

EURO FOOD CHEM XII

STRATEGIES FOR SAFE FOOD

**ANALYTICAL, INDUSTRIAL AND LEGAL ASPECTS:
CHALLENGES IN ORGANISATION AND COMMUNICATION**

**Congrescentrum Oud Sint-Jan, Brugge, Belgium
24 - 26 September 2003**



KVCV Koninklijke Vlaamse Chemische Vereniging

FECS event 279

Control of Superficial Moulds of Cheeses with Propolis

G. Zeppa and P. Dolci

Università degli Studi di Torino, Dipartimento di Valorizzazione e Protezione delle Risorse agroforestali, Sezione Microbiologia e Industrie agrarie, Via L. da Vinci 44, 10095 Grugliasco (TO), Italy.

Key words

Propolis; Cheese; Mould

SUMMARY

In the production of many cheeses control of the superficial moulds is one of the main problems that the cheesemaker must resolve because ultraviolet radiation or paraffin are not always useable and antifungal products as pimarinic and sorbic acid are not devoid of hygienic and sanitary contraindications. The research of an alternative product for controlling the superficial moulds of short and medium ripening cheeses addressed our interest to propolis, a product widely known for its biological activities. The rind treatment with a hydroalcoholic solution of propolis caused a slight fungus growth already at $1.5 \text{ g}\cdot\text{L}^{-1}$. With high concentrations the fungus growth is slight or absent. The propolis treatment produces no chemical or texture or sensory modification of the cheeses also for products with a short ripening time. The treatment is inexpensive and time saving if the wheels are directly immersed, like for salting, in the propolis solution. With propolis there is also a reduction of labour and weight loss for superficial cleaning before marketing and it is possible to use, if necessary, high environmental humidity without a corresponding increase of the superficial moulds.

INTRODUCTION

In the production of many cheeses the superficial moulds control is one of the main problems that the cheesemaker must resolve. The *Mucor* spp. is particularly complex to control. This fungus develops a thick superficial felt that hinders the correct formation of the rind and can, if touched, spot the rind. In order to control the growth of these fungi, antifungal products as pimarinic and sorbic acid are often used; however, even if admitted, they are not devoid of hygienic and sanitary contraindications: for example it has been demonstrated that some antifungal products are able to penetrate and spread through the rind [1]. During the search for an effective technique for superficial mould control our attention was directed to propolis, a complex mixture of resinous substances harvested by the honey-bees from the barks and the buds of various trees and known for antibacterial properties [2-3-4]. The aim of this work was to verify if the propolis can be used also for controlling superficial moulds of the cheese without producing chemical, sensory or texture modifications of the treated products.

EXPERIMENTAL

Six tests were made (Table 1). Three were done by an artisan cheesemaker with short and medium ripening cheeses from raw milk (1A-1B-1C) and three by a dairy cheesemaker with medium ripening cheeses from pasteurized milk (2A-2B-2C). Cheeses with at least 10 days of ripening and after two or three days from the salting were used. Each treatment was done in triplicate with cheeses of the same production lot.

The propolis solutions were made immediately before use by dissolving the propolis in 20 ml. of absolute ethanol and diluted to 1000 mL with deionized water [5].

Table 1. Experimental plan.

Test	Cheese	Treatment
1A	Toma piemontese POD (raw cow milk, bovine rennet, not cooked curd, 60 days of ripening)	- Not treated
		- Hydro-alcoholic solution (2%)
		- Propolis (1.5 g·L ⁻¹)
		- Propolis (6 g·L ⁻¹)
1B	Toma piemontese POD (raw cow milk, bovine rennet, not cooked curd, 60 days of ripening)	- Propolis (12 g·L ⁻¹)
		- Not treated
		- Hydro-alcoholic solution (2%)
		- Propolis (1.5 g·L ⁻¹)
1C	Short ripened cheese (raw cow milk, acid-precipitated curd)	- Propolis (6 g·L ⁻¹)
		- Hydro-alcoholic solution (2%)
		- Not treated
2A	Toma piemontese POD (pasteurized cow milk, bovine rennet, not cooked curd, 60 days of ripening)	- Propolis (1.5 g·L ⁻¹)
		- Propolis (6 g·L ⁻¹)
		- Propolis (12 g·L ⁻¹)
		- Not treated
2B	Bra tenero POD (pasteurized cow milk, bovine rennet, not cooked curd, 60 days of ripening)	- Hydro-alcoholic solution (2%)
		- Propolis (1.5 g·L ⁻¹)
		- Propolis (6 g·L ⁻¹)
		- Propolis (12 g·L ⁻¹)
2C	Toma piemontese POD (pasteurized cow milk, bovine rennet, not cooked curd, 60 days of ripening)	- Hydro-alcoholic solution (2%)
		- Propolis (3 g·L ⁻¹)
		- Not treated

For each test three untreated cheeses and other three treated with a 2% hydro-alcoholic solution were prepared. Propolis used in the research was produced in Piedmont (North West Italy). The cheese treatments were done by washing the whole cheese with a drenched sponge taking care to replace the sponge between treatments. The wheels were placed in ripening room with about 10°C temperature and 95% humidity. At the end of the ripening in the cheeses it has been determined dry matter, fats, proteins, soluble nitrogen, pH according to Italian Official Methods for cheese analysis. A paired difference test (ISO 5495) was performed between the untreated and the treated cheeses with nine trained assessors.

RESULTS AND DISCUSSION

The propolis effect on the superficial moulds growth for the Toma Piemontese POD produced by an artisan cheesemaker from raw milk (1A) was examined, as provided by Italian law, after 60 days of ripening.

The rind of the untreated cheeses and of those treated with the hydro-alcoholic solution showed a diffused growth of fungus particularly of the *Mucor* spp. and evident grey dark spots (Fig. 1a-1b). On the contrary the treated cheese wholes showed a slight (1.5 g·L⁻¹) (Fig. 1c) or absent (6 g·L⁻¹ and 12 g·L⁻¹) (Fig. 1d-1e) fungus growth and the rinds are regular with a white colour with yellow hue.

The chemical composition of treated and untreated cheeses was not statistically different.

The curd of the treated cheeses was regular and no statistical difference of flavour, odour or aroma due to the propolis treatment was found. Nor were there any anomalous odours in the rind.

Similar results were obtained also in the second test (IB).

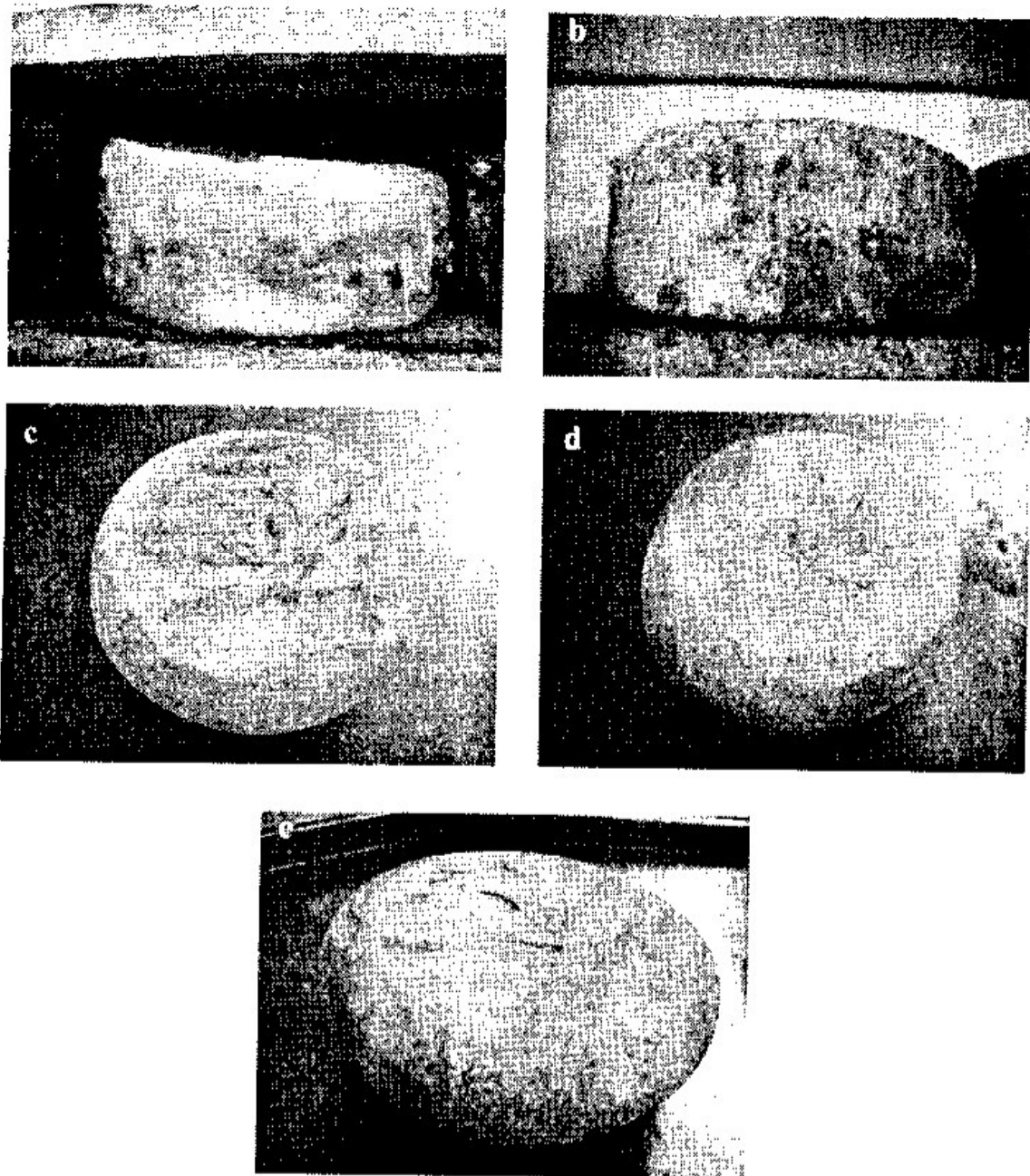


Figure 1. Test 1A: rind details of not treated cheese (a), of cheese treated with hydro-alcoholic solution (b), of cheese treated with propolis at 1.5 g/L (c), of cheese treated with propolis at 6 g/L (d) and cheese treated with propolis at 12 g/L (e).

After 60 days of ripening the test whole and those treated with the hydro-alcoholic solution showed a wide growth of *Penicillium* spp. while for those treated with propolis also at low concentration, the fungus growth was almost absent.

Also for the short ripening cheeses (20-25 days) (1C) the superficial moulds growth was entirely inhibited by the propolis treatment. However for this cheese the appearance on the cheese rind of light pale yellow colour was observed. This then is the maximum concentration useable.

Like for the Toma Piemontese POD also in this case the paired difference test has not show a variation in the treated cheeses texture or in the odour or in the taste. Also the rind did not show any odour or aroma due to the propolis treatment.

The experiments with the Toma Piemontese POD (2A-2C) and the Bra tenero POD (2B) produced in the dairy from pasteurized milk has given results similar to those obtained by artisan cheesemakers.

After 60 days of ripening a superficial growth of fungi such as *Mucor* spp. and *Penicillium* spp. was observed on both the rinds of the untreated and the cheeses treated only with the hydro-alcoholic solution. The same fungi were present on the rinds of the treated cheeses, but their diffusion was very slight. In this case a relationship between the fungus diffusion and the used propolis concentration was not observed.

For the 2C test the wheels were placed in a ripening room with 100% humidity instead of 95% and on the shelf with others cheeses with a wide diffusion of superficial moulds. After 60 days of ripening the whole cheese treated with propolis showed a small fungus development, while those not treated are almost completely covered preverantly by *Mucor* spp., *Aspergillus* spp. and *Penicillium* spp. moulds. These products then required an accurate superficial cleaning before marketing.

CONCLUSIONS

Propolis has confirmed its antifungal activity also for the control of the superficial moulds of the cheeses. The products treated with propolis showed superficial mould growth containment also in the more unfavourable conditions and did not require any cleaning procedure before marketing. Therefore it is possible to use, if necessary, elevated environmental humidity without producing a corresponding increase of the superficial moulds. The treatment does not however prevent fungus growth, but causes a growth delay and therefore does not modify the visual and texture rind characteristics.

The propolis treatment does not produce any texture or sensory modification of the cheeses also for products with a short ripening time. The treatment is inexpensive and time saving if effected for direct immersion of the whole, like for salting, in the propolis solution.

Acknowledgements

The authors are grateful to Azienda Terziano (Villarbasse, TO) and Caseificio Cooperativo "Valle Josina" (Peveragno, CN) for their collaboration in the research. Work carried out within a "Fondi ex-60%" research project financed by the University of Turin.

REFERENCES

- [1] C. Corradini, N. Innocente, *Scienza e Tecnica Lattiero-Casearia*, 2001, 52 (4), 269.
- [2] Y. K. Park, M. H. Koo, J. A. S. Abreu, M. Ikegaki, J. A. Cury, P. L. Rosalen, *Current Microbiology*, 1998, 36, 24.
- [3] J. Serra Bonvehí, F. Ventura Coll, R. Escolà Jordà, *Journal of the American Oil Chemists' Society*, 1994, 71 (5), 529.
- [4] J. M. Grange, R. W. Davey, *Journal of Royal Society of Medicine*, 1990, 83, 159.
- [5] Y. K. Park, M. Ikegaki, *Bioscience Biotechnology and Biochemistry*, 1998, 62 (11), 2230.