

## **Effects of *Candida* sp. and *Blastobotrys* sp. starter on fermentation of cocoa (*Theobroma cacao* L.) beans and its antibacterial activity**

### **ABSTRACT**

The effects of *Candida* sp. and *Blastobotrys* sp. starters on fermentation of cocoa beans were studied to determine the potential antibacterial activity of its extracts against foodborne pathogens. The fermentations of cocoa beans using *Candida* sp. and *Blastobotrys* sp. were conducted for seven days. The observed parameters including pH and temperature monitoring during fermentation, detected active compounds, and invitro antibacterial activity against several foodborne pathogens at on sampling day 0, 3 and 7. Spontaneous fermentation (without starter culture added) was used as control. The pH during fermentation increased from pH 3.00 to 7.97, pH 3.00 to 7.68, and pH 3.00 to 7.54 for spontaneous, *Candida* sp. and *Blastobotrys* sp. fermentation respectively. The temperatures of fermentation ranged from 28oC to 33oC, 28oC to 32oC, and 28oC to 32oC for fermentation by spontaneous, *Candida* sp. and *Blastobotrys* sp., respectively. Gas Chromatography Mass Spectrometry (GC-MS) analyses showed several active compounds including caffeine, theobromine, gamma-tocopherol, stigmasterol and beta-sitosterols in all three fermentations. Caffeine content was the highest (74.59%) in control fermentation in earlier process. Theobromine content was higher for control fermentation compared to other *Candida* sp. and *Blastobotrys* sp. fermentation. Generally, gamma-tocopherol, stigmasterol and beta-sitosterols contents declined in the middle of the fermentation period but increased again towards the end. Fermented cocoa beans extract exhibited antibacterial activity against *Bacillus cereus*, *Bacillus subtilis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Salmonella enteritica*, and *Staphylococcus aureus*. However, the extracts did not show any antibacterial activity against *Listeria monocytogenes* and *Pseudomonas aeruginosa*. In summary, the addition of starter cultures namely *Candida* sp. and *Blastobotrys* sp. in fermentation of cocoa beans able to trigger off the active compounds and show potent antibacterial activity against several foodborne pathogens.

**Keyword:** *Blastobotrys* sp.; *Candida* sp.; *Theobroma cacao* L; Cocoa beans; Fermentation; Foodborne pathogens