

Effect of Yeast Species on Total Soluble Solids, Total Polyphenol Content and Fermentation Index during Simulation Study of Cocoa Fermentation

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Abstract

The polyphenols has potential of health beneficial and its changes in cocoa are related to fermentation index. However, relationship of yeast species to total soluble solids, total polyphenols and fermentation index changes during cocoa fermentation is still unclear. This study focused on effect of yeast as starter culture during cocoa fermentation towards those parameters. Sixteen species of yeast were used as starter cultures during simulation study of cacao fermentation in the laboratory. Study revealed that *Candida ethanolica* give the highest correlation with fermentation index whereas *Candida jaroonii* is the lowest correlation. None of the yeast species showed high correlation with total polyphenols content compared to the control. Conversely, all of the yeasts especially *Pichia kudriavzevii* showed higher correlation with total soluble solids compared to control. The study also exhibited that cacao simulation media method can be useful to predict yeast performance during cacao fermentation prior to field application.

Keywords: yeast species, total polyphenols content, fermentation index, sugar content of pulp, cacao simulation media

1. Introduction

Cacao is particularly rich in polyphenols and acts as one of the richest sources of antioxidants. Therefore, cocoa products such as chocolate can be a major source of dietary antioxidants and have protective effects against cardiovascular disease (Suzana & Emad, 2013). During cocoa fermentation, the colour of cocoa bean cotyledon changes from purple into brown colour (Lopez, 1986). Fresh cocoa beans have purple colour in the bean cotyledon. The purple colour is caused by anthocyanidin pigments, 3- β -D-galactosyl- and 3- α -L-arabinosyl-cyanidins. These pigments are hydrolysed by glycosidases during the cocoa fermentation, causing a paler purple colour in the cocoa bean. The glycosidases have not been characterized but maximum destruction of polyphenol pigments occur at 45 ° C in the pH of 3.8 to 4.5 (Biehl et al., 1989). Changes of colour in cocoa bean are commonly used to determine

flavour potential of cocoa beans and their suitability for chocolate processing. Furthermore, fermentation index and cut test are also based on the colour changes of cocoa cotyledons after cocoa fermentation is completed.

Polyphenols are stored in pigment cells or polyphenolic storage cells of the cotyledons. The polyphenolic storage cells in cocoa bean are white to deep purple in colour, depending on the amount of anthocyanins (a minor class of cocoa bean polyphenols) (Lopez, 1986; Camu et al., 2008). Polyphenolic storage cell in cocoa beans are made of 14-20% dry bean weight and contain a large vacuole filled with polyphenols and alkaloids which including caffeine (0.1-0.2%), theobromine (2.5-3.2%), and theophylline (Osman et al., 2004). The major polyphenolic compounds in cocoa seeds are catechins (3.0-6.0%), leucocyanidins (2.5%) and tannins (2.0-3.5%). The polyphenols have bitter, astringent flavours and antioxidant properties that help protect the cocoa seed from damage and disease (Kyi et al., 2005).

Cocoa beans have polyphenols and anthocyanin with flavan-3-ols and their derivatives in high concentration (Schwan & Wheals, 2004; Kyi et al., 2005). The concentration of polyphenols and anthocyanin can be influenced by a variety of biological and processing conditions of fresh cocoa beans until finished products where it might decrease from 100% to 10% in the final cocoa product throughout the different manufacturing processes such as fermentation, roasting and ditching (Gertner, 2004). In addition to that, the polyphenols content and profile in food can be influenced by factors such as environmental (sample origin, variety, degree of ripeness, climate and so on), food processing (heating and alkalisation) and food storage (refrigeration practice) (Rusconi & Conti, 2009). Genetics alone can cause 4-fold difference in polyphenolic content of fresh cocoa beans (Rusconi & Conti, 2009). Fermentation of cocoa beans is