Impact of partial substitution of NaCl with KCl on the microbial dynamics of Kalamata natural black olives at semi-industrial scale

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Background

Salt plays a crucial role in the fermentation of table olives. However, concerns have been raised regarding the high salt content traditionally used in this process, due to its association with strokes and cardiovascular diseases. This study investigated the effect of partially replacing NaCl with KCl (50% substitution) on the semi-industrial fermentation of Kalamata black olives.

Methods

Fermentation was performed at the Cooperative of Sterna, Messinia, Greece, in 220 L plastic vessels containing 130 kg of olives and 90 L of brine. Two fermentation treatments were tested: (a) 7% (w/v) NaCl (control), and (b) 50% substitution of NaCl with KCl. The process was monitored for 135 days. Sensory evaluation was performed at the end of fermentation according to the official IOC method.

Result

The results of the microbiological analysis indicated that lactic acid bacteria and yeasts dominated throughout the process. Their counts increased progressively until day 22 and then reached a plateau ranging from 5.6 to 6.4 log CFU/mL. Enterobacteriaceae presented a decline from the onset of fermentation and were not detected in the brine after 45 days. Sensory analysis showed no defects, classifying the olives as Extra.

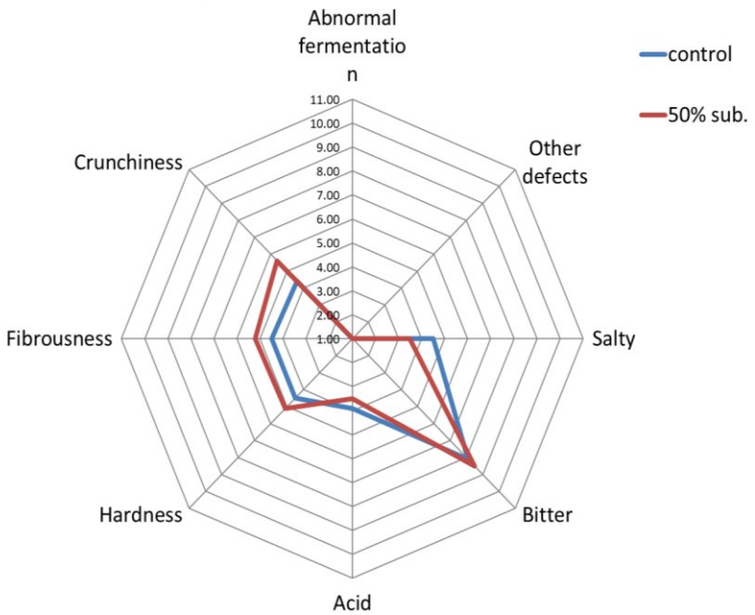

Fig 1. Median values of sensory attributes for cv. Kalamata natural black olives in the case of control (blue line) and NaCl/KCl fermentation (red line).

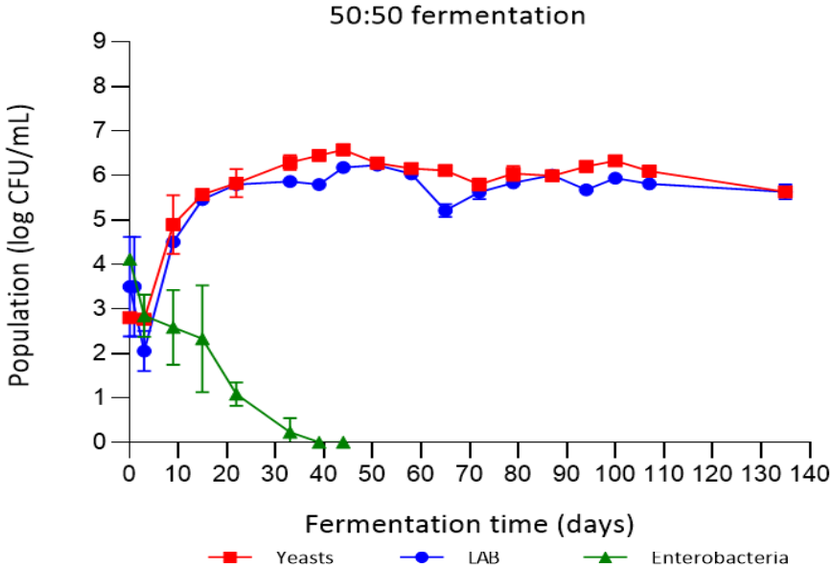

Fig 2. Changes in the microbial population of LAB, yeasts and Enterobacteriaceae during NaCl/KCl fermentation.

Conclusions

This study demonstrated that the semi-industrial fermentation of Kalamata natural black olives is feasible with 50% substitution of NaCl by KCl. Therefore, large-scale trials are necessary to validate these findings and assess their applicability under commercial production conditions.