Insight Medical Publishing

JOURNAL OF FOOD SCIENCE AND TOXICOLOGY

Effect of different strains, inoculum size, temperature and incubation period on pH culture during VitAto (Ipomoea batatas L) fermentation

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Aim and Objective:

Vitato (Ipomoea batatas L) is one of the sweet potato varieties in Malaysia. These sweet potatoes are orange in colour, have high nutritional value in terms of vitamins, minerals, carbohydrates, crude fibre and low fat content. The purpose of this experiment was to study the effect of different strains, inoculum size, temperature and incubation period on pH culture when Amylomyces rouxii F0050 and Saccharomycopsis fibuligera Y0021 were used in VitAto fermentation.

Methods: Substrate preparation –

VitAto sweet potatoes were obtained from Bank Gen's research farm at MARDI Station, Kundang, Selangor, Malaysia. These sweet potatoes were first cleaned of impurities such as sand and soil, peeled, soaked and cut into cubes measuring 1 cm x 1 cm x 1 cm using a cutting machine (Hallde model RG 61, Sweden) before being used in fermentation studies (Smita et al. 2007). The diced sweet potatoes were weighed at 50 g and placed in a 250 mL flask. Flasks containing VitAto sweet potatoes were sterilized at 118°C for 20 min (Wang-Chen et al. 2012).

Microorganisms –

This research study involved two strains of microorganisms consisting of A. rouxii F0050 and S. fibuligera Y0021 obtained from the Collection of Functional Food Culture, Enzyme and Fermentation Technology Program, Food Science and Technology Research Centre, Institute Malaysian Agricultural Research and Development (MARDI), Serdang, Selangor, Malaysia.

Fermentation condition –

The solid-state fermentation of VitAto used three types of inoculum strain namely: (i) fungal inoculum (A. rouxii F0050), (ii) yeast (S. fibuligera Y0021) and (iii) a mixture of fungal and yeast strains (A. rouxii F0050 and S. fibuligera Y0021). The size of the inoculum also plays an important role in the fermentation of this solid phase. This study involved three different inoculum sizes namely 0.2%, 0.4% and 0.6%. There were three different incubation temperatures used in this solid phase fermentation study namely 27, 30 and 33°C. In addition, the effect of solid phase fermentation incubation period was also studied. Fermentation cultures were incubated for 72 hours. Sampling was done for each of the next 12 hours at 0, 12, 24, 36, 48, 60 and 72 hours.

pH analysis –

Sample pH measurement was performed by inserting 10 mL of fermented sample supernatant into a test tube. The pH sample was measured using a pH measuring instrument (Mettler Toledo model MP220, Switzerland) through the method of AOAC (2000). The pH analysis of these samples was performed in triplicate.

Results:

All cultures studied showed a decrease in their respective pH. The decrease in pH began to occur after 12 hours of fermentation was carried out on to all fungal (A. rouxii F0050), yeast (S. fibuligera Y0021) and mixtures of fungal and yeast cultures (A. rouxii F0050 and S. fibuligera Y0021). In addition, the pattern of pH decrease continued until the 36th hour and then began to flatten until 72 hours fermentation was carried out especially for K2 culture incubation temperature 30°C and inoculum percentage 0.4%; 4.61 ± 0.123), this was followed by K3, K1 (range pH around 4.627 ± 0.16 to 5.12 ± 0.125) KY1, KY2, KY3 (pH range around 4.677 ± 0.1 to 4.95 ± 0.131), Y1, Y2 and Y3 (pH range around 5.317 ± 0.049 to 5.937 ± 0.072) cultures. As the fermentation process progresses, acids will be produced and this indicates that there is an increase in the population of microorganisms in the culture as the fermentation period increases (Ajayi et al. 2016). According to Ainaa et al. (2016), pH also plays a role as one of the indicators for the growth of microorganisms.

Conclusions:

The use of A. rouxii F0050 culture strains was found to lower the pH of the fermentation culture higher than that of mixed cultures and yeast culture. As the fermentation process progressed, acid was produced and this indicated that there was an increase in the population of microorganisms in the culture as the fermentation period increased.