



University of Zabol  
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Faculty of Veterinary Medicine  
Department of Food Hygiene

**Dissertation for obtaining a master's degree in food hygiene  
and quality control**

**The effect of pH, temperature and salt on the  
growth curve of *Bacillus cereus* in barley soup  
using Hurdel technology**

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## Abstract:

Today, due to the increase in people's awareness of the negative effects of heat on the ingredients of processed foods, the desire to use minimally processed foods that retain their aroma, flavor, texture, and nutritional value has increased. Hurdle technology is a control method to control and prevent the growth of bacteria in food. In this method, a combination of various factors such as heat, acidity, light, pressure, protective substances, antibiotics, etc. are used as control factors. The use of Hurdle technology due to the combination of different methods, while creating appropriate safety and shelf life along with maintaining the sensory and nutritional quality, can reduce the risks related to each method alone, in addition to improving efficiency. In general, this method increases the shelf life of food by affecting the growth curve of bacteria. The bacterial growth curve shows the changes in the number of bacteria in a growth medium over time. This curve can be used as a tool to predict the growth process of bacteria and determine the optimal conditions for its growth in different environments. For this purpose, in this study, the combined effect of various factors including pH (2.5, 4, 5.2, and 7), temperature (4, 15, 25, and 30 degrees Celsius), and salt (2, 6, 8, and 10% ), during 21 days, the growth curve of *Bacillus cereus* bacteria in prepared and packaged barley soup was investigated. For bacterial counting, surface culture (SPC) was used in the BHI agar medium. The independent and interactive effects of the studied factors on the logarithm of the number of bacteria were analyzed in the form of a three-factor and three-level factorial design, using the three-way variance method, and the obtained results showed that all three factors of temperature, pH, and salt improved. They significantly affect the growth of bacteria. Also, the interaction effects of temperature  $\times$  salt, temperature  $\times$  pH and salt  $\times$  pH were statistically significant ( $P < 0.05$ ).

**Keywords:** *Bacillus cereus*, growth curve, barley soup, Hurdle technology.