

GROWTH DYNAMICS OF MICROORGANISMS IN RAINBOW TROUT MARINATED WITH FRUIT AND BERRY POMACES

Mati Roasto¹, Mihkel Mäesaar¹, Dea Anton¹, Reelika Rätsep², Terje Elias¹, Kadri Meremäe¹

¹Chair of Veterinary Biomedicine and Food Hygiene, Estonian University of Life Sciences, Fr. R. Kreutzwaldi 56/3, 51006 Tartu, Estonia

²Polli Horticultural Research Centre, Chair of Horticulture, Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Uus 2, 69108 Polli, Estonia

- In recent years, there has been an increasing trend in food production to use various plant-origin materials including fruit, and berry pomaces, a by-products of juice production, in the composition of food of animal origin [1, 2].
- This is mainly because of potential health benefits of plant derived bioactive components to human health [3].
- Also, it is in a good agreement with the principles of the circular bioeconomy. The use of berry pomaces reduce the food waste and provides added value to the final products [4].

AIM

- The aim of the present study was to evaluate the effect of apple, black currant, rhubarb and tomato pomace aqueous extracts containing marinades on the growth dynamics of microorganisms in raw rainbow trout within the determined study period (durability study).



FISH

- Fresh rainbow trout (*Oncorhynchus mykiss*) fillets were purchased from a local fish farm.



CONCLUSION

- The use of apple, black currant, rhubarb and tomato pomaces in marinades can ensure a **sufficiently long** and **microbiologically safe shelf-life** for the marinated raw rainbow trout products.



PLANT MATERIAL (POMACES)

The pomaces were obtained after juicing of the apples (*Malus domestica* Borkh.), black currants (*Ribes nigrum* L.), rhubarbs (*Rheum rhaponticum* L.) and tomatoes (*Lycopersicon esculentum* Mill.).

MARINADES

- Aqueous pomace extracts were prepared in a ratio of 1:10 (w/v), calculated for a solids content of 10%.
- The pomace extracts were pasteurized at 80 °C for 20 minutes, sealed airtight in glass bottles and cooled.
- Finally for each pomace extract the 3% sugar, 3% salt, 1% acetic acid and 0.25% citric acid were added to obtain the marinade.

ANALYSES

- Enumeration of aerobic mesophilic microorganisms, yeasts and moulds, presumptive *Pseudomonas* spp., and *Listeria monocytogenes* was performed according to the ISO standard methods.
- The challenge test in accordance with the technical guidance document (version 4) of the European Union Reference Laboratory for *L. monocytogenes* was carried out to determine the growth potential (δ) of *L. monocytogenes* in marinated fish samples.

Table 1. *L. monocytogenes* growth potential dynamics between tested marinated samples on different storage days.

| Marinating solution | Storage day* | | | | |
|---------------------|--------------|--------------|--------------|--------------|--------------|
| | 1 | 4 | 8 | 11 | 15 |
| Control | 2.48 | -0.405 | -0.194 | -0.053 | 0.169 |
| APP | 2.43 | 0.293 | -0.201 | -0.120 | -0.352 |
| BCP | 2.32 | -0.419 | 0.030 | 0.321 | -1.021 |
| RHP | 2.46 | 0.464 | 0.015 | -0.341 | -0.143 |
| TOP | 2.37 | 0.179 | 0.209 | 0.052 | 0.113 |

*The first storage day is given in log₁₀ cfu/g of *L. monocytogenes* and the other storage days are given as a relative change from day one.

The overall growth potential of the challenge test according to the European Reference Laboratory for *L. monocytogenes* method is given in bold.

Abbreviations: APP, apple pomace; BCP, black currant pomace; RHP, rhubarb pomace; TOP, tomato pomace

- In all samples, there was a decrease in the number of *Pseudomonas* spp. from 3.42 log₁₀ cfu/g to 1.00 log₁₀ cfu/g.
- The growth potential of *L. monocytogenes* was lower than 0.5 log₁₀ cfu/g in all tested samples during the 15-day durability period.
- Comparing the results of initial and final numbers of *L. monocytogenes*, more than 2 log₁₀ cfu/g decrease in the average counts of the pathogen was determined in the black currant pomace, followed by the apple pomace and rhubarb pomace fish samples.
- Compared to the control, the lowest numbers of *L. monocytogenes* were observed in the black currant pomace containing marinated fish samples.

1. Koskar, et al. 2022. Appl. Sci.,12, 11292.

2. Kerner et al. 2023. Meat Sci., 200, 109160

3. Samtiya et al. 2022. Foods, 10, 839

4. Liu et al. 2021. Bioresour. Technol., 332, 125181