

## THE EFFECT OF SYNBIOTIC *Streptococcus salivarius* K12 AND YACON (*Smallanthus sonchifolius*) ON *Candida albicans* BIOFILM FORMATION

**Nurul Alia Risma Rismayuddin<sup>1</sup>**, Munirah Mokhtar<sup>2</sup>, Mohd Hafiz Arzmi<sup>3</sup>

<sup>1</sup>Department of Basic Medical Sciences, Kulliyyah of Nursing, International Islamic University Malaysia, Kuantan Campus, Pahang, Malaysia.

<sup>2</sup>Department of Biomedical Sciences, Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Kuantan Campus, Pahang, Malaysia.

<sup>3</sup>Department of Fundamental Dental and Medical Sciences, Kulliyyah of Dentistry, International Islamic University Malaysia, Kuantan Campus, Pahang, Malaysia.

\*Corresponding author: [hafizarzmi@iium.edu.my](mailto:hafizarzmi@iium.edu.my)

### ABSTRACT

*Candida albicans* is an opportunistic fungus that is known for its ability to form biofilms. *Streptococcus salivarius* K12 is an oral probiotic while yacon is a source of prebiotic. The objective of this study is to investigate the effect of *S. salivarius* K12 and yacon aqueous extract (synbiotic) on *C. albicans* with the hypothesis that *S. salivarius* K12 and yacon inhibit *C. albicans* biofilm formation. To develop mono-species biofilm, *C. albicans* (ATCC MYA-4901 and cancer isolates, ALC2 and ALC3 strains) and *S. salivarius* K12 were standardised to  $10^5$  cells and  $10^6$  cells, respectively and grown in 96-well plate in nutrient broth (NB) or RPMI at 37 °C for 72 h. Polymicrobial biofilms were developed by inoculating both microorganisms in the same well with similar cell number as in mono-species. To determine the effect of the synbiotic, a similar protocol was repeated by mixing with 800 mg mL<sup>-1</sup> of yacon extract and incubated at 37 °C for 72 h. The medium was replenished at every 24 h, aseptically. Finally, the biofilms were assessed using the crystal violet assay, and the optical density was measured at OD<sub>620nm</sub>. The combination of both prebiotic and probiotic has effectively reduced all the *C. albicans* strain (MYA-4901, ALC2 and ALC3) in both NB and RPMI. All *C. albicans* strain when grown in polymicrobial with *S. salivarius* K12 in NB that is predominated by yeast-form *C. albicans*, exhibited decreased biofilms by 51.34±11.6, 8.20±43.9 and 11.3±82.7%, respectively when compared to the expected biofilms. Meanwhile in RPMI, which *C. albicans* strain ATCC MYA-4901, ALC2 and ALC3 were predominated by hyphal-form showed decreased biofilms by 43.3±12.1%, 39.4±15.7% and 25.7±56.8%, respectively when compared to the expected biofilms. *S. salivarius* K12 and yacon extract synbiotic inhibits biofilm formation of *C. albicans* yeast and hyphal forms thus supported the hypothesis of the present study.

**Keywords:** *Candida albicans*, *S. salivarius* K12, oral cancer, probiotic, biofilm

**Acknowledgement:** The author would like to acknowledge International Islamic University Malaysia (IIUM) and Ministry of Education for the funding.