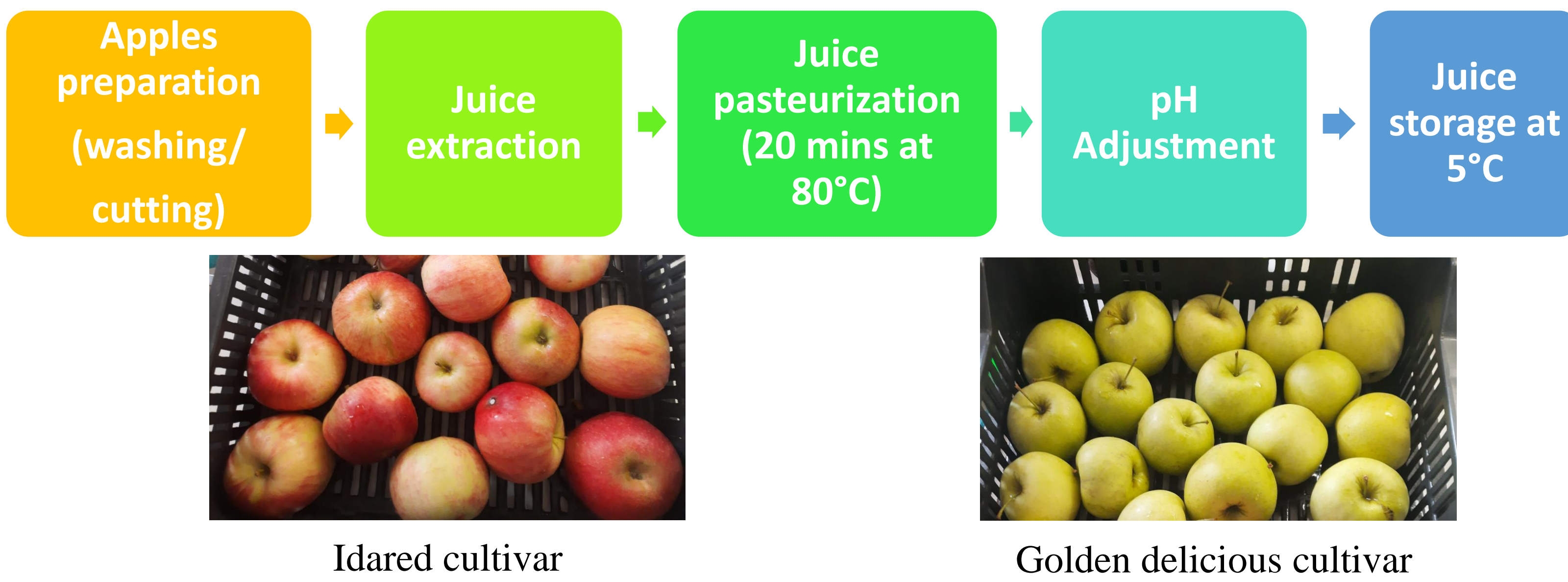


INTRODUCTION AND AIMS

Probiotic fruit juices allow the consumption of the beneficial microorganisms by people intolerant to lactose, allergic to milk proteins, hyper-cholesterolemic, strict vegetarian, or resident in places where dairy products are not accessible. The major sugars of apple juice (fructose, glucose and sucrose) can be used by Lactic Acid Bacteria (LAB) during fermentation for cellular growth and bioconversion into lactic acid, promoting a decrease of all the sugars after the process, particularly fructose. However, juice supplementation with probiotics is more complicated than in dairy products, since juices have insufficient amounts of peptides and free amino acids that are necessary for the metabolism of probiotic cultures. The aim of this study is the screening of lactic acid bacteria strain for the apple juice fermentation, the investigation of the peptone supplementation as a nitrogen source that will affect the acid production and thus the sensorial properties of the apple juices, and determination of the fruit variety effect on the efficiency of apple juice fermentation.

EXPERIMENTAL METHODS

1- Apple juice preparation



2- Applied strains

Apple juice was fermented with 1% and 5% inoculum of 3 different strains of probiotic lactic acid bacteria:

L. brevis HA112,
L. plantarum 299v
L. acidophilus La5

During 48 hours fermentation the pH and cell growth were measured 3 times (0, 24 h and 48 h).

3- Apple juices fermentation

Golden Delicious (GD) and Idared (ID) apple juices were inoculated with 5% of *L. plantarum* 299v and with peptone supplementation (GDp) and (Idp) the fermentation was conducted for 24 hours during which pH and cell growth were measured every 4 hours.

RESULTS AND DISCUSSION

1- Screening of lactic acid bacteria for apple juice fermentation

- The growth of *L. brevis* HA-112, *L. plantarum* 299v and *L. acidophilus* La5 with 1% and 5% inoculation of apple juice. The juice fermented with 5% inoculum of *L. plantarum* 299v showed the highest cell growth after 24h (8.45×10^9 CFU/ml).

2- pH and cell growth results

- The apples juices with peptone showed more important bacterial growth after 24 hours of fermentation than Golden and Idared apple juices (GDp: $1,66 \cdot 10^9$ CFU/ml, IDp: $1,75 \cdot 10^9$ CFU/ml, GD: $1,48 \cdot 10^9$ CFU/ml, ID: $7,90 \cdot 10^8$ CFU/ml) The pH was lower for supplemented samples, but the difference was not important (GDp: pH 4,12, IDp: pH 4,08, GD: pH 4,23, ID: pH 4,25).

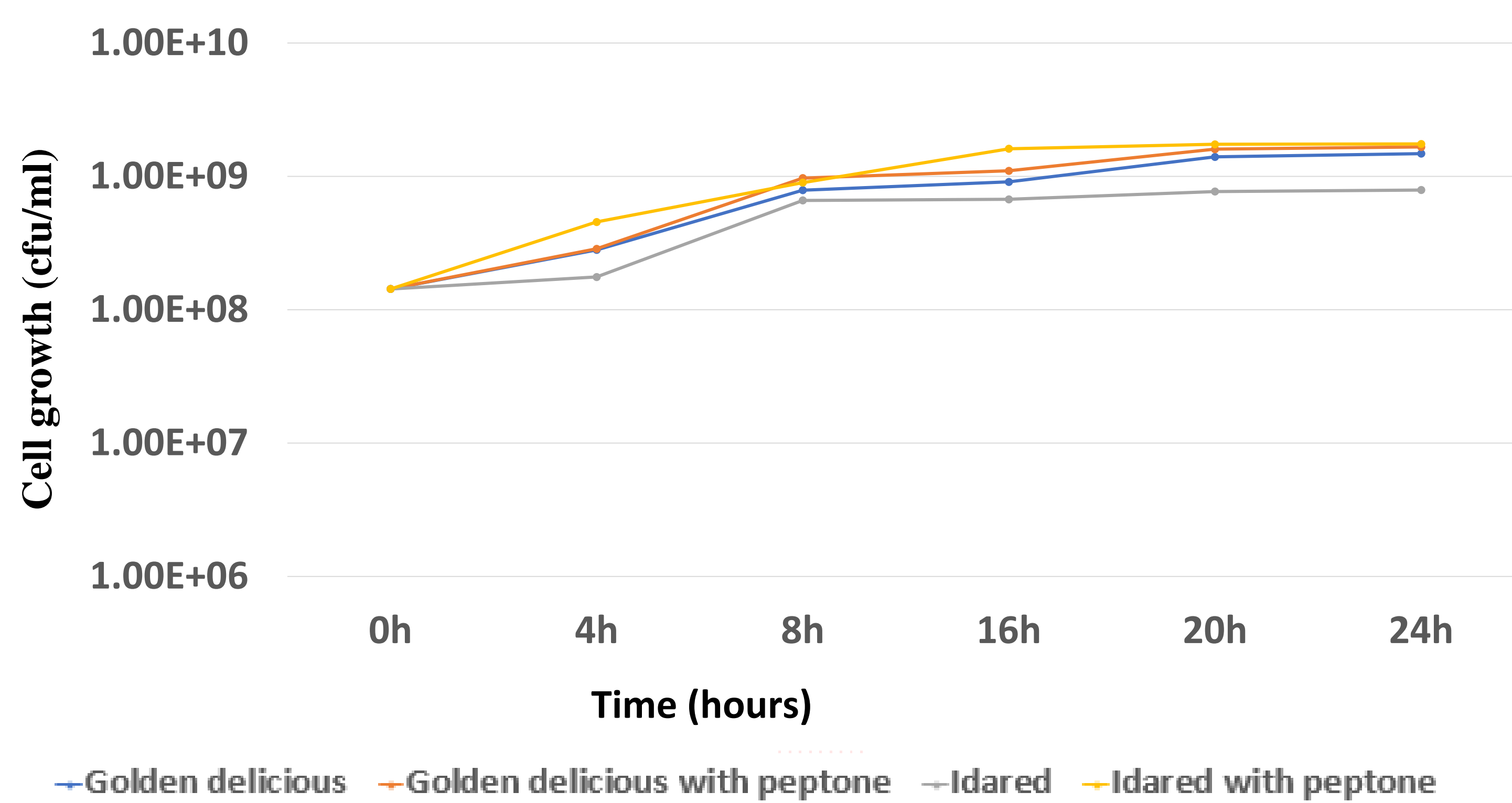


Figure2. Bacterial growth of *L. plantarum* 299v during the fermentation of apples juices (Golden Delicious, Golden Delicious with peptone, Idared, Idared with peptone)

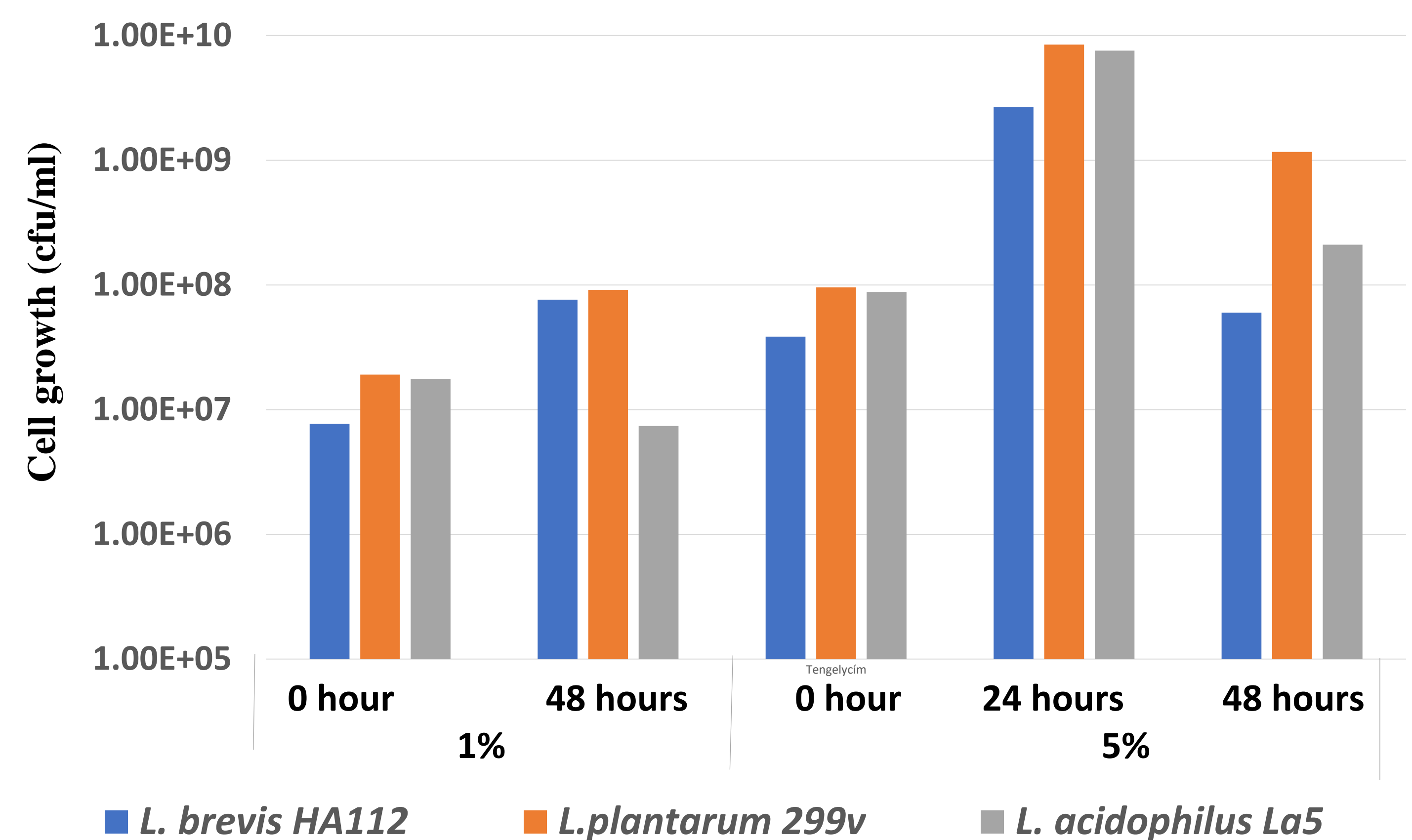


Figure1. Growth of *L. brevis* HA112, *L. plantarum* 299v and *L. acidophilus* La5 with 1% and 5% inoculation of apple juice

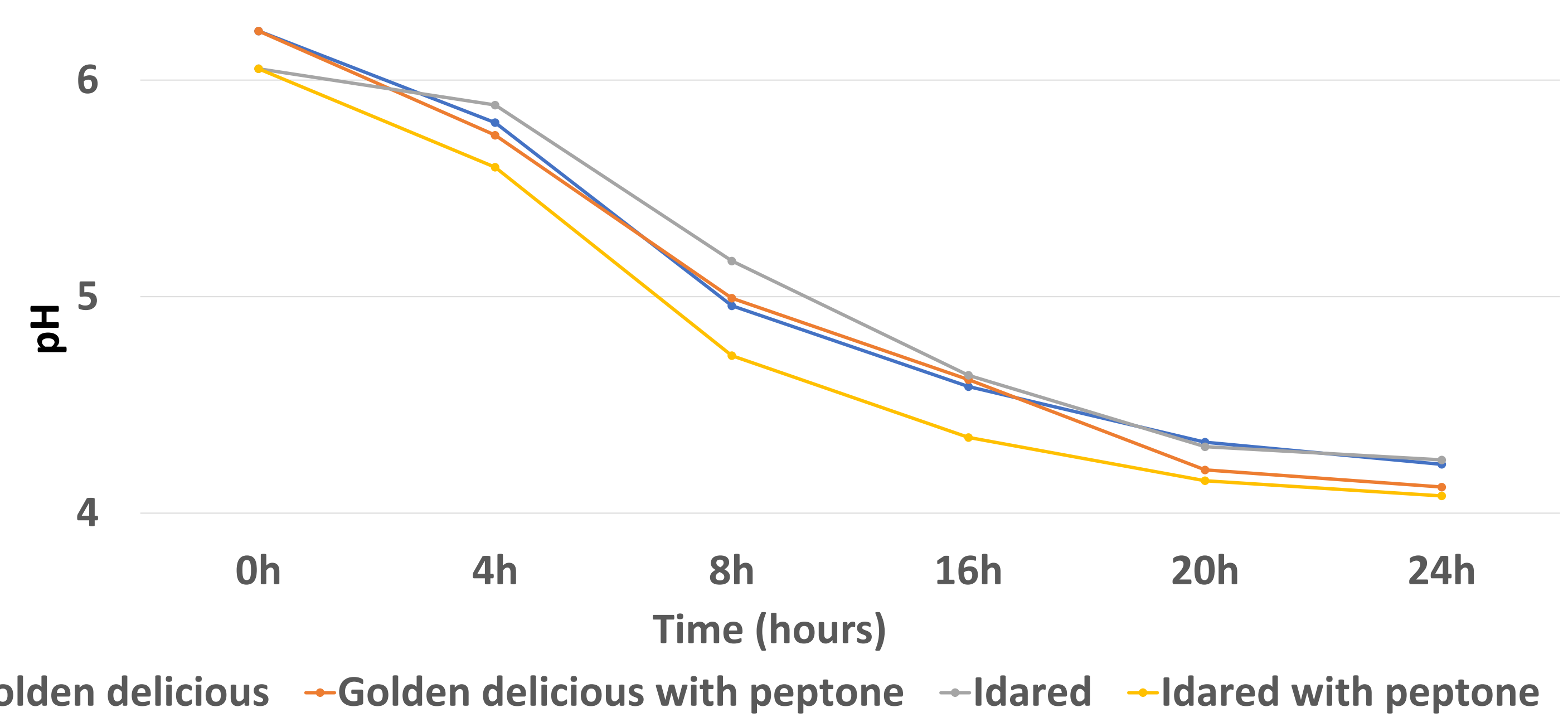


Figure3. pH changes during the fermentation of apples juices (Golden Delicious, Golden Delicious with peptone, Idared, Idared with peptone) with *L. plantarum* 299v

- The positive effect of the peptone supplementation on the fermentation parameters shows the importance of peptides in the metabolism of *L. plantarum*. Zhang *et al.* (2009) stated that peptides are required either to grow lactic acid bacteria, or to stimulate their development.
- *L. plantarum* grew better than the other strains and different substrates fermentation (two apples varieties juices) had divergent fermentation results, thus, depending on the metabolic characteristic and enzymatic systems of the LAB strain the nutritional requirements and the fermentation end products and parameters will not be the same.

CONCLUSION

L. plantarum 299v (5%) was the most efficient lactic acid bacteria strain for apple juice fermentation. Furthermore, the supplementation of apple juice with a nitrogen source has a positive effect on the viability of the LAB. Considering the type of apple, the most suitable cultivar as substrate for the growth of microorganisms is Golden Delicious. Further research on the effect of nitrogen supplementation on the bacterial metabolites and the physicochemical and sensory profiles of the fermented apple juice are needed.

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