

The killer effect of *Saccharomyces cerevisiae*, *Saccharomyces bayanus* and *Hansenula anomala* on *Candida albicans*

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Abstract— *C. albicans* is a commensal yeast which asymptotically colonizes mucosal surfaces; however, any disruption in the host environment or under conditions of immune dysfunction, *C. albicans* can proliferate and invade virtually any site in the host. *S. cerevisiae* is found in nature associated with man and, more rarely, found on the skins of grapes. *S. bayanus* can be found in locations remote from humans, which is not in common with *S. cerevisiae*. *H. anomala* ecological traits include: fermentation contaminant, soil, grain, ensilage, water, plants (especially fruits and fermenting matter), sewage, warm blooded animals.

The scope of this study was to see if *S. cerevisiae*, *S. bayanus*, and *H. anomala* have any killer effect on *C. albicans* strains. We have realized it at Phytotoxin Laboratory, Department of Plant Protection, Durrës, Albania. We have analyzed 20 positive samples of *C. albicans*, isolated in the Microbiological Laboratory of Durrës, Albania.

It has resulted that *Hansenula anomala* has the greatest killer effect of these three yeasts on *Candida albicans* strains, while the effect of *Saccharomyces cerevisiae* and *Saccharomyces bayanus* is almost rough, with minor differences between *C. albicans* strains.

Keywords— *Candida albicans*, *Saccharomyces cerevisiae*, *Saccharomyces bayanus*, *Hansenula anomala*, killer effect.

I. INTRODUCTION

Candida albicans is the most common human fungal pathogen causing diseases ranging from mucosal to systemic infections. As a commensal, *C. albicans* asymptotically colonizes mucosal surfaces; however, any disruption in the host environment or under conditions of immune dysfunction, *C. albicans* can proliferate and invade

virtually any site in the host. The ability of this highly adaptable fungal species to transition from commensal to pathogen is due to a repertoire of virulence factors (Christina Tsui et al., 2016).

Saccharomyces cerevisiae belongs to the phylum Ascomycota and can be reproduced in these ways: Spore: Spherical often in groups of four; Zygote: dumbbell-shaped; Ascus: group of four spores arranged in a tetrad conformation *S. cerevisiae* is found in nature associated with man and, more rarely, found on the skins of grapes (H. Konig et al., 2009).

Saccharomyces bayanus belongs to the phylum Ascomycota. *S. bayanus* reproduction has three possible ways: Spore: spheroidal and smooth; Zygote: diploid vegetative cell; Ascus: typically four spores per ascus, ascus persistent *S. bayanus* can be found in locations remote from humans, which is not in common with *S. cerevisiae* (Naumov et al., 2001).

Hansenula anomala is an Ascomycete fungus. *H. anomala* can be in two different forms: cells, spheroidal to elongate (1.9-4.1)X(2.1-6.1)µm singly, pairs, small clusters; ovoid, ellipsoidal, or cylindrical, multilateral budding or pseudohyphae form as chains of ovoid or cylindrical cells. *H. anomala* ecological traits include: fermentation contaminant, soil, grain, ensilage, water, plants (especially fruits and fermenting matter), sewage, warm blooded animals (Kurtzman 1998).

II. MATERIALS AND METHODS

We have realized this study at Phytotoxin Laboratory, Department of Plant Protection, Durrës, Albania. We have study the effect of the three supposed "killer" yeasts: *Saccharomyces cerevisiae*, *Saccharomyces bayanus*, *Hansenula anomala*, on *C. albicans* strains.

20 isolates of *C. albicans*, isolated in the Microbiological Laboratory of Durrës, Albania, have been preserved in SDA medium in a professional refrigerator at -20°C. To “refresh” the isolates we have plate the samples in YEPD fresh medium for 48 hours.

The same steps were taken with *Saccharomyces cerevisiae*, *Saccharomyces bayanus*, *Hansenula anomala*. We have taken *S. bayanus* and *H. anomala* in the Biotechnology Laboratory, Biotechnology Faculty, Tirana, Albania, but to take the isolated colonies we plated them in solid YEPD medium.

Each isolate of *C. albicans* was then incubated in 10 ml of liquid YEPD medium, for 18 hours in 25 °C in a rotary shaker (120 rpm). 1 ml of this culture was diluted in 10 ml fresh liquid YEPD medium. 1 ml of the diluted culture has been mixed with 20 ml fresh solid YEPD medium and then plated in Petri dishes, to get an Agar-*C. albicans* medium. In this medium we have plated *S. cerevisiae*, *S. bayanus* dhe *H. anomala* and we have incubated them in 25°C, for 72 hours.

For compare propose, we have deluted the 48 hours culture of *C. albicans* in 10 ml distilled water. 1 ml of this suspension was mixed with 20 ml fresh solid YEPD medium and then plated in Petri dishes, to get an Agar-*C. albicans* medium. Then we have incubated the dishes in 25°C for 72 hours.

III. RESULTS AND DISCUSSION

We have determined the effect of the three “killer” yeasts by counting the colonies on each *C. albicans* strains (C1A-C20A). In the case of positive control, since the number of *C. albicans* colonies was very large and evenly spread throughout the plate, we first made the division of the plate into 8 equal parts, we counted the colonies in one of them and we multiplied by 8. After the effect of the “killer” yeasts, counting the remaining *C. albicans* colonies was very easy.

The results are shown in table 1.1

Table.1.1: “Killer” yeasts effects on *C.albicans* strains

	<i>S. cerevisiae</i>	<i>S. bayanus</i>	<i>H. anomala</i>
C1A	90%	10%	70%
C2A	15%	80%	85%
C3A	25%	15%	45%
C4A	35%	10%	75%
C5A	30%	5%	45%
C6A	15%	30%	40%
C7A	10%	30%	55%
C8A	5%	10%	30%
C9A	10%	10%	30%
C10A	5%	5%	55%
C11A	80%	20%	80%
C12A	10%	70%	80%
C13A	30%	20%	50%
C14A	30%	10%	70%
C15A	20%	10%	40%
C16A	20%	40%	50%
C17A	20%	40%	60%
C18A	20%	20%	40%
C19A	20%	20%	40%
C20A	10%	15%	70%

Therefore, we can say that *Hansenula anomala* has the greatest killer effect of these three yeasts on *Candida albicans* strains, while the effect of *Saccharomyces cerevisiae* and *Saccharomyces bayanus* is almost rough, with minor differences between *C. albicans* strains.

Characteristic of *H. anomala* on *C. albicans* strains was that this yeast clouded the medium, while *S. cerevisiae* clarified it.

The killer effect of *S. cerevisiae*, *S. bayanus* dhe *H. anomala* on *C. albicans* strains are shown in Figure 1.1.

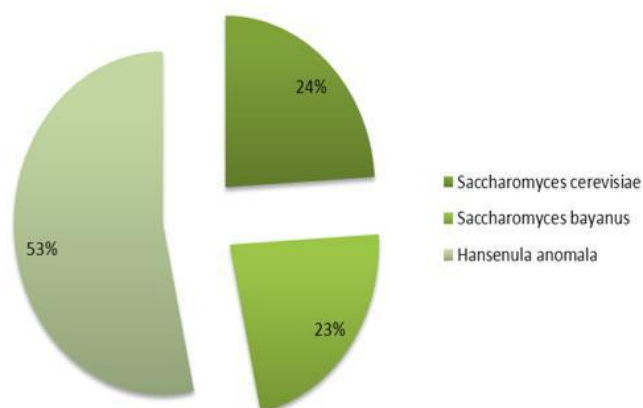


Fig.1.1: The killer effect of *S. cerevisiae*, *S. bayanus* dhe *H. anomala* on *C. albicans* strains

We have compared our results with a similar study of Polonelli et al., 1983. Even in their study, *C. albicans* strains have resulted sensitive to the killer effect of yeasts. The killer effect of *Hansenula anomala* on *C. albicans* strains in their study has resulted about 72%, but with difference between the type of *C. albicans* strains.

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