INFLUENCE OF PECTIN AND SUCROSE CONCENTRATIONS ON THE SURVIVAL OF *Lactobacillus rhamnosus* ATCC 7469 IN CAATINGA PASSION FRUIT SYMBIOTIC BEVERAGES DURING REFRIGERATED STORAGE

Roberta Maria Lins Mendes, Maryana Rogéria dos Santos and Ester Ribeiro*

*Federal University of Pernambuco, Antibiotics Department.  
*ester.ribeiro@ufpe.br

1. INTRODUCTION

Fruit juices are food matrices with potential use in formulating probiotic products of non-dairy origin (LILLO-PEREZ et al., 2021). Studies have shown that *Lactobacillus rhamnosus* ATCC 7469 can grow and maintain viability in beverages from different plant matrices, including passion fruit from Caatinga (PFC) (Passiflora cincinnata Mast) (FARIAS et al, 2016; SANTOS et al. 2017). It is a native fruit of the Brazilian semi-arid region, with a characteristic aroma and exotic flavor (MENDES et al., 2021). Its pulp can be used to manufacture jellies, jams and juice, and pectin, a soluble fiber with prebiotic action, which can be extracted from its peel (SANTOS et al., 2017). The synergistic potential between probiotics and prebiotics results in a symbiotic product that provides the consumer with superior beneficial effects when used alone (COSTA et al. 2020). Considering the need to formulate non-dairy probiotic foods using low-cost fruits that can be used in full, the objective of this work was to evaluate the survival of *Lactobacillus rhamnosus* ATCC 7469 in the formulation of symbiotic beverages with different concentrations of pectin and sucrose during a 28-day refrigerated storage period.

2. MATERIALS AND METHODS

Beverages were prepared using 50% V/V of the PFC pulp. Pectin was extracted from passion fruit peel flour, using 0.75M citric acid, 150 RPM stirring at 50°C (SANTOS et al., 2017). The pH was adjusted to 6.0 ± 0.2 with NaOH (2M), and then the beverages were pasteurized. A volume equivalent to 10% (V/V) of the inoculum in MRS medium (from Man, Rogosa, Sharpe) was transferred to the flasks containing the pasteurized beverages, which were placed in an oven at 37°C for 24 hours. After fermentation, sucrose and pectin were added according to the concentrations in the factorial design. A $2^2$ factorial design (concentrations of sucrose and pectin) was carried out with three replicates at the central point (CP) to determine the best survival conditions for the probiotic strain during the refrigerated storage (4°C). Four assays and the central point (PC) were designed according to the following conditions, based on the study by Santos et al. (2017): E1 - Sucrose 5% (m/V) and Pectin 5g/L; E2 - Sucrose 15% (m/V) and Pectin 5g/L; E3 - Sucrose 5% (m/V) and Pectin 20g/L; E4 - Sucrose 15% (m/V) and Pectin 20g/L; Central Point - Sucrose 10% (m/V) and Pectin 12.5g/L. Cell Viability was determined by plating method (Santos et al., 2017). The result was expressed in Colony Forming Units per milliliter (CFU/mL). Probiotic survival was calculated using viability values at the beginning and end of the storage (28 days).

3. RESULTS AND DISCUSSION

Table 1 presents the viability at the beginning and end of the storage and the survival of the probiotic for the planning trials. Except for the E1 trial, survivals ranged from 92.55 to 102.64%. The relative standard deviation was less than 5%. Therefore, these values can be considered constant, with an average of 98%. From the statistical analysis of the factorial design, the effect of varying the pectin concentration on the survival was not significant. However, the effect of sucrose was significant and when the sucrose concentration varies from the low level to the high level, the survival increases.
Despite using the lower level of sucrose in the E3 assay, survival was almost 100%. This is probably attributed to the pectin level being at the highest level because, despite the effect of this factor is not significant.

**Table 1:** Survival of *Lactobacillus rhamnosus* ATCC 7469 after 28 days of refrigerated storage

<table>
<thead>
<tr>
<th>ASSAY</th>
<th>INITIAL (Log CFU/mL)</th>
<th>FINAL (Log CFU/mL)</th>
<th>SURVIVAL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1 (S - 5% / P - 5g/L)</td>
<td>8,98</td>
<td>7,00</td>
<td>77,93</td>
</tr>
<tr>
<td>E2 (S - 15% / P - 5g/L)</td>
<td>7,33</td>
<td>7,39</td>
<td>100,85</td>
</tr>
<tr>
<td>E3 (S - 5% / P - 20g/L)</td>
<td>7,34</td>
<td>7,07</td>
<td>96,29</td>
</tr>
<tr>
<td>E4 (S - 15% / P - 20g/L)</td>
<td>7,41</td>
<td>6,86</td>
<td>92,55</td>
</tr>
<tr>
<td>CP (S - 10% / P – 12,5g/L)</td>
<td>7,56 (± 0,6)</td>
<td>7,76 (± 0,3)</td>
<td>102,64 (± 3,8)</td>
</tr>
</tbody>
</table>

S - Sucrose, P - Pectin, CP - Central Point

The highest survival values were obtained in the central point assays and in the E2 assay, that is, when the pectin concentration was low level. Only the E1 assay showed survival lower than 80%, and this can be attributed to both the lower levels of sucrose and pectin. The results of the CP condition indicates that there is probably an optimal point close to this region because the survival was the highest between the assays, and the levels of pectin and sucrose were intermediate. Besides, the linear model showed a lack of fit, which may indicate that a quadratic model would need to be adjusted. However, new assays with more levels should be performed to confirm this hypothesis.

4. CONCLUSIONS

Although the increase in sucrose concentration has a significant positive effect on survival, values close to 100% were obtained even with the sucrose concentration at the central point. Intermediate values indicate that it would not be necessary to use its highest sucrose level and, consequently increase the caloric value of the beverage. Concerning pectin, as its effect on survival was not significant, the response of this factor does not differ, provided that, when it is at the lowest level, the sucrose concentration is at the highest level. But in this case (E2), it would not be interesting, as the beverage would have a higher caloric content. Thus, it is possible to conclude that intermediate levels of both factors were better for survival.

5. REFERENCES


