Regional Center of Agronomic Research of Errachidia
(INRA-Morooco)

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FAO-CIHEAM Network on Sheep and Goats
Joint Seminar of the Sub-Network on Production Systems & Sub-Network on Nutrition

Sensory and microbiological evaluation of Drâa goat cheese and study of its stability during storage

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Vitoria-Gasteiz (Spain)

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Outlines

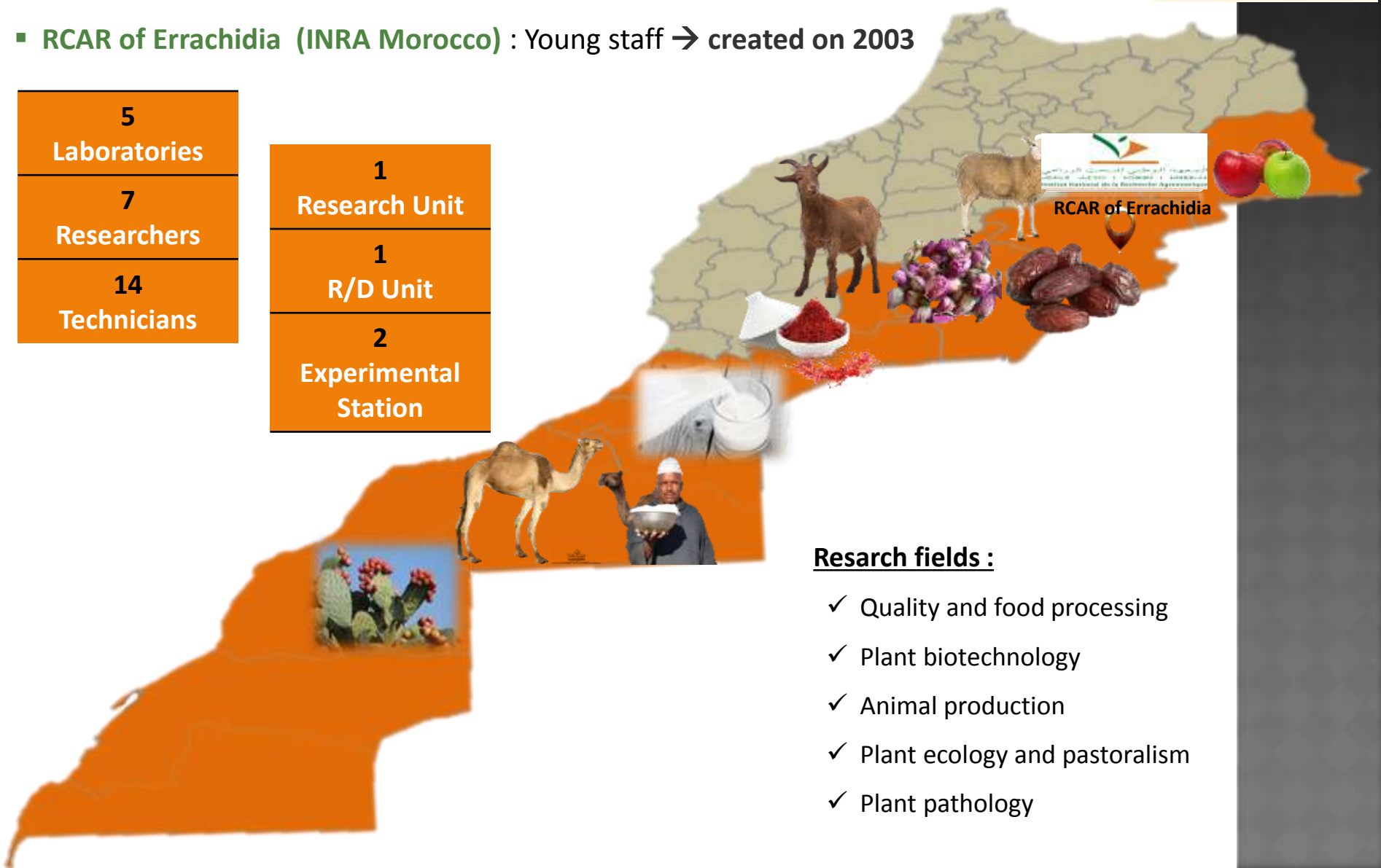
- INTRODUCTION
- METHODOLOGICAL APPROACH
- RESULTS
- CONCLUSION

Introduction

- **RCAR of Errachidia (INRA Morocco)** : Young staff → **created on 2003**

5 Laboratories
7 Researchers
14 Technicians

1 Research Unit
1 R/D Unit
2 Experimental Station



Resarch fields :

- ✓ Quality and food processing
- ✓ Plant biotechnology
- ✓ Animal production
- ✓ Plant ecology and pastoralism
- ✓ Plant pathology

Introduction

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IN MOROCCO :

- **Goat breeding in Morocco : Solid socio-economic activity in Poor and remote areas (fragile populations).**
- **Size of livestock: about 5.3 millions.**
- **Goat genetic resources: high diversity and heterogeneity → 4 populations: Northern goat population, mountain goat, imported breeds and Oasis population (Drâa).**

IN THE OASES REGIONS :

- **Intensive goat farming : (1) covering food needs of the rural population (fragile) and (2) income-generating activities (women's cooperatives).**
- **Herd size : more than 510,000 heads (Rahali, Drâa and Alpine).**
- **Drâa goat is the main goat breed raised in oases of South-East of Morocco.**
  - **Very prolific (160 – 200%) & considered as a source of supply of oasis milk …**

Introduction

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CONSTRAINTS !!

- **existence of a large number of small unorganized farms;**
- **lack of infrastructure, making it difficult for the farmer to apply good hygiene practices;**
- **failure to meet quality requirements (from production to processing);**
- **existence of small goat cheese production units but lack of technical supervision;**
- **production remains traditional, seasonal and poorly controlled;**
- **difficulties in storing and preserving goat cheese, which is marketed fresh.**
- **lack of characterization of goat products …**

المغرب الاخضر
LE MAROC VERT

GREEN MOROCOO PLAN

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Objective

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Continue research and R & D studies aimed the characterization of Drâa goat considered as a "typical goat breed in the oasis of South-East Morocco", through:

1- Microbiological and sensorial characterization of Drâa goat cheese …

2- Study of storage abilities of this cheese ...

Methodology (1/2)

- **Drâa goat cheese** was produced in the laboratory using **goat milk** from an **intensive livestock at the Errachidia experimental station :**

Preliminary steps

Pasteurization (72°C-20s)

Inoculation : 32.5ppm

Renneting : 0.2ml/l

Addition of $CaCl_2$

Coagulation (36°C-150min)

Cutting and patching

Moulding

Draining (25°C-15h)

Turning and salting

Drâa goat raw milk

Drâa goat cheese

Methodology (2/2)

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Drâa goat cheese Analyses

Microbiological analysis

Count of :

- Lactic Acid Bacteria (LAB)
- Yeast and Molds
- Psychrotrophic Bacteria
- Fecal Coliforms

Culture on specific "culture media"

Sensory evaluation

Three major tests :

- Hedonic Test
- Preference Test
- Triangular Test (in comparison with Alpine & Drâa goat cheese)

Panel of 50 persons

54% Women – 46% Men

Quality during storage

Control of 3 parameters :

- Acidity (Dornic degree)
- Water content (%)
- Yeast and Molds

Frequency of control

(0 - 8 and 16 days)

Results

I. Physicochemical analyses of Drâa goat cheese :

Parameter	Mean ± SD
pH	**4.58** ± 0.15
Acidity (°D)	211 ± 17.3
Humidity (%)	57.3 ± 2.65
Dry Matter (%)	42.7 ± 2.65
Fat (%)	21.9 ± 3.07
FAT/DM	**0.51** ± 0.05
DNF (%)	20.8 ± 2.34
TNM (%)	15.3 ± 2.60
Ash (%)	2.26 ± 0.54
Cheese Yield (%)	18.8 ± 1.55

In general, Physical & chemical components of Drâa fresh cheese are comparable or higher than :

- **Servilletta (Spain)**
- **Domiati (Egypt)**
- **Mato (Spain)**
- **Cacioricotta (Italy)**

(review of Raynal-Ljutovac et al., 2014)

- **Local goat breed (Northern Morocco)**

(Noutfia et al., 2014)

Results

II. Microbiological analyzes :

Parameter	Mean Log10 (CFU/g)	Tolerated limit
Fecal coliforms	2.34	< 4
Lactic acid bacteria	8.92	-
Psychrotrophic bacteria	6.97	< 6
Yeast	4.34	5
Molds	3.83	5

✓ The fecal bacterial flora → well below the threshold set by the standard → Good conduct of milking and best processing conditions.

✓ Lactic acid bacteria : High amount → Good technological abilities (ripening, probiotics ...)

✓ Yeast & Molds lower than (Log10 (CFU/g) : 5-6) which is associated to yeasty and fermented off-flavors and gassy appearance.

Results

III. Sensory analyses :

1) Preference Test (Tasting preferences)

Mid-goat cheese

Acidity (°D)	Ash	Lipids	Proteins	Water content (%)
158	1.2	19.8	16.4	60.9

➡ **Preferred : (N = 40%)**

Alpine-goat cheese

Acidity (°D)	Ash	Lipids	Proteins	Water content (%)
153	0.79	16.6	11.7	66.4

➡ **Preferred : (N = 38%)**

Drâa-goat cheese

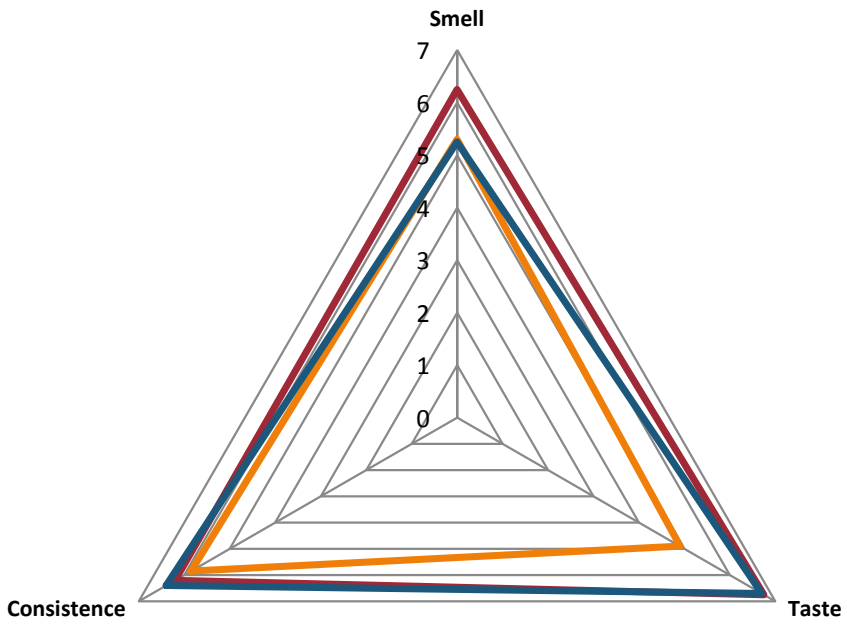
Acidity (°D)	Ash	Lipids	Proteins	Water content (%)
210	1.7	23.4	15.7	57.0

➡ **Preferred : (N = 22%)**

Results

III. Sensory analyses :

2) Hedonic Test



- Sensorial attributes of mid-goat cheese and Alpine cheeses are similar.
- In addition, the best sensory profile is that of mid-goat cheese, followed by Alpine cheese.

→ This confirms the results identified in the preference test.

Results

III. Sensory analyzes :

3) Triangular Test

A highly significant difference* **between Drâa goat cheese** (local breed) **and Alpine goat** (imported breed) **:**

- 62% of tasters : Able to differentiate between the two types of cheese …

- 38% : Not able …

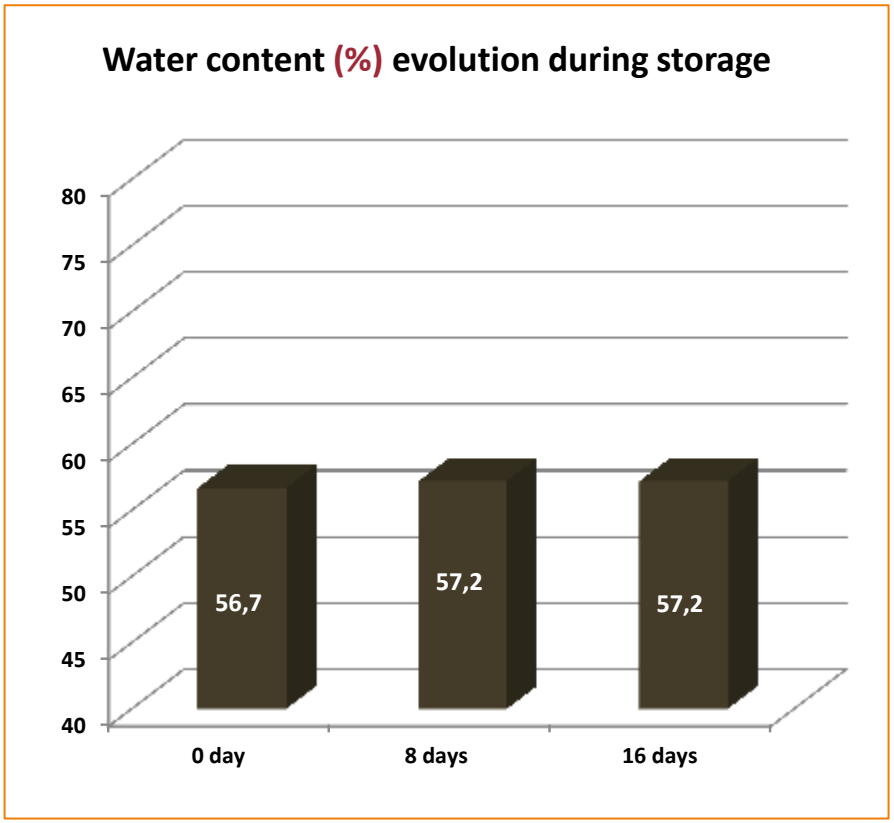
*chi-squared test (χ test)

→ **This shows that the characteristics of the Drâa goat cheese, namely the acid taste, the slightly yellowish coloring, the firm consistency, the pronounced odor, are easily detected by the panel.**

Results

IV. Quality of cheese during storage :

1) Water content



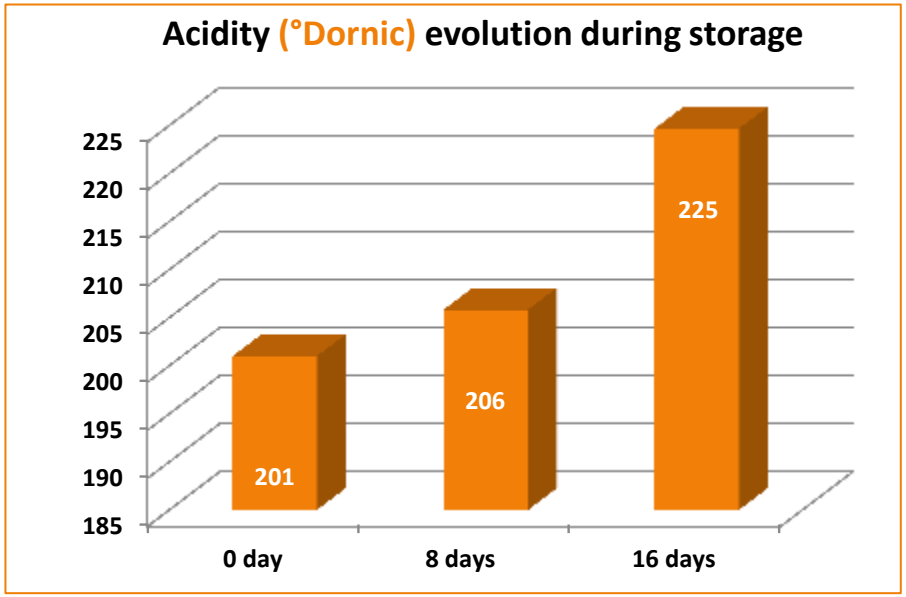
- Changes in water content content during storage increased slightly from 56.7% to 57.2%.

- However, the analysis of variance, *ie shelf life at + 4 °C*, showed that there was no significant difference between the water content at processing day and 16 days of storage.

Results

IV. Quality of cheese during storage :

2) Acidity (Dornic degree)



- The lactic acid content increases during storage, from 204°D at the beginning → 225°D after 16 days …

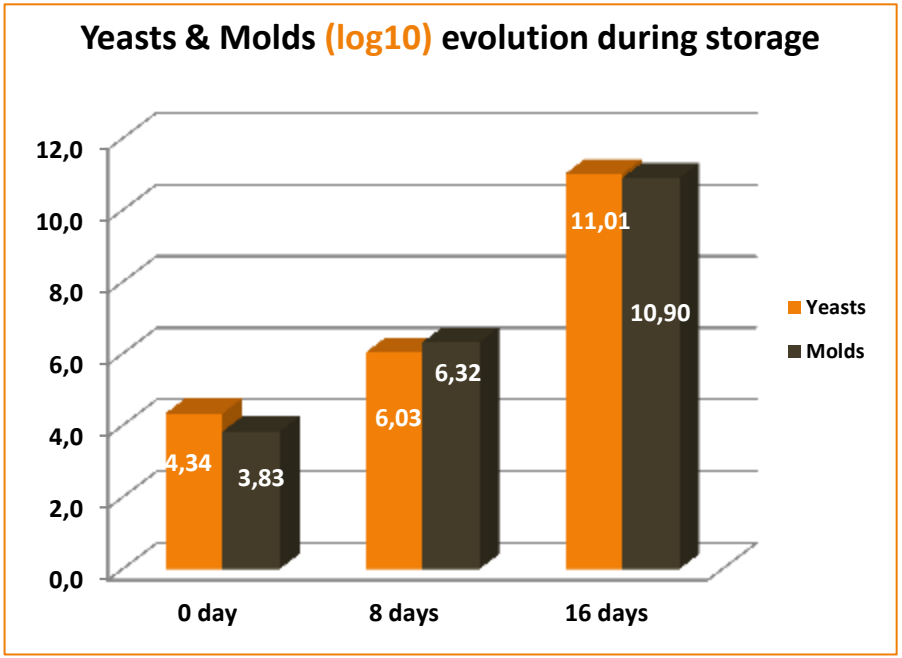
→ Significant difference ($p < 0.05$) between the acidity of the cheese at 16 and 0 day.

→ This indicates a lactic fermentation in the stored cheese … This finding is consistent with the conclusions reported by Yedri (2010) and Yessraoui (2002).

Results

IV. Quality of cheese during storage :

3) Yeast and Molds



- Yeasts and molds have been reported to be the major determinant parameter of shelf-life of fresh cheese *(Lewis and Dale, 2000)*.

- A cut-off of ≥ 10^5 CFU/g for yeasts and molds was chosen to mark the end of shelf-life *(Al-Kadamany et al., 2003)*.

→ Yeast and mold growth rate increases significantly ($p<0.05$) during storage.

→ Estimated Shelf-life of our cheese is reached on the 7 - 8th day : Similarity with the study of *Arriagada et al. (2012)* report a shelf life of 7 days for fresh cheese …

Conclusion

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1 - Further research on the microbiological aspect : sharp characterization of the lactic flora of oases goat cheeses (bacteriocins, etc) **…**

2 - Diversify the range of cheeses produced in the oases regions : semi-ripened, flavored cheeses with indigenous aromatic & medicinal plants …

3 - Start research activities related to the quality characterization of Drâa goat meat …

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- **Characterization and improvement of local know-how in cheese processing …**

- **Training of cheese makers in cheese processing & making techniques …**

- **Training of 3 local cheese factories on Good manufacturing and hygiene practices (GMP & BPH) …**

Thank you