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Pecorino di Lucardo: **A sheep's milk cheese historically going back to the Middle Ages, produced during the XXI century**

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SUMMARY – This cheese is obtained from raw sheep's milk and vegetable rennet; its production goes back to the Middle Ages and was lost after this period. A study, concerning sanitary hygiene aspects of its production and transformation, involved four agro-pastoral farms in the provinces of Florence and Siena, the original production area of the *Pecorino di Lucardo*, in the project of retrieval, i.e. producing the cheese directly from the milk following ancient recipes recovered from historical sources. Production techniques take advantage of the derogations predicted by the European Hygiene Regulations; but the study shows that the reality of current production structures and sheep holdings as well as the quality of the milk produced differ from the reality of 400 years ago. The crises concerning milk production lead producers to rediscover traditional cheeses of quality and to introduce them to the market. This requires the ability to know how much of the tradition may be retrieved and adapted to modern systems of farming and transformation in order to produce quality cheese on a medium scale.

Key words: *Pecorino di Lucardo*, traditional cheese, hygiene.

RESUME – "*Pecorino di Lucardo : Un fromage au lait de brebis qui remonte historiquement au Moyen Age, produit au XXI^e siècle*". Le fromage est obtenu avec du lait cru de brebis et de la présure de légumes. Sa production remonte au Moyen Age et fut interrompue après cette période. Une étude, concernant l'aspect d'hygiène sanitaire de sa production et transformation, impliquait 4 fermes agropastorales des provinces de Florence et de Sienne, la région de production originelle du *Pecorino di Lucardo*, dans un projet de redécouverte, c'est-à-dire la fabrication en suivant directement les recettes recouvrées par des sources historiques. Les techniques de production profitent des dérogations accordées par les normes d'hygiène européennes ; mais l'étude démontre que les réalités des structures actuelles de production et d'élevage des moutons aussi bien que la qualité du lait produit diffèrent des réalités d'il y a 400 ans. Les crises concernant la production du lait conduisent les producteurs à redécouvrir des fromages traditionnels de qualité et à les introduire sur le marché. Ceci nécessite la capacité de savoir extraire le meilleur de la tradition et de l'adapter aux systèmes d'élevage et de transformation modernes dans le but de produire des fromages de qualité à une échelle moyenne.

Mots-clés : *Pecorino di Lucardo, fromage traditionnel, hygiène.*

Introduction

An historic inquiry has brought back to our present times a forgotten cheese that was however recognized and appreciated since the XVIII century in Italy due to its higher selling price in comparison to other cheeses produced in Tuscany during the same period: the *Pecorino di Lucardo* or *Marzolino di Lucardo*. The name of this cheese explains the period of production (March – spring time) as well as the origin of production (Lucardo, a small village in the region of Florence). The production dates back to the Middle Ages but the first proved origins are at the of 1600 when Paolo Borcione from Venice has included this cheese in a memory book of Italian cheese supplying additional information as the milk used is sheep milk and the rennet used is vegetable rennet called thistle (Fig. 1).

This kind of cheese has been produced prevalently by women in Tuscan farms and the ability of producing this cheese has been considered a good quality for marriage.



Fig. 1. The vegetable rennet called thistle.

The production was very limited due to the small number of sheep held in the farm and the period of production: only during spring time.

A precised study of the technique of production has been carried out by a Florentine Doctor called Giovanni Targioni Tozzettini in 1759 due to a case of intoxication in a friary convent where this kind of *Pecorino* cheese has been eaten. This study has been handed on to today and has represented the historic base for the work of recovery.

Materials and methods

A project has been promoted where 4 agro-pastoral farms are participating: 3 in the region of Siena and 1 in the region of Florence. All farms are family conducted and breed sheep of Sardine race. The feeding is mainly based on a daily pasture in a meadow together with an integration of dry fodders during the winter and concentrates bought at the market.

The produced milk is prevalently given to an industrial dairy although all farms have a small dairy within their farms where a part of the milk is turned into cheese and sold at the local market.

As in the past, mostly women are responsible for the production of cheese and the local selling represents an interesting integration of the family's salary although if there exist some law restrictions for milk production.

The 3 farm dairies in the region of Siena are registered according to the EC Directive 92/46 and the one in the region of Florence is authorized according to the national law and foresees the direct selling in the farm or in local markets.

The technique of production for the *Pecorino di Lucardo* has been elaborated according to the historic resources found:

- (i) Dry thistle: 4/6 g for 10 litres of milk.
- (ii) Temperature for curdling: 38°C.
- (iii) Time for curdling: approximate 2 hours.
- (iv) Weight per whole cheese: 1-1.1 kg.
- (v) Shape of cheese: oval or frustum of cone.

The following transactions are to be effected:

- (i) Take away the first milk flower before the forming of the curdling. This flower has to be used

later for re-kneading the curdled mass and spreading it on the surface before placing it into the sackcloth.

(ii) After 2 hours approximately remove finely the curdling in small pieces not bigger than a maize seed.

(iii) After the rest of the mass, it is to be compacted and strained.

(iv) The curdling is to be kneaded with a part of the left first milk flower and the other part is to be spread on the exterior side of the whole cheese. For approximate 20 minutes press the cheese and salt it on the surface.

(v) Place the *Pecorino* cheese in the appropriate line-sackcloth according to the frustum of cone and prick the whole cheese in order to get out the whey.

(vi) Purge the cheese for approximate 2/3 days considering constantly the valuations to be received from operators according to their experience up to the end of the process. If needed a small pressure can be applied (Fig. 2).

(vii) Hang up the whole cheese in a cold store for approximate 2 days; after this period the surface of the whole cheese has to oiled with olive oil (Fig. 3).

(viii) Season the cheese in a tuff cellar for a period between 30 and 40 days; the cellar has to correspond to the requested temperatures and humidity.



Fig. 2. The *Pecorino di Lucardo* while purging.



Fig. 3. *Pecorino* oiled with olive oil.

Each farm has been controlled following a check list elaborated and validated according to a previous research of industrial dairies. The check list has been created in order to classify each dairy with a specific number that represents a class of hygienic and sanitary risk.

This number is used by the Official Veterinarian Health Service to revoke if necessary the authorization of production or to oblige the farmers to apply the necessary structural or hygienic modifications.

The characteristics of this check list are the following: objectivity, easy to be filled-in, reproduced and repeated, to be used either for small or big dairies/farms.

The check list is divided in 6 sections and different values are attributed to each section: presence and absence from different characteristic and numbers from -2 to +2 where the number 0 is considered as normality.

The sections are the following:

(i) Information about the farm's location and identification.

(ii) Milk quantity produced per year and possible milk collection from other local farms, weekly cheese production (number of days per week), number of employees and possible milk pasteurisation before transformation into cheese.

(iii) Different kind of cheese and derivatives (e.g. cottage cheese).

(iv) Modality of water supplying: public or private aqueduct, water deposit or tank, drink water or water sweetening plants.

(v) Control the whole structure, plant and machines beginning from the milk collection up to the production of cheese and cottage cheese, the seasoning, the storage, the manufacturing as well as hygienic services and water deposit (Fig. 4).

(vi) Verify and double check the HACCP plan.



Fig. 4. Seasoning of the cheese area well maintained in a farm.

By filling-in this check list you obtain a certain number that represents the risk of the whole structure. Subsequently The Official Veterinarian Health Service has established 5 risk classes to which are corresponding different departments to follow (Table 1).

Table 1. Dairies' classification according to risk value

Risk value	Risk class	Plant classification	Departments to follow
2-30	1	Serious privation from structure and management	1. Stoppage of work 2. Proposal to revoke the CE license tag
31-55	2	Raised risk	Intensification of controls 1. Prescriptions (to resolve within deadline) of structure privation and HACCP plan 2. If necessary, slowing down of the production 3. Precised valuation of whole production chain: from milk collection/arrival of milk up to manufacturing and selling of the final product 4. If necessary verifying the hygienic aspects of the laboratory 5. Professional training of the responsible of the plant and/or employees
56-73	3	Light risk	Maintaining of hygienic controls as established in the Official Veterinarian Health Services plan
74-86	4	Elevated hygienic-sanitary standard and HACCP	Possible reduction of controls
87-100	5	Very good hygienic-sanitary standard and HACCP	Reduction of controls

From March to May 2005 a total of 35 milk samples have been collected in a casual way: a minimum of 7 samples per each farm. The milk samples have been analysed per fat, protein, lactose, solid not fat (SNF), cryoscopic index, total bacteria count, somatic cells and antibiotic-sulphamide residue.

The data related to milk quality have been analysed with the JMP statistic software (SAS Institute) and the results collected from the check list have been examined with the different strategies of the Critical Control Points (CCP).

Results and discussion

The risk values elaborated from the check lists are described in Table 2.

Table 2. Risk values of the 4 dairies that are producing *Pecorino di Lucardo* cheese

Farm	Risk value	Risk degree
A	62	3
B	42	2
C	39	2
D	18	1

Farm A has obtained an excellent score in comparison to farm B and C which are in the high risk class even if their score is very close the normality value expected.

Farm D has shown different privations due to structural requirements, plants and equipments as well as the privation of the HACCP plan.

The major differences of the check list are the following:

(i) Structural requirements, plants and equipments:

- Privation of disposable towels.
- Door to the bathroom that is not automatically closing.
- Bathroom's sink with manual water tap.
- Privation of waste baskets.
- Privation of thermometer in the cold store.

(ii) Maintenance and hygienic-sanitary management of the structure, plants and equipments:

- Inadequate maintenance of packaging machines, tables in the cold store, employees' wardrobes and the door of the cold store.
- Presence of broken tiles.
- Walls with falling down plaster.
- Broken mosquito nets.
- Inadequate closing system of the cold store's door.

(iii) HACCP requirements:

- The revision of the plan is not foreseen.
- Privation of technical schedules of the products.
- Corrective actions are not defined.
- Privation of disinfections and rodent extermination procedures.
- Privation of procedures for sanitary brand.
- Privation of procedures for complains and returns.
- Privation of procedures for instruments' calibration.
- Privation of procedures for the water control.
- Privation of the HACCP plan.

(iv) HACCP applications:

- Monitoring and recording CCP not conforming.
- Absence of verifying the rodent extermination program.
- Privation of registration of ordinary and extraordinary maintenance.
- Privation of professional training documentation.

The results of the milk qualities are described in Table 3.

Table 3. Results of the whole milk quality of the 4 farms that are producing the *Pecorino di Lucardo* cheese

Farm	Fat (%)	Protein (%)	Lactose (%)	SNF (%)	CI (°C)	TBC x 1000	SCC x 1000
A	6.12	5.17	4.80	11.08	-0.560	558.25 B	523.67 B
sd	1.93	0.98	0.22	0.14	0.02	869.02	197.37
B	5.96	5.56	4.82	11.04	-0.560	974.17 A	2433.00 A
sd.	0.43	0.11	0.11	0.07	0.023	1265.23	832.38
C	5.82	5.55	4.85	11.04	-0.570	2434.67A	1976.71 A
sd	0.35	0.12	0.07	0.13	0.01	1731.68	246.40
D	6.40	5.60	4.74	11.04	-0.580	2096.75 A	1384.20 A
sd	0.55	0.22	0.11	0.18	0.02	1640.43	531.47
Total	6.07	5.47	4.80	11.05	-0.569	1515.95	1579.39
sd	0.25	0.19	0.04	0.02	0.01	892.95	824.45

^{A,B}Values with the same letter do not differ significantly.

Significant differences have not been registered for fat, protein, lactose and cryoscopic index while significant differences have been noted for CBT and SCC in farm A (the minor values in comparison to the other 3 farm values). This confirms that a good dairy management corresponds to a good breed management.

Nine *Pecorino di Lucardo* whole cheeses have been produced with this project. After 6 months of seasoning the cheeses have been visually analysed with the following results: not too many wholes in the cheese's pulp, neither solid nor dry but compact pulp, yellow straw-colour, hay, straw and Mediterranean herbs flavour. The taste that remains in your mouth after eating the cheese is very strong, bitter and persisting.

Apart from one farm, the others do not show heavy structural, plant and equipment problems in their dairies. This means that they have followed the adequate rules in order to be able to produce a traditional and historical cheese made by particular dairy techniques (Fig. 5).

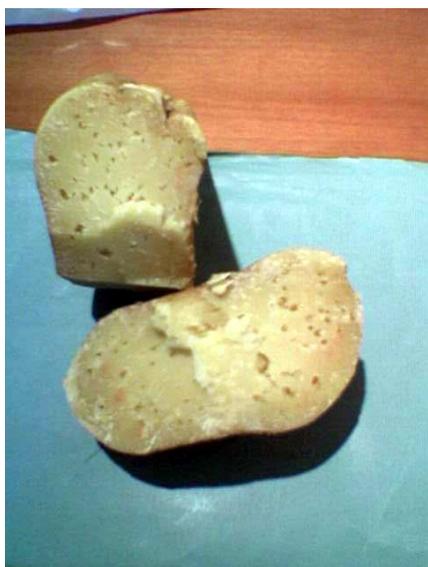


Fig. 5. *Pecorino di Lucardo*. Not too many wholes in the cheese's pulp, neither solid nor dry but compact pulp, yellow straw-colour.

The farms in order to be able to produce the *Pecorino di Lucardo* cheese have to modify their production phases, according to the HACCP rules, especially for what concerns the vegetable rennet and the equipment used for the cheese preparation and the line-sackcloth.

In order to produce a cheese with raw milk you have to follow the requirements foreseen by the EC Rule no. 2073/2005 in particular for what concerns the hygienic and sanitary characteristics.

In conclusion, the valorisation of Mediterranean products such as the recovery of antiques cheeses' receipts has to be subjected to today's laws concerning hygienic and sanitary characteristics, genetic improvement of different races breed and improvement of breeding techniques. Furthermore the monitoring processes should help to obtain cheeses of higher quality than the ones produced in the past.