Biochemical and molecular activities of *Candida albicans* treated with medicinal plants

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Abstract

This study aimed to compare the antimicrobial activity of *Phoenix dactylifera* and *Ziziphus spina-christi* ethanol extracts in terms of their biochemical and molecular effects on *Candida albicans*. These effects were evaluated with regard to intracellular sterols, permeability of the cell membranes, and morphological characteristics determined by scanning electron microscopy (SEM). Energy-dispersive x-ray spectroscopy (EDAX) analyses were also conducted in addition to assessment of the changes in *TEF1*: *QRTTEF1*, *CaERG1*: *ERG1*, *CdERG12*: *CdERG1*, and *ERG25*: *ERG25* genes. The results showed that sterols increased by 1.096% and 0.588% with treatment by *P. dactylifera* and *Z. spina-christi*, respectively, compared to the untreated cells. The ethanol extracts were effective on *C. albicans* permeability by reducing the cell membranes permeability. The SEM and EDAX analyses showed cell cavities and shrinkage of the cell wall. In addition, the quantity of cells was decreased to a few abnormal cells compared to the untreated cells. Yttrium was detected in the cells treated with *Z. spina-christi*, and high levels of osmium were detected in the cells treated with *P. dactylifera*. The gene sequence showed gaps and mismatches on *ERG1F*, *ERG1R*, *ERG12F*, *ERG12R*, and *ERG25F* genes after treatment with *P. dactylifera* and *Z. spina-christi* compared to untreated cells. The results were highly significant ($p \leq 0.01$), and we concluded that ethanol extracts of *P. dactylifera* and *Z. spina-christi* have an antimicrobial effect on several targets in yeast cells.