

Chitosan as a natural food preservative for sauces: A proof of concept

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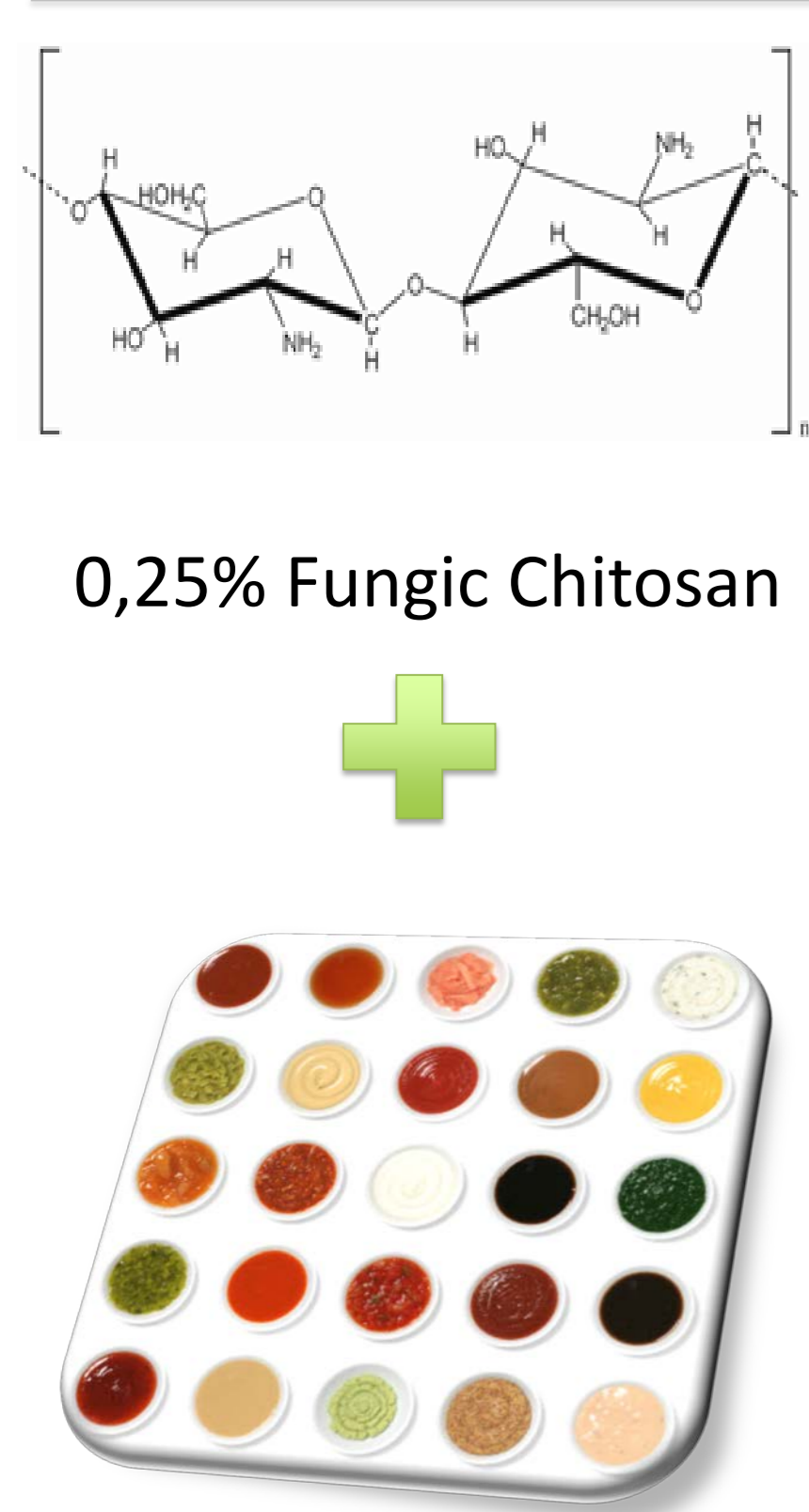
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Introduction

Nowadays, consumers demand more natural, nutritionally balanced, less caloric, and minimally processed foods leading to the emergence of sauces with low fat content and without chemical preservatives. This market pressure has led to the modification of a well established and microbiologically stable matrix, triggering the search for new antimicrobial compounds of natural origin, compounds whose inhibitory efficacy must be studied [1]. Chitosan has attracted attention as a potential food preservative of natural origin due to its antimicrobial activity against a wide range of foodborne pathogens and contaminants. However, the antimicrobial capacity of chitosan, despite being extensively reported, is primarily based upon *in vitro* trials, where the compound, unimpeded, acts upon microorganisms. Currently, inclusion of chitosan in a food matrices is in its early steps with works reporting the application of chitosan in bread, egg, fruits, vegetables, juices, meat, milk and others, with various degrees of success [2]. In food sauces examples of chitosan application are few and scarce, as most works report on the usage of chitosan as an emulsifier or a emulsifier stabilizer and only Roller and Covill [3] described the successful usage of a chemically altered chitosan as a food preservative. As such, in this work we sought to ascertain the potential of chitosan as a viable, natural, alternative to traditional food preservatives used in food sauces, namely ketchup, mayonnaise and mustard, through assessment of the effect of chitosan containing sauces on the inhibition of lactic acid bacteria isolated therefrom and sensorial analysis of the developed prototypes.

Methods



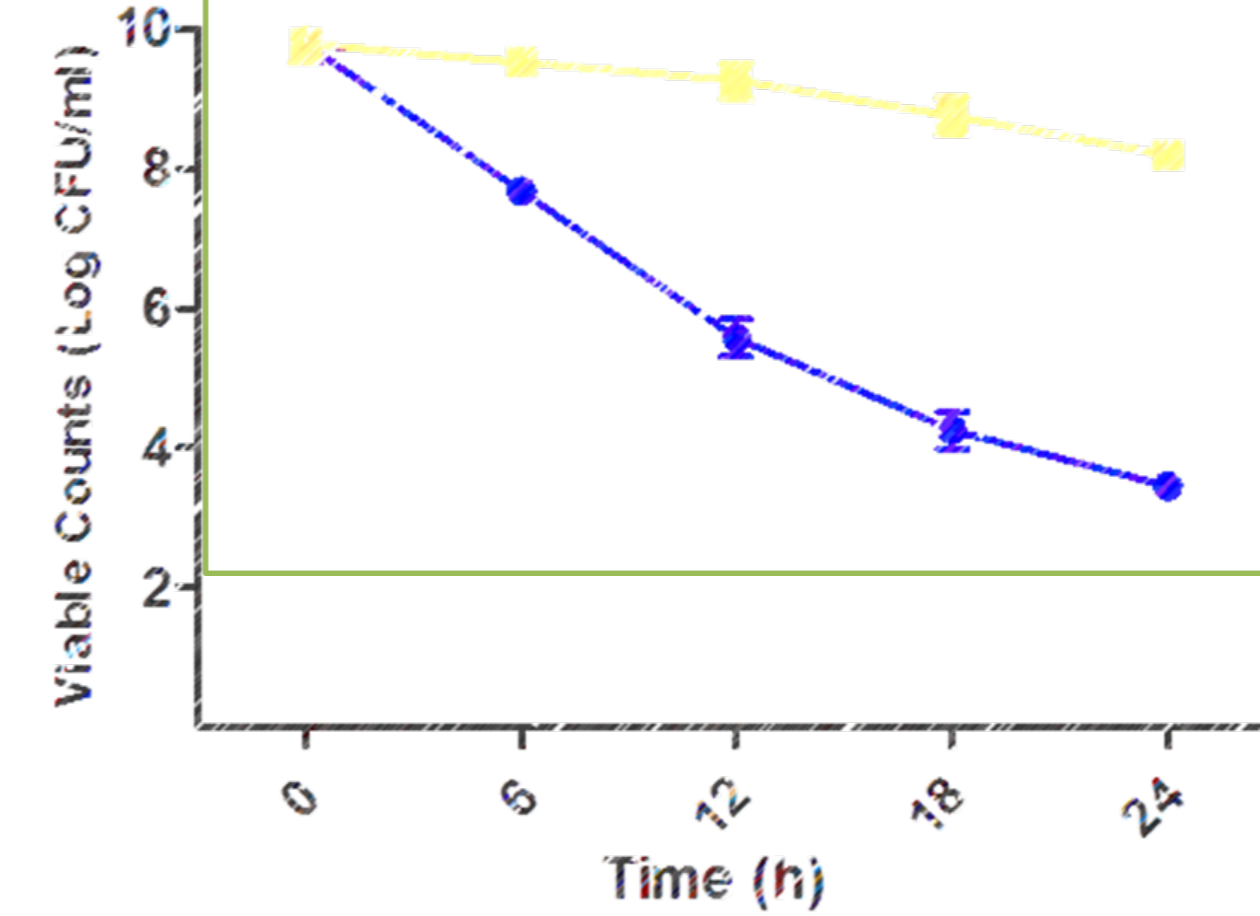
Prototypes



Antimicrobial activity

24 at 37 °C Activity screening

48h at 37 °C Death curves



Sensorial Analysis



Results

Antimicrobial activity

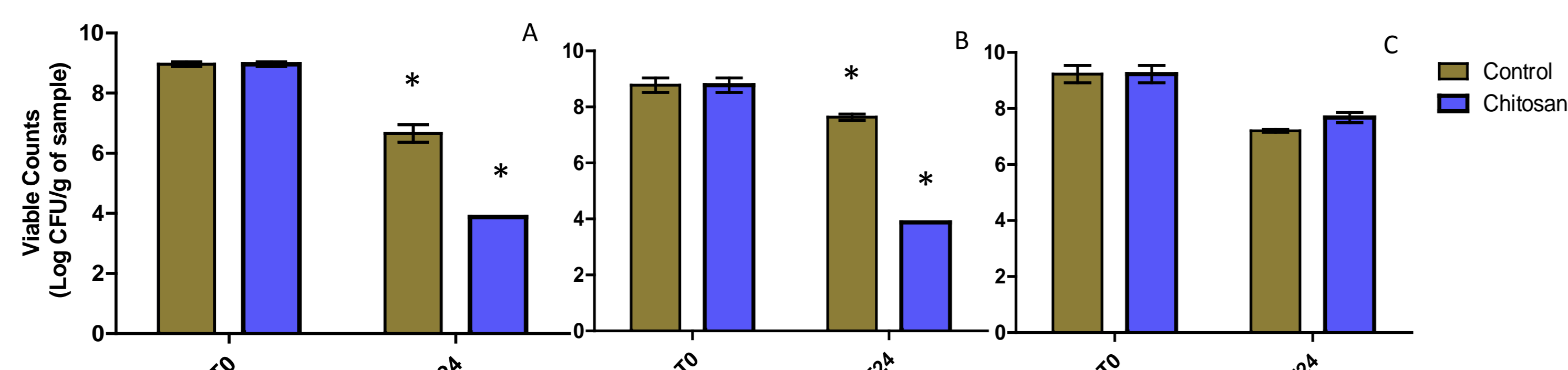


Figure 1 – Viable cell numbers in MRS Agar of a lactic acid bacteria isolate inoculated in A) Ketchup; B) Mayonnaise; C) Mustard, after a 24h at 37 °C antimicrobial activity screening. * represents significant differences after 24h. Control sauces had 0,1% potassium sorbate as antimicrobial

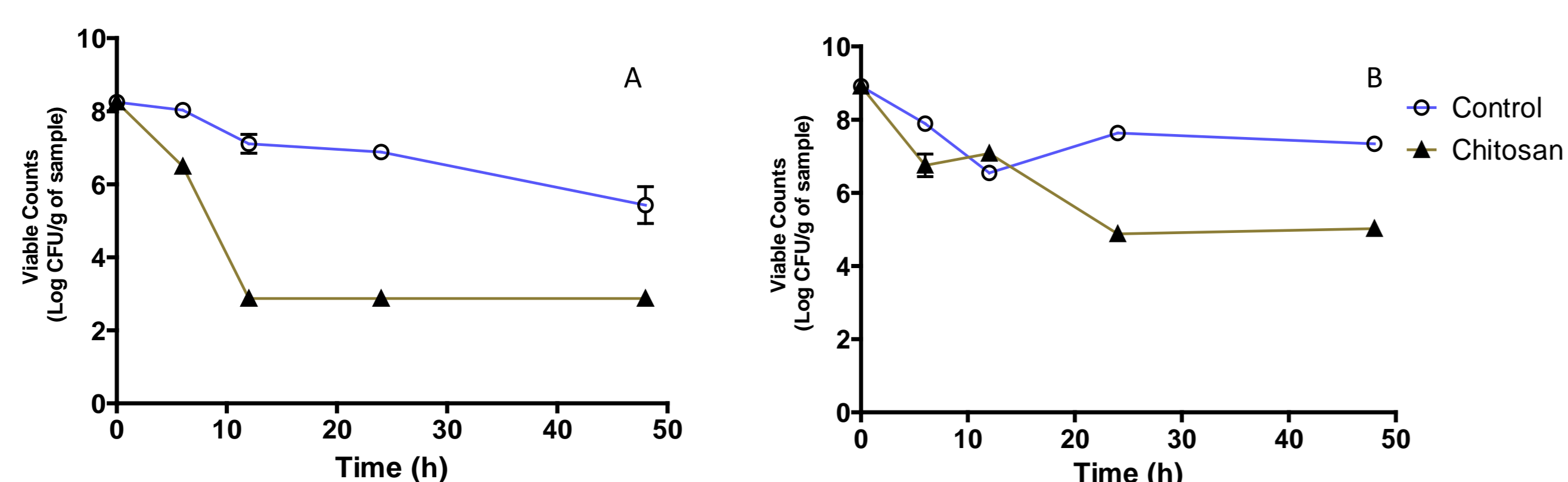


Figure 2 – Viable cell numbers in MRS Agar of a lactic acid bacteria isolate inoculated in ketchup (A) and mayonnaise (B) prototypes, after a 48h at 37 °C death curve. Control sauces had 0,1% potassium sorbate as antimicrobial

Sensory analysis

Table 1 – Sensory description of the ketchup, mayonnaise and mustard prototypes by a sensorial panel

Prototype	Descriptors
Ketchup	<ul style="list-style-type: none"> • Astringent • Loss of creaminess in texture • Non-characteristic flavor
Mayonnaise	<ul style="list-style-type: none"> • Pasty texture • Astringent • Unbalanced flavor
Mustard	<ul style="list-style-type: none"> • Creamy • Full bodied and thick texture • Pleasant and mouthful



Mustard prototype sensorially validated as the most promising in terms of chitosan application despite the least inhibitory activity reported (Figure 1)

Conclusions

- ☞ Chitosan as an antimicrobial was successfully incorporated in all **three** prototypes
- ☞ Highest antimicrobial activity was registered for the ketchup and mayonnaise prototypes
- ☞ After 48h the ketchup prototype reduced viable cell counts to under the method's detection limit
- ☞ The incorporation of chitosan altered the organoleptic characteristics of ketchup and mayonnaise
- ☞ Only the mustard prototype was deemed as viable for consumption

References

- [1] Castro et al. LWT 2009, 42, 1428-1434
- [2] HK No et al. J Food Sci 2007,5, 87-100
- [3] S Roler and N Covil.. Int J Food Microbiol 2000, 63, 202-209.

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