

Lactic acid bacteria and thermo stress combined with suppressed water activity

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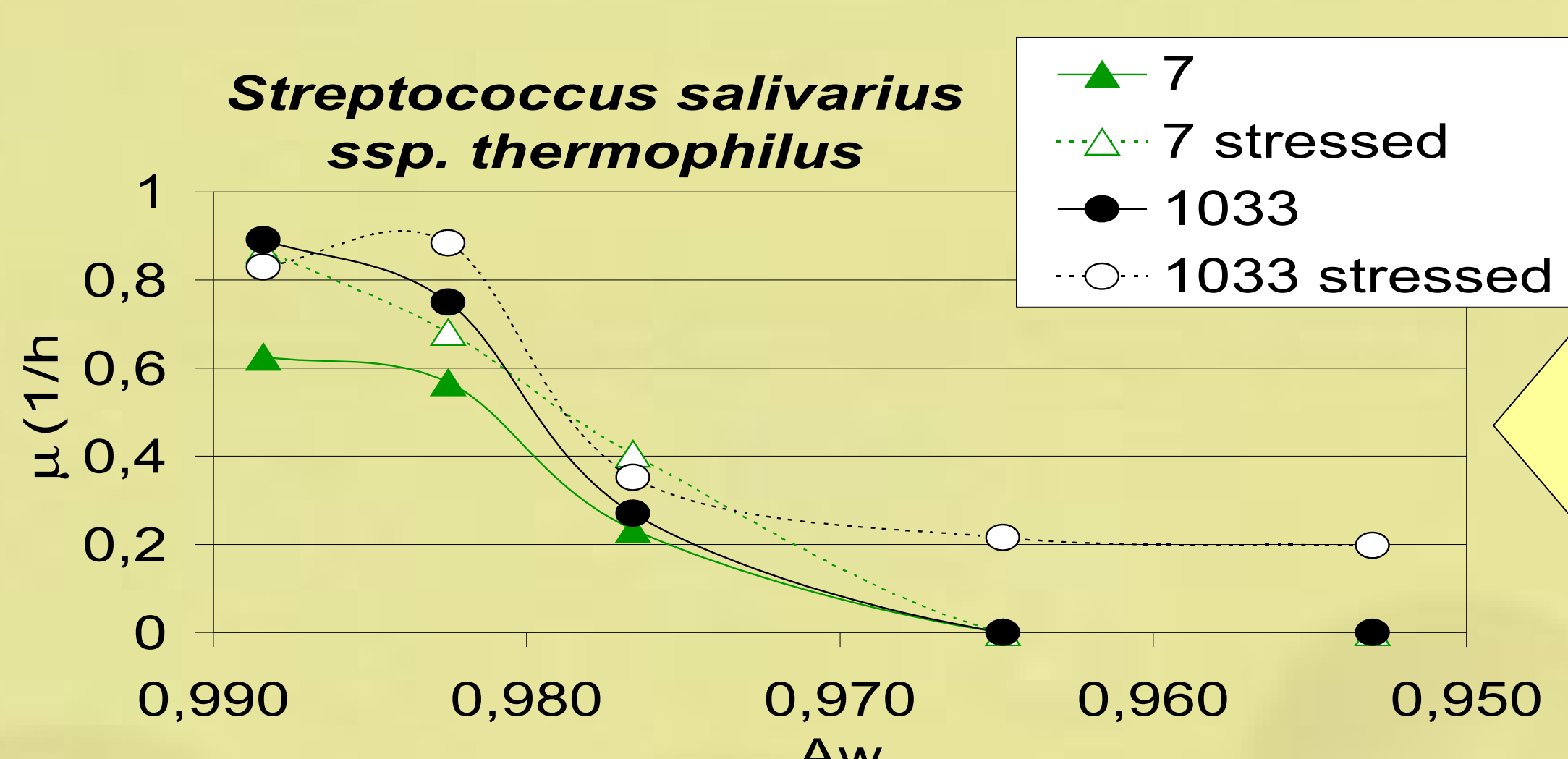
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Introduction

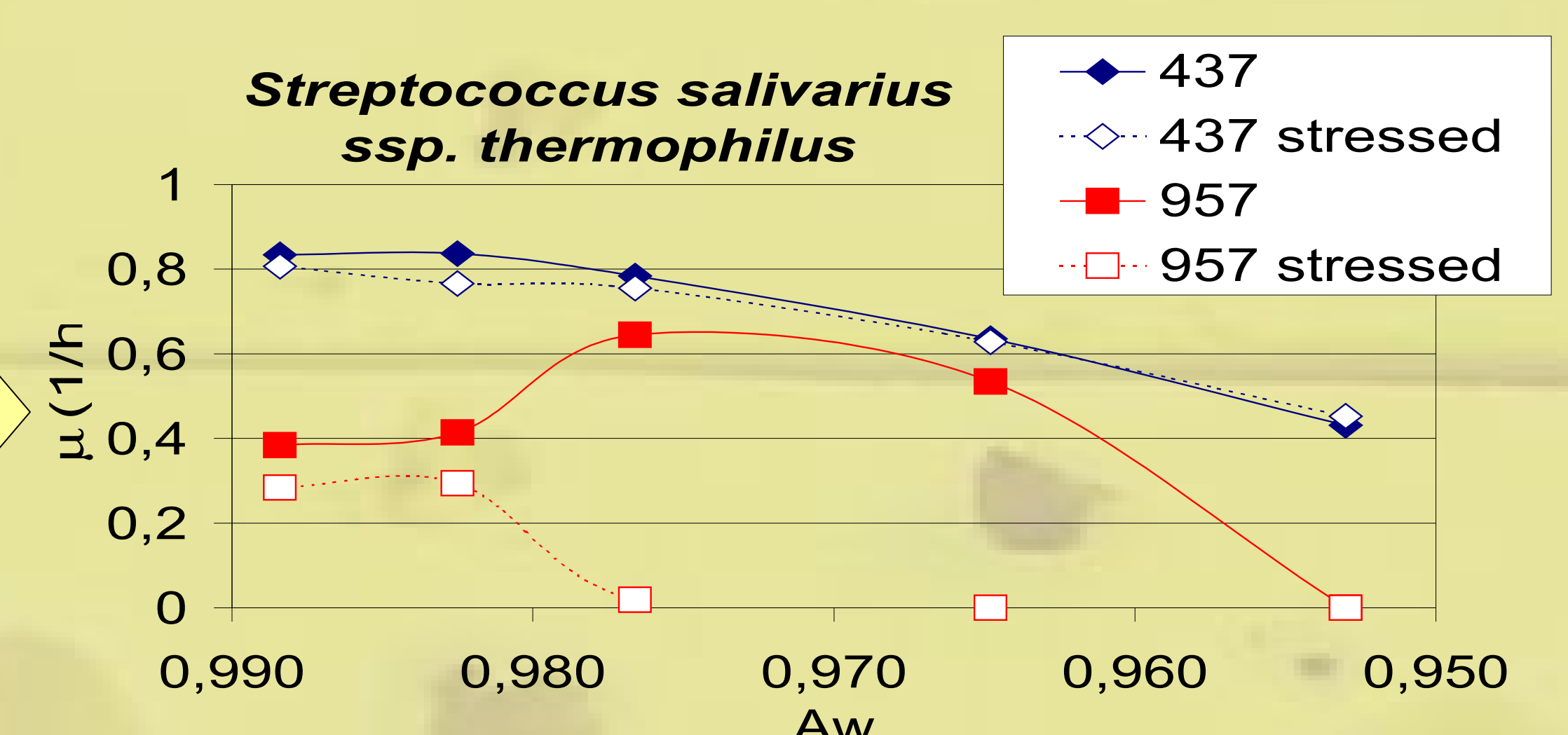
Lactic acid bacteria are applied in hard cheeses production technology as starters. Their populations are stressed during the technology operation by many impacts including thermo stress (heating after clotting of milk) and osmotic stress (water activity decreasing through ripening of the cheese). Physiological stress responses are diverse and their combinations can cause different effects. *Lactobacillus sp.* and *Streptococcus salivarius ssp. thermophilus* are used in hard cheeses production as starters and were chosen as the model populations.

Results

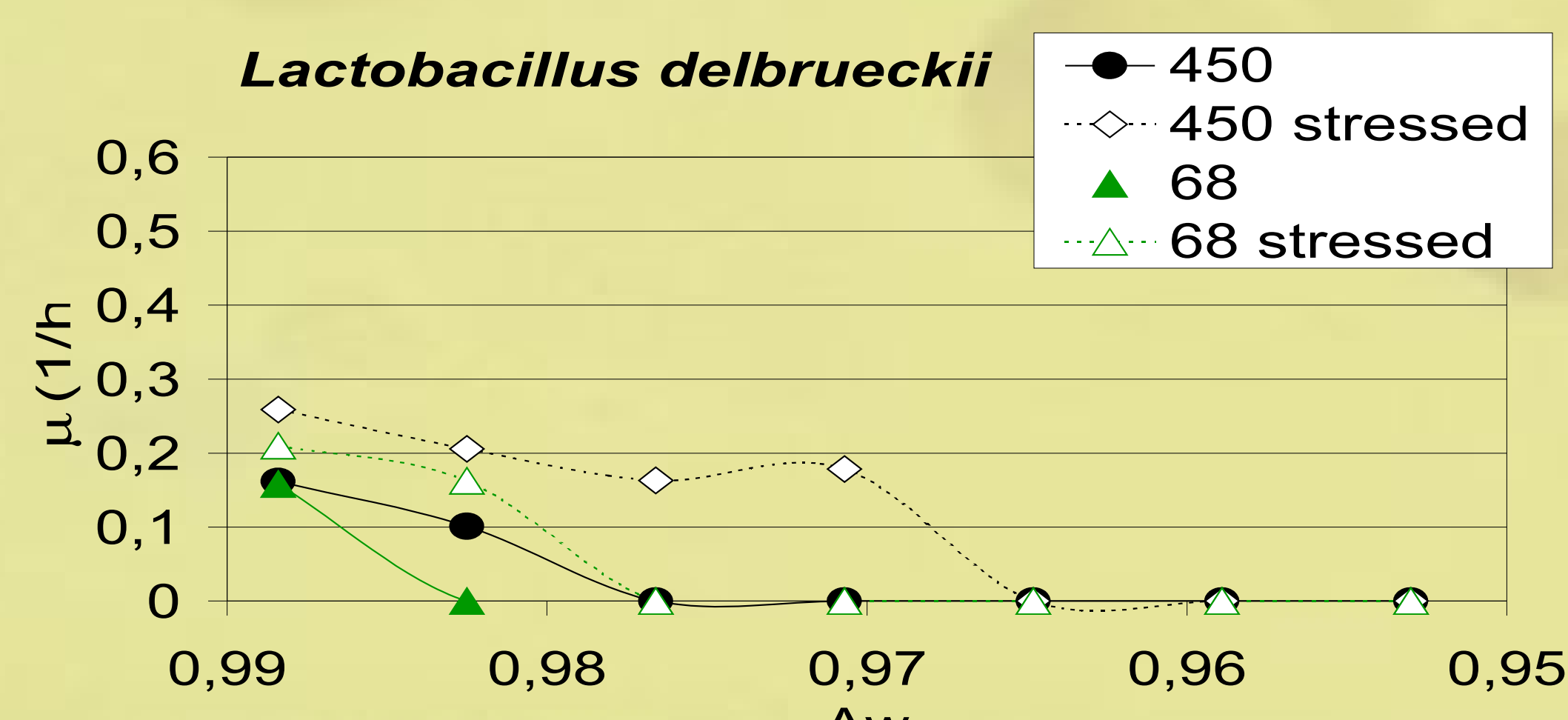
Lactic acid bacteria are different in reaction on Aw stress and thermo stress can induce processes changing their resistance. Each strain shows different response on the multiplied stress. This research is base of new method for better characterization biotechnological strains and their applicability in present technologies based on a new complex information about biological agents. Study of the genetic base is work for the next research.



Thermo stress applied on selected *Streptococcus* strains did not induce significant changes in growth characteristics, just two strains showed slightly increased resistance to the Aw stress.



Positive effect of the thermo stress illustrate increased resistance to the increased Aw of medium.

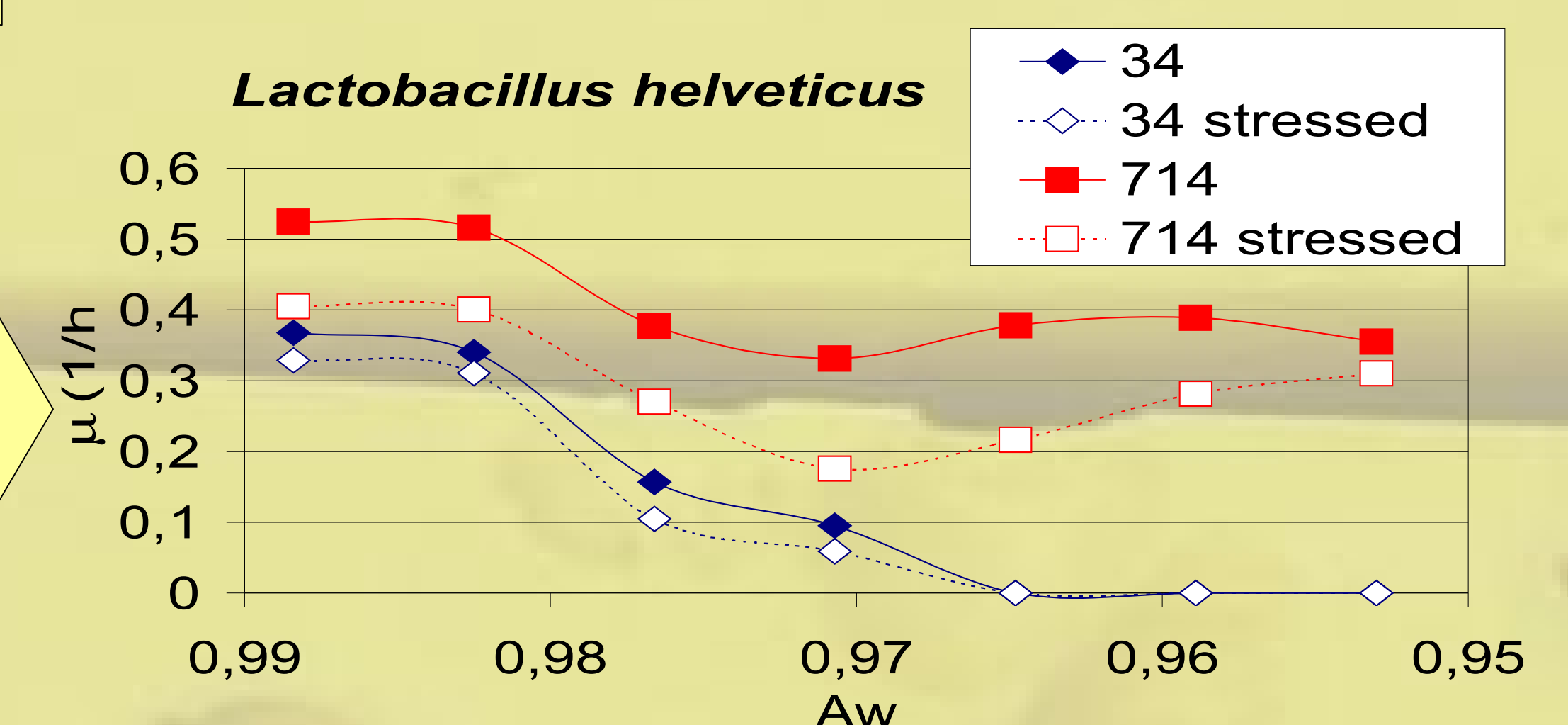


Both tested *Lactobacillus delbrueckii* strains were inhibited by Aw 0,970 (3% NaCl), but populations influenced by a thermo stress were able to grow. Thermo stress can also cause increase in maximum growth rate in medium with NaCl.

Some strains are naturally resistant to Aw and this quality is not influenced by the thermo stress, or the thermo stress suppress this resistance.

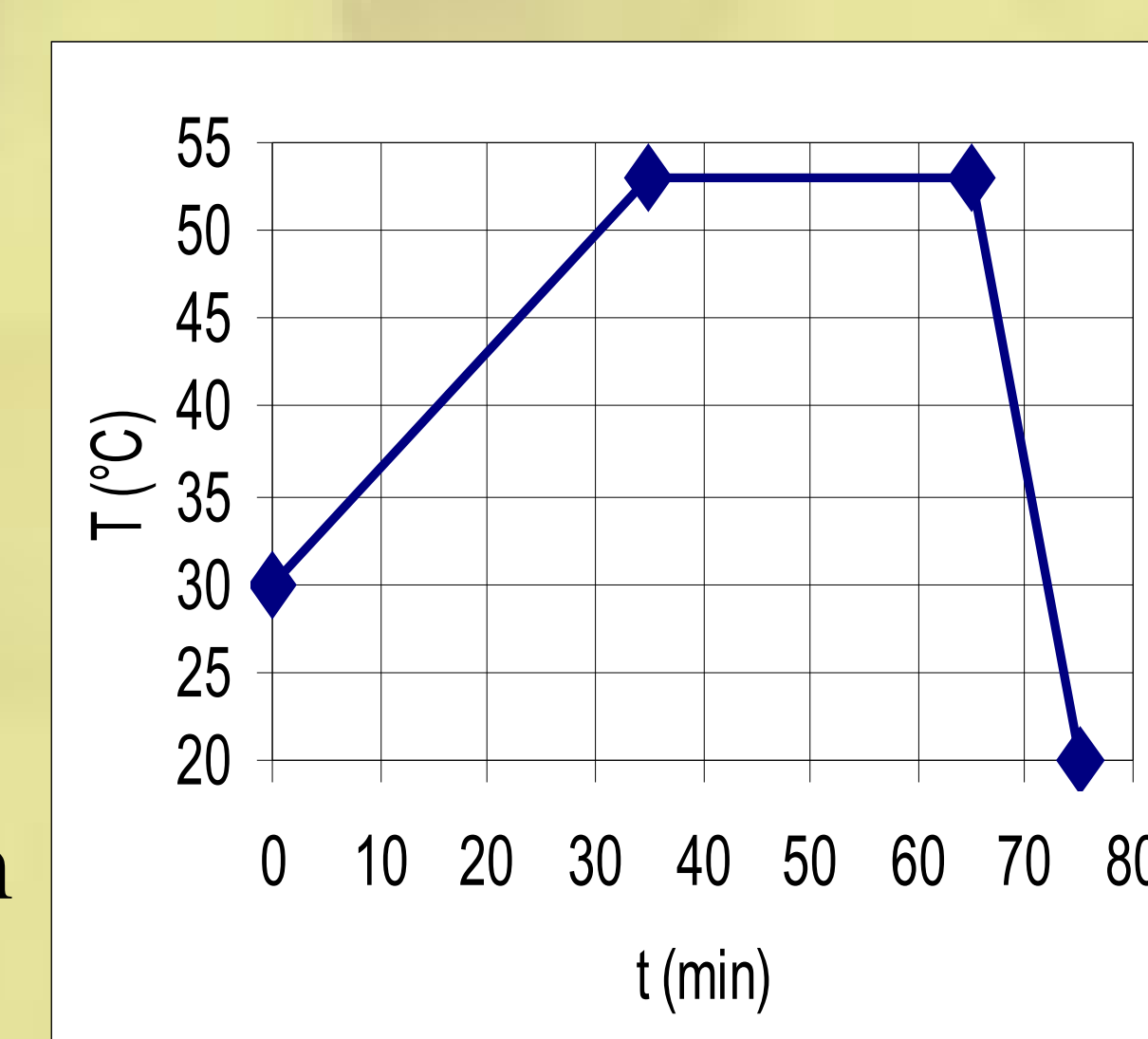
Results show that different strains react differently under the Aw stress. All *Streptococcus* strains were able to grow with Aw 0,982 (1% NaCl), but the subsequent Aw decrease (0,977 = 2% NaCl) causes growth inhibition for 6 of 13 tested strains. Other strains were able to growth with Aw 0,954 (6% NaCl).

Both tested *Lactobacillus helveticus* strains were able to growth under Aw 0,970 (3% NaCl) and thermo stress did not cause significant changes in Aw resistance.



Material and methods

Tested cultures were chosen from Laktoflora - collection of pure milk cultures. Cultures were stressed by temperature course derived form the real technology process (53°C). Following the thermo stress, the cultures were cultivated in medium with different NaCl concentrations. NaCl presence simulated changes in water activity in processed cheese during the milk to cheese transformation in fermenting cellar. Water activity (Aw) decreases from the value 0,990 for milk to the 0,955 in cheese. Cultivation was provided in M17 medium for *Streptococcus* strains and in MRS medium for *Lactobacillus* strains. Strains were cultivated at optimal temperature.



Thermo stress was realised in water bath. Population was heated from 30°C to 53°C in 30 min, maintained with 53°C for next 30 min and the cooled to the laboratory temperature.