ESTABLISHING SPECIFIC GROWTH RATE OF TWO *LACTOBACILLUS SALIVARIUS* STRAINS ISOLATED FROM DENTAL ROOT CANAL AND SOME *LACTOBACILLUS* PROBIOTIC STRAINS BY INTESTINAL ORIGIN AT PH VALUES 4,5 AND 7,0

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Abstract

In vitro researches were carried out for evaluate specific growth rate and generation time of two Lactobacillus salivarius strains isolated from dental root canal and two Lactobacillus probiotic strains at pH values 4.5 and 7.0. These tests indicated that Lactobacillus salivarius strains isolated from dental root canal showed biger specific growth rate values at both pH values compared with the probiotic Lactobacillus strains.

Key words: *Lactobacillus salivarius, probiotic, specific growth rate*

INTRODUCTION

Lactobacilli have been isolated from specific habitats, including dairy products, plants, meat products, humans and animals (Brizuela M.A. 2001, Cristensen J.E. 2003, Nowel O. 2012 and Teusink B. 2009).
The main goal of our study was to establish the specific growth rate of *Lactobacillus salivarius* strains isolated from dental root canal and two *Lactobacillus* probiotic strains at pH 4.5 and 7.0.

MATERIALS AND METHODS

Two *Lactobacillus salivarius* strains isolated from dental root canal (G1 and G2) and two *Lactobacillus* probiotic strains: *L.salivarius* probiotic and *Lactobacillus rhamnosus* GG were used in this work. These strains were grown in MRS broth in Anglicon fermenters, at 37ºC and CO_2 5% atmosphere, at pH 4.5 and 7.0. The DO_{600} values were determined in the moment of inoculation (T0) and than hourly (moment T1 after one hour, T2 after two hours, T3 after three hours etc).

The DO_{600} values were plotted on logarithmic graphic and the curves growth were obtained. The specific growth rate (μ) and generation time (Δt) were calculated.
The specific growth rate was calculated using the formula:

$$\mu = \frac{\ln OD_{max} - \ln OD_{min}}{T_{max} - T_{min}}$$

Where:
OD max is the value of DO600 in moment Tmax;
OD min is value DO600 in moment Tmin;
The generation time (Δt) (dubling time) was calculated in this main:

$$\Delta t = \frac{\ln 2}{\mu}$$

RESULTS AND DISCUSSIONS

The specific growth rate and generation time of the investigated strains at pH 4.5 are shown in table 1.
Lactobacillus salivarius strains isolated from dental root canal G1 and G2 showed higher values of specific growth rate (0.81 and 0.7) compared with *Lactobacillus* probiotic strains (0.48 for *L.salivarius* probiotic and 0.56 for LGG) at pH 4.5.
Also, the *Lactobacillus* strains by dental origin had smaller generation time values (0.85h for G1 and 0.98h for G2) compared with the probiotic strains (1.43h for *L.salivarius* probiotic and 1.23h for LGG) (table 1).

Tabel 1. The DO600 values, the specific growth rate (μ) and generation time (Δt) at pH 4.5

		DO600 values				pH			
Moment	Time	*L.s.* probiotic	G1	G2	LGG	*L.s.* probiotic	G1	G2	LGG
T0	11:45	0,032	0,038	0,037	0,033	4,57	4,79	4,41	4,62
T1	12:45	0,040	0,057*	0,053*	0,046*	4,35	4,7	4,57	4,58
T3	13:45	0,058	0,121	0,102	0,081	4,61	4,7	4,55	4,49
T4	14:45	0,080*	0,273	0,201	0,140	4,61	4,61	4,51	4,63
T5	15:45	0,121	0,64	0,425	0,243	4,6	6,59	4,55	4,6
T6	16:45	0,206	1,49**	0,89**	0,440**	4,58	4,47	4,57	4,57
T7	17:45	0,342**	1,97	1,59	0,82	4,57	4,55	4,61	4,56
μ (h^{-1})		0,48	0,81	0,7	0,56				
Δt (h)		1,43	0,85	0,98	1,23				

*DOmin, **DO max

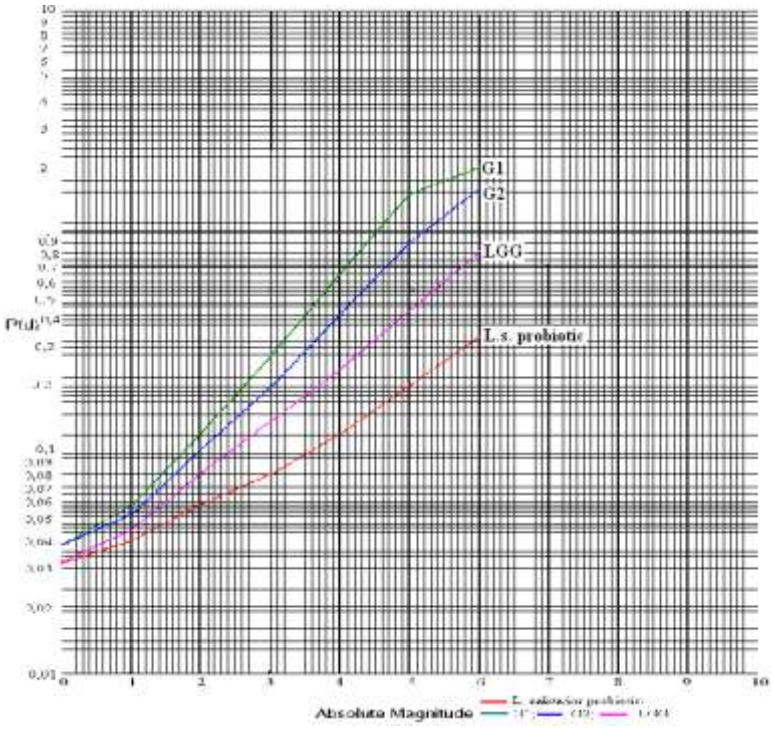

Fig. 1. Graphical representation of DO600 values at pH 4,5

The specific growth rate and generation time of the investigated strains at pH 7.0 are shown in table 2.

Also, at pH 7.0 *Lactobacillus salivarius* strains isolated from dental root canal G1 and G2 showed higher specific growth rate (1.26 and 0.92) compared with *Lactobacillus* probiotic strains (0.77 for *L. salivarius* probiotic and 0.69 for LGG). The *Lactobacillus* strains by dental origin had smaller generation time values (0.54h for G1 and 0.75h for G2) compared with the probiotic strains (0.89h for *L.salivarius* probiotic and 1.0h for LGG) (table 2).

Tabel 2. The DO600 values, the specific growth rate (μ) and generation time (Δt) at pH 7,0

		Valorile DO600				pH			
Moment	Time	*L.s.* probiotic	G1	G2	LGG	*L.s.* probiotic	G1	G2	LGG
T0	13:00	0,033	0,043	0,043	0,033*	7,24	7,14	7,2	7,15
T1	14:00	0,047	0,066*	0,061*	0,048	7,12	6.96	7,01	7,02
T2	15:00	0,072*	0,180	0,135	0,089	7,06	7,03	7,08	7,22
T3	16:00	0,143	0,82**	0,388**	0.151	7,04	6,97	7,03	7,19
T4	17:00	0,338**	2,21	1,36	0,263				
T5	18:00				0,524**				
μ (h^{-1})		0,77	1,26	0,92	0,69				
Δt (h)		0,89	0,54	0,75	1				

*DOmin, **DOmax

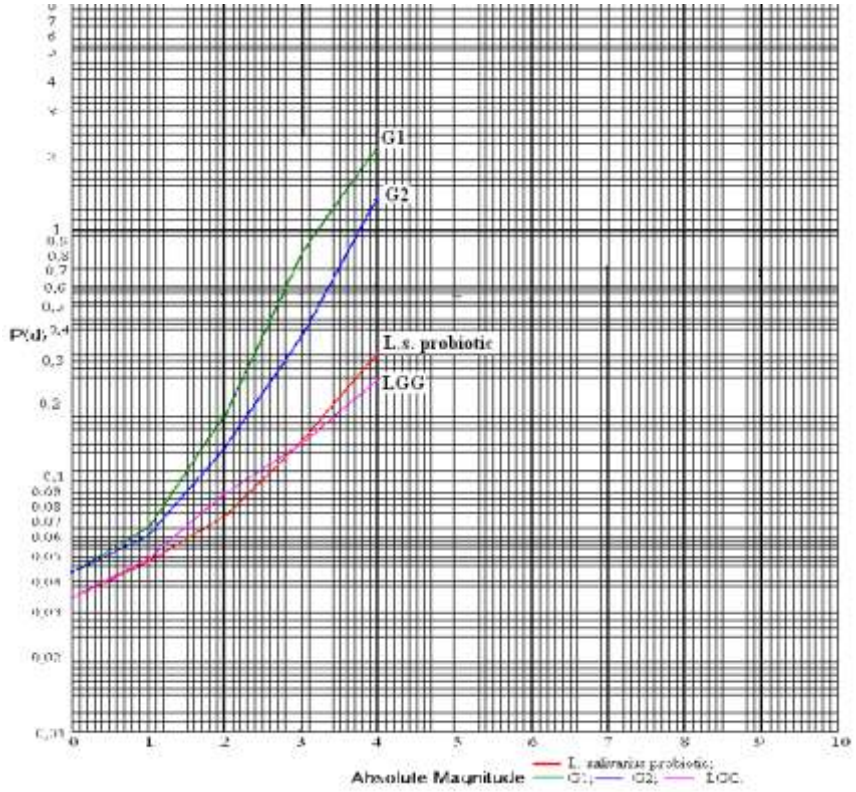

Fig. 2. Graphical representation of DO600 values at pH 7,0

Tabel 3. The values of specific growth rate μ (h^{-1}) and generation time at pH 4,5 and 7,0

	L. salivarius probiotic	G1	G2	LGG
pH 4,5				
Specific growth rate μ (h^{-1})	0,48	0,81	0,7	0.56
Generation time Δt (h)	1,43	0,85	0,98	1,23
pH 7.0				
Specific growth rate μ (h^{-1})	0,77	1,26	0,92	0,69
Generation time (h)	0,89	0,54	0,75	1

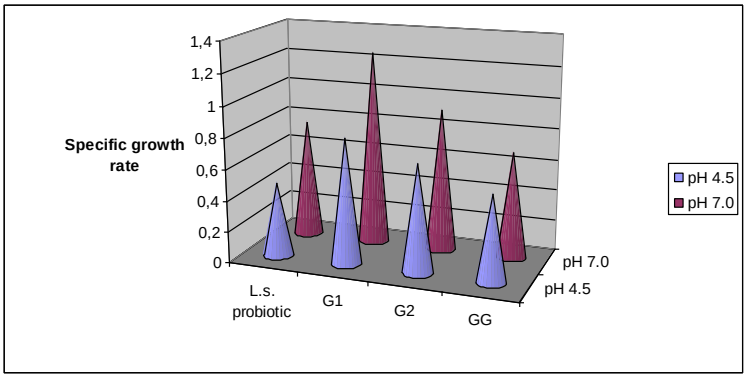

Fig. 3. The specific growth rate μ (h^{-1}) at pH 4.5 and 7.0

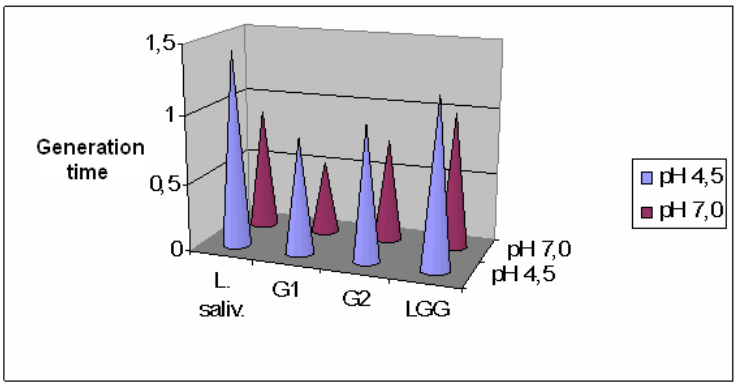

Fig. 4. The generation time values (h) at pH 4.5 and 7.0.

The values of specific growth rate of *Lactobacillus* strains with dental origin were higher than those of probiotic strains at both pH values. The values of generation time were smaller at *Lactobacillus salivarius* strains isolated from dental root canal than those of probiotic strains at both pH values (table 3 and fig.3).

All *Lactobacillus* strains showed smaller values of generation time at pH 7.0 (ranged between 0.54h and 1.0h and the average time was 0,795h) compared with those at pH 4.5 (ranged between 0.85h and 1.43h and the average time was 1,125h) (table 3 and fig.4).

Between the specific growth rate and the generation time is a high negatve correlation. The correlation Pearson factor r= -0,99. These data are correlated with those of Nezhad H.M, 2010 and Wijtzes T, 1995.

CONCLUSIONS

The next conclusions have been formulated:
Higher values of specific growth rate at 7.0 pH were registered for all *Lactobacillus* investigated strains compared with those at 4.5 pH.
The strains with dental origin showed biger specific growth rate values at both pH values compared with the probiotic *Lactobacillus* strains.
The values of generation time for all *Lactobacillus* strains were smaller at pH 7.0 (the average time was 0.795h) than those at pH 4.5 (the averahe time was 1.125h).
A negative correlation between specific growth rate and generation time was observated.

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