Development of a Quinoa-Based Fermentation Medium for Propagation of Lactobacillus Plantarum and Weissella Confusa in Opaque Beer Production

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Abstract

Product inconsistency of opaque beer has for long been a tenacious problem in the brewing industry since the current process relies on spontaneous lactic acid fermentation. In order to impede this challenge, there is a need to add lactic acid bacteria (LAB) starter cultures in opaque beer brewing to improve its organoleptic qualities. Ois study sought to develop a quinoa-based fermentation medium for propagation of Lactobacillus plantarum and Weissella confusa as potential starter cultures in opaque beer production. An evaluation of the stability and tolerance of the LAB under various stress conditions was also done. Fermentation wort from opaque beer brewing and di erent quinoa-based synthetic media with varying nutritional components was prepared for propagation of LAB. Physiochemical analyses which included pH, Brix value and total titratable acidity (TTA) of monocultured and cocultured synthetic media were measured. 0e measurements were done at 24 h time intervals ranging from 0 to 96 h. Tolerance studies which included the e ect of heat shock, cold shock, oxidative stress and osmotic pressure on the survival rate of LAB were conducted to determine the stability of LAB. MRS with L. plantarum monoculture (MRSp) had a notable change in pH from 4.5 to 3.6 after 24 h. 0e cocultured (M5p + w) synthetic media and cocultured MRS (MRSp + w) also exhibited change in pH from 4.3 to 3.2 and 4.3 to 3.3, respectively, after 72 h. Brix value in all media samples decreased after 24 h except for the uninoculated MRS sample (MRS C). Oe synthetic and coculture medium (M5p + w) exhibited an increase in TTA (0.79% (m/ v) lactic acid) within the Brst 24 h. Exposure to heat shock had a signiBcance e ect (p < 0.05) on the survival rate of L. plantarum and W. confusa. 0e W. confusa in synthetic media recorded a higher survival rate ($27 \pm 0.03\%$) upon exposure to heat shock than L. plantarum ($7 \pm 0.01\%$). In contrast, L. plantarum in MRS recorded a higher survival rate ($67 \pm 0.02\%$) upon exposure to cold shock and oxidative stress ($34 \pm 0.01\%$). Oestarter cultures tested survived upon exposure to the stress conditions, indicating their potential use in opaque beer production.

Keywords: Lactic acid bacteria; Medium development; Quinoa; Starter culture