

Study of the antagonistic activity of yeasts isolated from fruits belonging to Rosaceae family against Galactomyces geotrichum



Giseli Cristina Da Costa Arruda<sup>b</sup>, Andrea Pomázi, Mónika Kovács

Department of Food Microbiology, Hygiene and Safety, Hungarian University of Agriculture and Life Sciences, H-1118 Budapest, Hungary

<sup>b</sup>Corresponding author e-mail: da.costa.arruda.giseli.cristina@phd.uni-mate.hu

# Introduction

Postharvest losses of fruits can be quite significant if handling, processing, and storage conditions are not optimal [1]. The principal method of controlling postharvest diseases is to use synthetic chemical fungicides [2]. However, synthetic pesticides are being restricted because of concerns regarding their

# Galactomyces geotrichum

- Found in different environments as soil, plants, fruits, insects, mammals, and it is a natural of dairy products [6].
- Non-Saccharomyces yeast able to produce a strong fruity aroma in in wine, beer and cider fermentations [7].
- Responsible for flavor formation and for proteolysis in the Slovakian bryndza cheese [8]
- G. geotrichum is able to biodegrade harmful

### Results

- 5 strains from *Rosacea* family successfully inhibited the growth of *G. Geotrichum*:
- 2svc 1.1; 3svc 2. 1b; 2.16vc.1.1re; BB 3.1p; BB *2.1p* (Fig. 4)



potential impact on human health and environment [3]. Biocontrol is one of the potential alternatives to the use of chemical pesticides [3]. Yeasts are naturally present on fruit surfaces, and have been especially emphasized regarding their role as biocontrol agents [4].

# Purpose

- To investigate the biodiversity of important yeasts to the food industry;
- To study the antagonism mechanism of yeasts against other yeasts, molds and bacteria;
- To understand the association among those  $\bullet$ organisms correlated to general public health and food safety.

## **Rosaceae** family

The plant family Rosaceae consists of over 100

compounds, which could be used to improve the quality of the environment [8].

Materials & Methods

The yeasts were isolated from the listed fruits on

Further they were cultivated on RBC agar medium

and on YEPD agar medium. Incubation took place

For the screening and identification of antagonism

activity, the Contact Method was used. The

concentration of suspension of G. geotrichum strain

was adjusted to 10<sup>6</sup> CFU/mL and spread on YEPD

medium. The yeast strains examined were

inoculated in spots on the surface of the plates (Fig.

east Strains

**RBC** medium

selective media.

for 3 days at 25 °C.

ruits Collectior

September/20

21 to

Figure 4. Antagonistic yeast strains: 2svc 1.1; 3svc 2. 1b; 2.16vc.1.1re; BB 3.1p; BB 2.1p

- In total, 129 yeast strains were obtained.
- 53 yeast strains from the *Rosaceae* family fruits.
- Screening for antagonism capability resulted on 5 yeast strains belonging to Rosaceae family capable of inhibiting the growth of G. *geotrichum* (Fig. 5: a, b, c).







genera and 3,000 species that include many important fruit, nut, ornamental, and wood crops [5]. In this study 5 different species were used:

Medlar (Mespilus germanica), Dog-rose (Rosa canina), Quince (Cydonia oblonga), Sloe Fruit (Prunus spinosa), Crab Apple (Malus sylvestris), and Golden Apple (*Malus domestica*) (Fig. 1: a, b, c, d, e, f).









agonistic

Concentration c

**Figure 2**. Yeast strains isolation and Antagonism mechanism against *G. Geotrichum*.

Figure 5. Antagonistic activity of strains against G. geotrichum growth: a) BB 2.1p; b) BB 3.1p & 2.16vc.1.1re; c) 2svc 1.1 & 3svc

# Discussion

This preliminary observation of antagonism ability of our isolated strains is an interesting finding due to its importance economically and to food quality, improving the food safety and sensory qualities of beverage processes, as those yeasts can act as biocontrol pathogenic agents against microorganisms that lead to a reduction in the quality of fruits. Equal importance is given to public health, as alternatives to the use of chemical pesticides.

## Conclusion

Further investigation is necessary in order to define the exact mechanisms of antagonism. Other parts of the plants will also be isolated in order to obtain new yeast strains. To test the activity of the yeast strains against other microorganisms is part of a near future investigation.

Results

15 strains cultivated on YEPD medium to be found antagonists. From Rosacea family, the strains are from dog-rose and sloe fruits (Fig. 3).



Figure 1. Rosacea fruits utilized in the study in order to isolate the yeast strains.

Figure 3. Antagonism strains isolated from Rosacea fruits and others.

### References

- 1. Elik, Aysel, Derya Kocak Yanik, Yildiray Istanbullu, Nurcan Aysar Guzelsoy, Arzu Yavuz, and Fahrettin Gogus. "Strategies to reduce postharvest losses for fruits and vegetables." *Strategies* 5, no. 3 (2019): 29-39.
- 2. Mari, Marta, Alessandra Di Francesco, and Paolo Bertolini. "Control of fruit postharvest diseases: old issues and innovative approaches." Stewart Postharvest Review 10, no. 1 (2014): 1-4.
- 3. Thomas, Matthew Brian, and A. J. Willis. "Biocontrol—risky but necessary?." Trends in ecology & evolution 13, no. 8 (1998): 325-329.
- 4. Assaf, LA Rodriguez, L. P. Pedrozo, M. C. Nally, V. M. Pesce, M. E. Toro, LI Castellanos de Figueroa, and F. Vazquez. "Use of yeasts from different environments for the control of Penicillium expansum on table grapes at storage temperature." International Journal of Food Microbiology 320 (2020): 108520.
- 5. Shulaev, Vladimir, Schuyler S. Korban, Bryon Sosinski, Albert G. Abbott, Herb S. Aldwinckle, Kevin M. Folta, Amy Jezzoni et al. "Multiple models for Rosaceae genomics." *Plant physiology* 147, no. 3 (2008): 985-1003.
- 6. Grygier, Anna, Kamila Myszka, Wojciech Juzwa, Wojciech Białas, and Magdalena Rudzińska. "Galactomyces geotrichum mold isolated from a traditional fried cottage cheese produced omega-3 fatty acids." International journal of food microbiology 319 (2020): 108503.
- 7. Gutiérrez, Alicia, Teun Boekhout, Zoran Gojkovic, and Michael Katz. "Evaluation of non-Saccharomyces yeasts in the fermentation of wine, beer and cider for the development of new beverages." Journal of the Institute of Brewing 124, no. 4 (2018): 389-402.
- 8. Grygier, Anna, Kamila Myszka, and Magdalena Rudzińska. "Galactomyces geotrichum-molds from dairy products with high biotechnological potential." Acta scientiarum polonorum Technologia alimentaria 16, no. 1 (2017): 5-16

### Acknowledgements

- 1. Hungarian University of Agriculture and Life Sciences' Doctoral School of Food Science
- Stipendium Hungaricum Scholarship Program
- 3. Tempus Public Foundation