

Influence of starter cultures on the concentration of ACE-inhibiting tripeptides VPP and IPP in semi-hard cheese

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Introduction



Angiotensin-converting enzyme (ACE)-inhibiting peptides can lower blood pressure in human. Several fermented milk products containing the tripeptides valyl-prolyl-proline (Val-Pro-Pro; VPP) and isoleucyl-prolyl-proline (Ile-Pro-Pro; IPP) are commercially available. The same peptides were found in different cheese varieties of Swiss origin.

However the concentrations of the two peptides in cheese varied considerably during ripening in all varieties and even among individual loafs of the same variety. Various factors such as cultures, milk pretreatment, scalding and ripening conditions are influencing the concentration of these tripeptides.

The objective of the present study was to investigate the influence of two different starter cultures (A and B) on the concentration of the two tripeptides VPP and IPP in an experimental semi-hard cheese during ripening.

Methods and Material

The concentration of the two antihypertensive peptides VPP and IPP was determined during ripening in an experimental semi-hard cheese produced with different starter culture strains. The concentration of VPP and IPP were quantified in the water-soluble extract of the experimental cheeses over a period of 360 days in a single analysis. The peptides VPP and IPP were separated by HPLC and quantified with a selected reaction monitoring approach. Isotope labelled VP*P and IP*P were used as internal standards (Fig. 1). Additionally ACE-inhibition was measured *in vitro*.

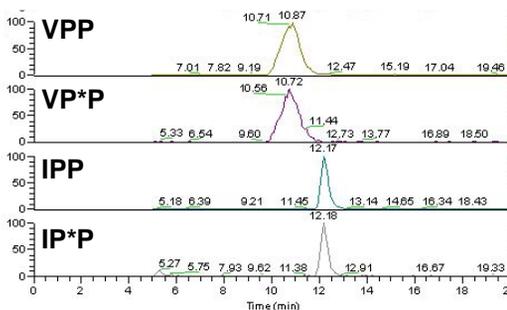


Figure 1: Quantification of VPP+IPP with isotope labelled standards

Results

The two peptides VPP and IPP are found in the sequence f84-86 and f74-76 of β -casein. During cheese ripening caseins are degraded to larger and smaller peptides. In the ripened cheese made with culture A VPP and IPP were found in concentrations of up to 1500 mg/kg which is close to the theoretical maximum. In contrast cheese B contained only moderate concentrations of the VPP and IPP (Fig 2). The curves of the ACE-inhibition showed similar trends as the concentration of the two tripeptides (Fig 3).

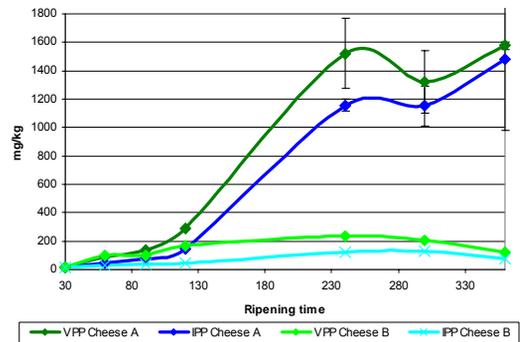


Figure 2: Concentration of VPP+IPP during ripening in experimental semi-hard cheeses made with different starter cultures

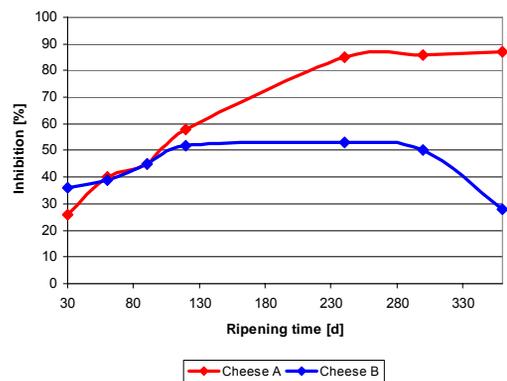


Figure 3: ACE-inhibition during ripening in experimental semi-hard cheeses made with two different starter cultures

Conclusion

The release of VPP and IPP is strongly influenced by the type of starter culture and varies greatly during ripening. In both cheeses VPP and IPP was accumulated during the first 8 month of ripening. In cheese B a decrease in ACE inhibition and the concentration of VPP and IPP was observed during the final stage of ripening. In contrast to this, ACE-inhibition and the concentrations of VPP and IPP remained stable in cheese A indicating that the enzymes for degradation of these two peptides are most probably missing in this cheese.