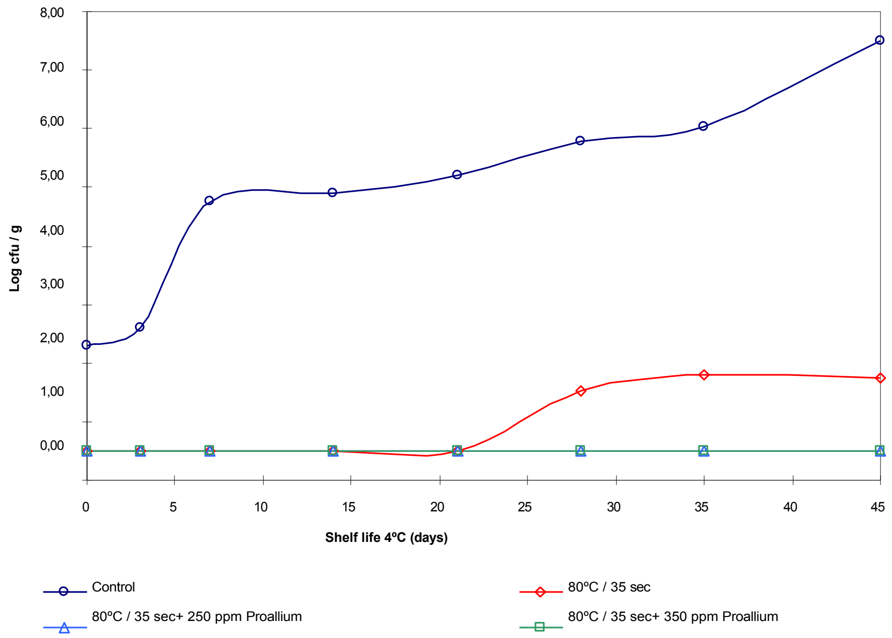
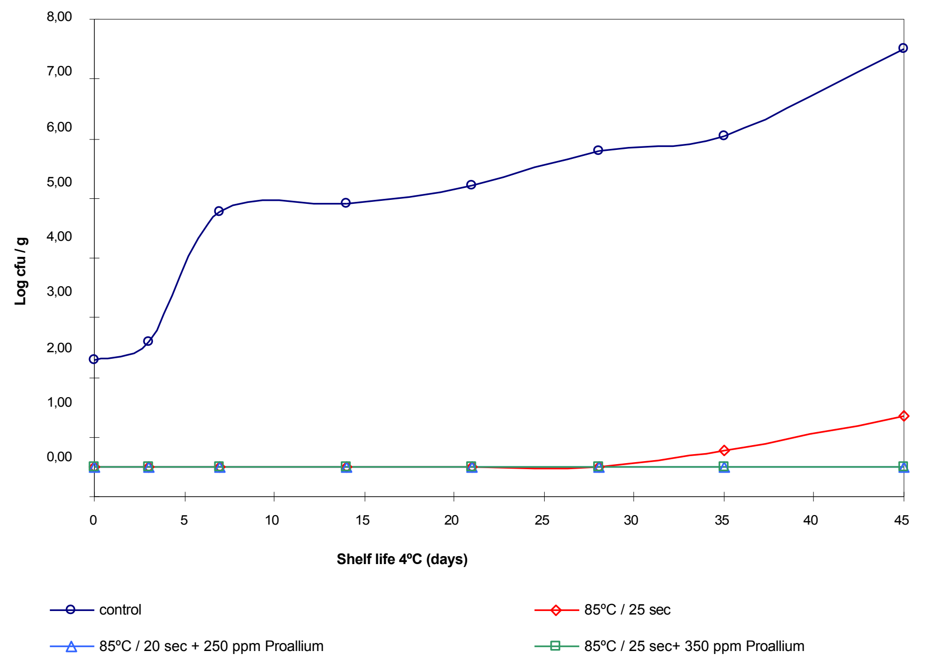


Figure 1B. Evolution of total mesophilic aerobic microorganisms in fried tomato sauce at different heat treatments and doses of liquid Proallium S.



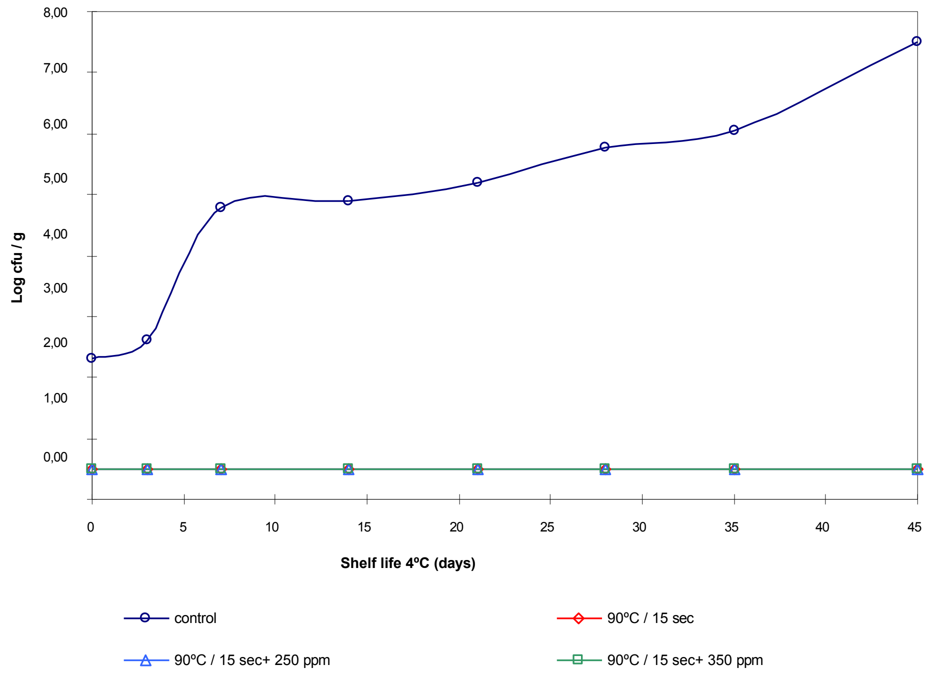
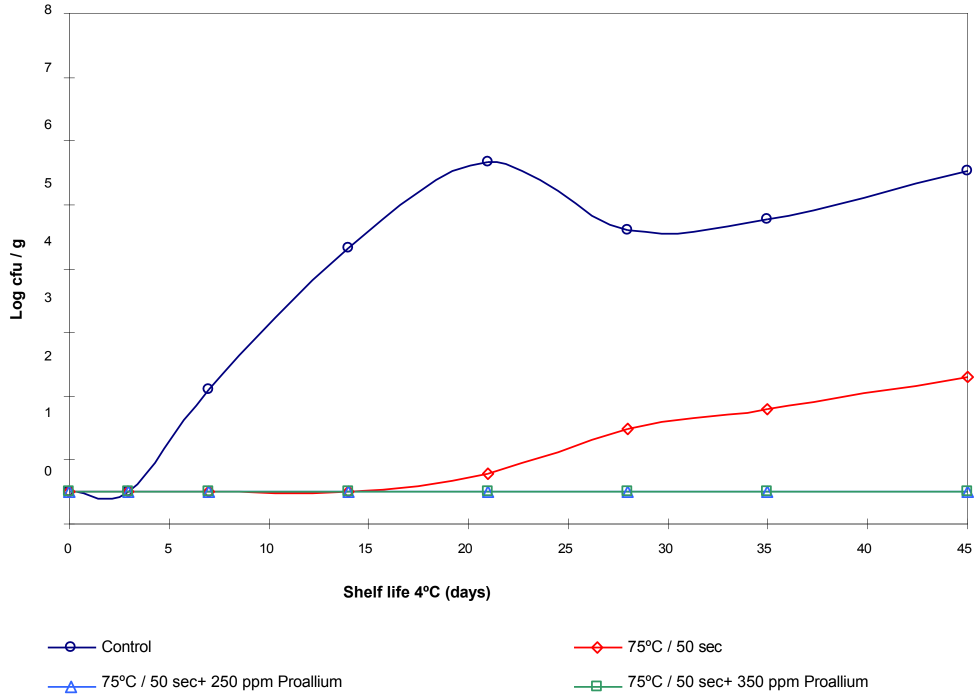


Figure 2A. Evolution of moulds and yeasts in fried tomato sauce at different heat treatments and doses of liquid Proallium S.



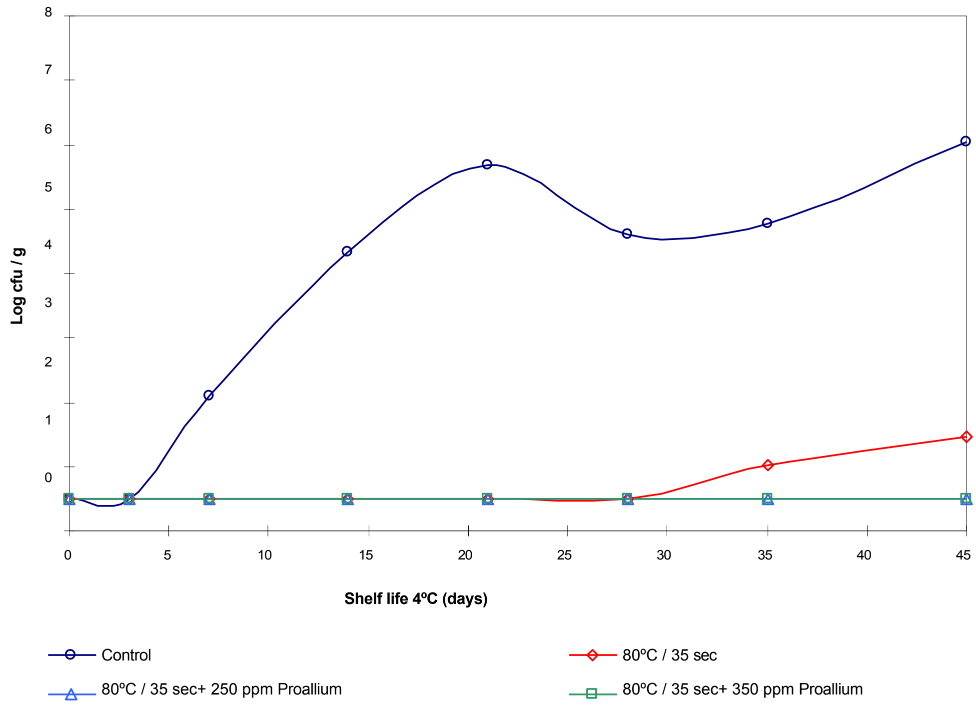
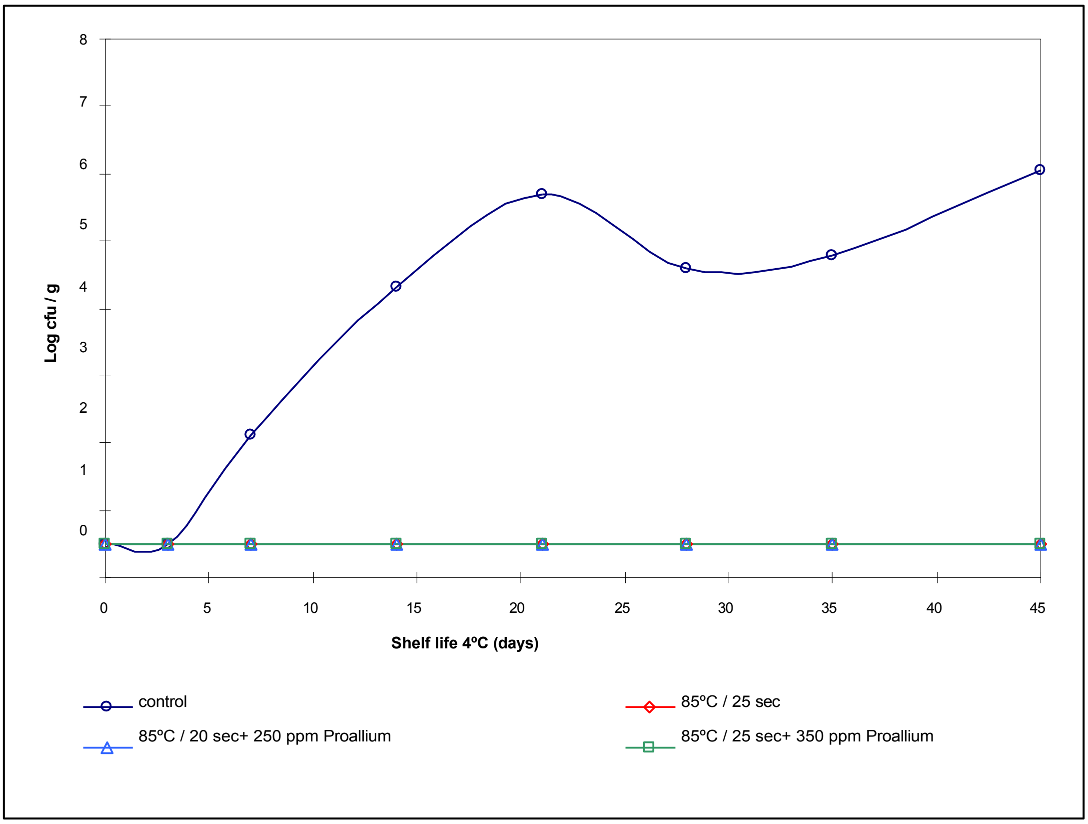


Figure 2B. Evolution of moulds and yeasts in fried tomato sauce at different heat treatments and doses of liquid Proallium S.



4. COMMENT

From the data obtained, it can be stated that the natural identical flavouring Proallium S liquid, at an optimal application rate between 250 and 350 ppm, exerts an excellent microbiological control of the food when combined with the different heat treatments, extending the shelf life of the fried tomato sauce.

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