



MilkQua

<http://www.milkqua.eu>

Milk Quality along the Dairy
Chain for a Safe and
Sustainable MILK

Section 2. Multi-topic-2018

Topic of the call:

1.3.2: Food Safety in Local Chains

Steering Committee Sept. 27-28th, 2021 *WP4: In vivo evaluation of bioactive molecules and extracts*

WP Leader: Sonia Andrés (CSIC)

**Partners involved: CSIC, IDELE, INRAT,
EEV**



The PRIMA programme is supported under Horizon 2020, the European Union's Framework Programme for Research and Innovation





- 💧 Standardization of protocols (T4.1).
- 💧 Feed efficiency and health status of dairy cattle being fed EOs (T4.2).
- 💧 EOs as a curative solution applied directly on the udder with mastitis (T4.3).

💧 In a nutshell.....

💧 FEEDING TRIALS

EOS

Feed efficiency and health

**Birth
12 M**

CTRL vs DOHaD group



Newborn
dairy calves

EOS / MP

Feed efficiency and health

Mid-lactation

CTRL vs EO/MP group
2x2 design



Adult dairy
cows

💧 MANAGEMENT OF MASTITIS

Under controlled conditions (Pathogens, SCC)







Large scale study (Pathogens, SCC)

CONTROL
EOs
AB
EOs+AB



Adult dairy
cows

Deliverables

-  D4.1 Protocols and data collection (CSIC, M10) **READY TO BE SUBMITTED**
-  D4.2 Report on EOs newborn calves and feed efficiency (CSIC, M24) **DELAYED (end of 2021)**
-  D4.3 Report on EOs newborn calves and health status (CSIC, M24) **DELAYED (end of 2021)**
-  D4.4 Report on the effect of EOs fed on milk yield, quality and health in adult cows (LPAF, M24) **DELAYED (XXX)**
-  D4.5 Report on the curative effect of EOs against mastitis in small controlled conditions (IDELE, M32) **DELAYED (XXXX)**
-  D4.6 Report on the effect of EOs against mastitis (Tunisian Farms) (ENMV, M32) **DELAYED (XXXX)**

WP4 - In vivo evaluation of bioactive molecules and extracts

Status of tasks: actions achieved so
far, next steps, needs



MilkQua

- Standardization of PROTOCOLS (T4.1)
- FEED EFFICIENCY AND HEALTH STATUS of dairy cattle being fed EOs (T4.2)
- EOs as a curative solution applied directly on the udder with MASTITIS (T4.3 and T4.4)

💧 Standardization of PROTOCOLS (T4.1)

💧 Standardization of PROTOCOLS (T4.1)

💧 Deliverable 4.1. (CSIC, M10). **READY TO BE SUBMITTED**

💧 Pending to discuss differences between the proposal and the final D4.1.

- 💧 Standardization of PROTOCOLS (T4.1)
- 💧 FEED EFFICIENCY AND HEALTH STATUS of dairy cattle being fed EOs (T4.2)

Sub-task 4.2.1. Feed efficiency and health status during the replacement period of dairy calves supplied with EOs along the first two months of life (CSIC)

EOs

Feed efficiency and health

Birth

12 M

CTRL vs DOHaD group

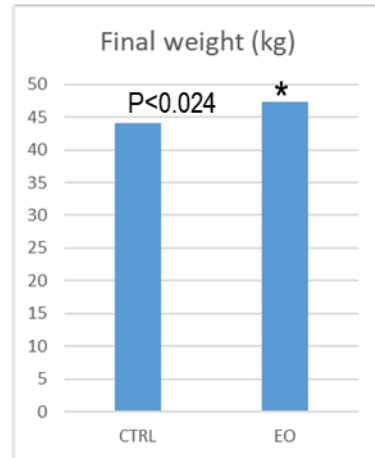
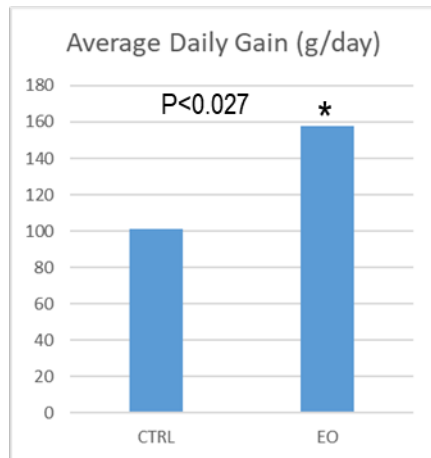


Newborn
dairy calves



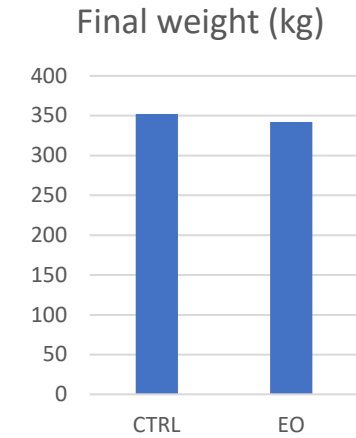
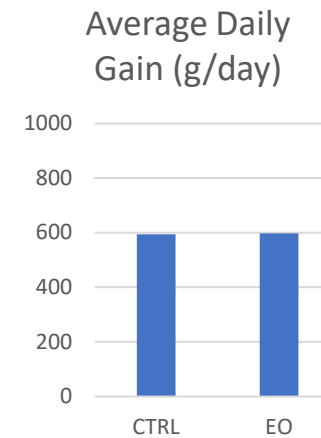
Results

No differences in the biochemical profile ($P>0.05$) after 45 days but:



Results

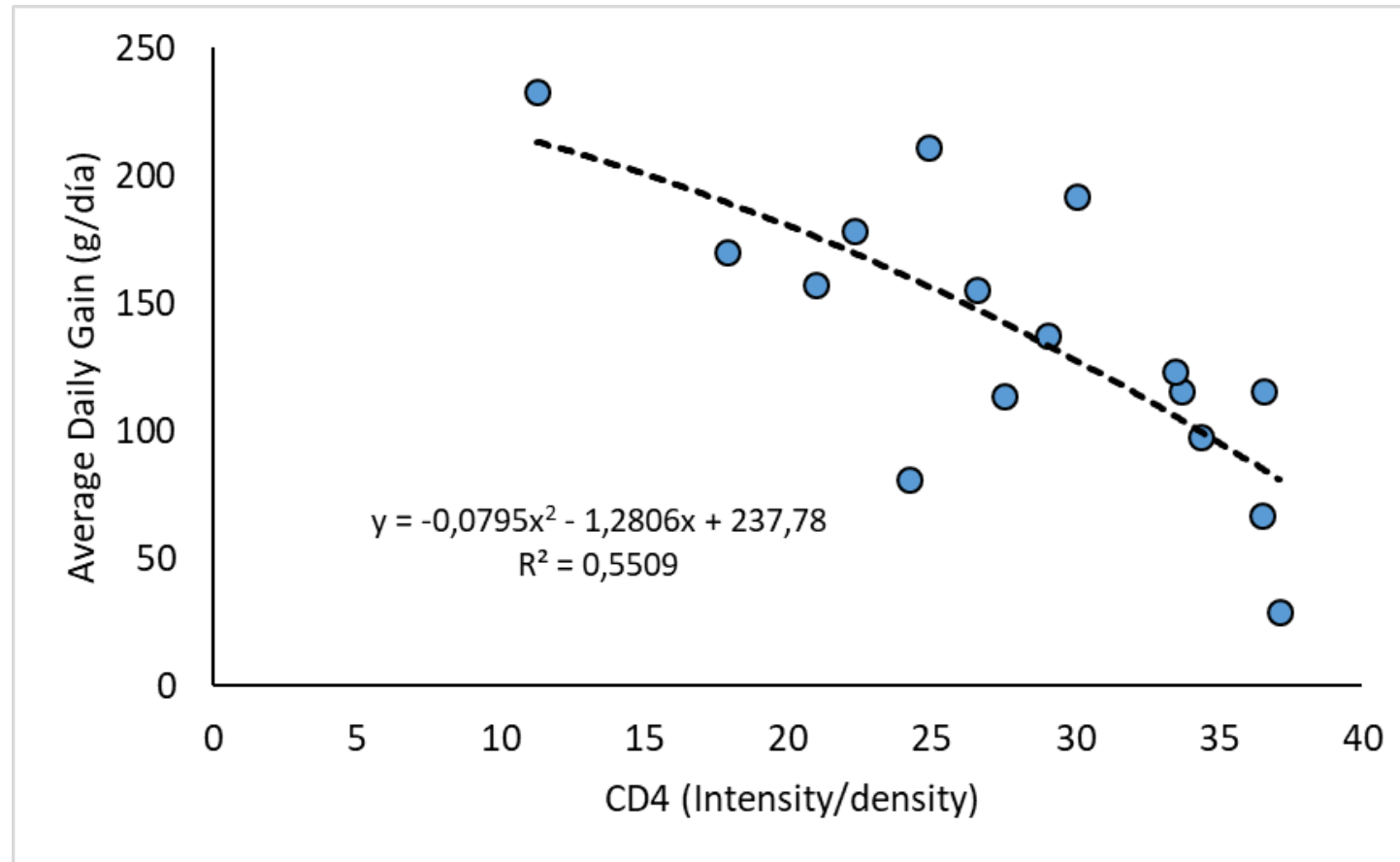
No differences in the biochemical profile nor in feed efficiency (replacement phase)



Conclusions:

Newborn dairy calves being fed EO during the suckling period were more efficient than the control group
No long-term effects of EOs effects during the replacement phase

Task 4.2



EO group, reduced CD4 intensity ($P=0.013$) and higher ADG during the suckling period ($P=0.033$)
Inverse relationship between with the ADG during the suckling period and CD4 intensity even during the replacement phase

- 💧 Standardization of PROTOCOLS (T4.1)
- 💧 FEED EFFICIENCY AND HEALTH STATUS of dairy cattle being fed EOs (T4.2)

Sub-task 4.2.1. Feed efficiency and health status during the replacement period of dairy calves supplied with EOs along the first two months of life (CSIC)

EOs

Feed efficiency and health

Birth

12 M

CTRL vs DOHaD group



Newborn
dairy calves

- 💧 Deliverables 4.2 and 4.3. (CSIC, M24). DELAYED (end of 2021)
- 💧 Three sampling times along 12 months (feaces and plasma) will be submitted to UNIMI (-omi

- 💧 Standardization of PROTOCOLS (T4.1)
- 💧 FEED EFFICIENCY AND HEALTH STATUS of dairy cattle being fed EOs (T4.2)

Sub-task 4.2.1. Feed efficiency and health status during the replacement period of dairy calves supplied with EOs along the first two months of life (CSIC)

Sub-task 4.2.2. Sub-task 4.2.2. Feed efficiency, milk yield and quality and health status of adult dairy cattle supplied with EOs during the mid-lactation [LPAF (INRAT)]

EOs

Feed efficiency and health

Mid-lactation

CTRL vs EO group
2×2 design



Adult dairy
cows

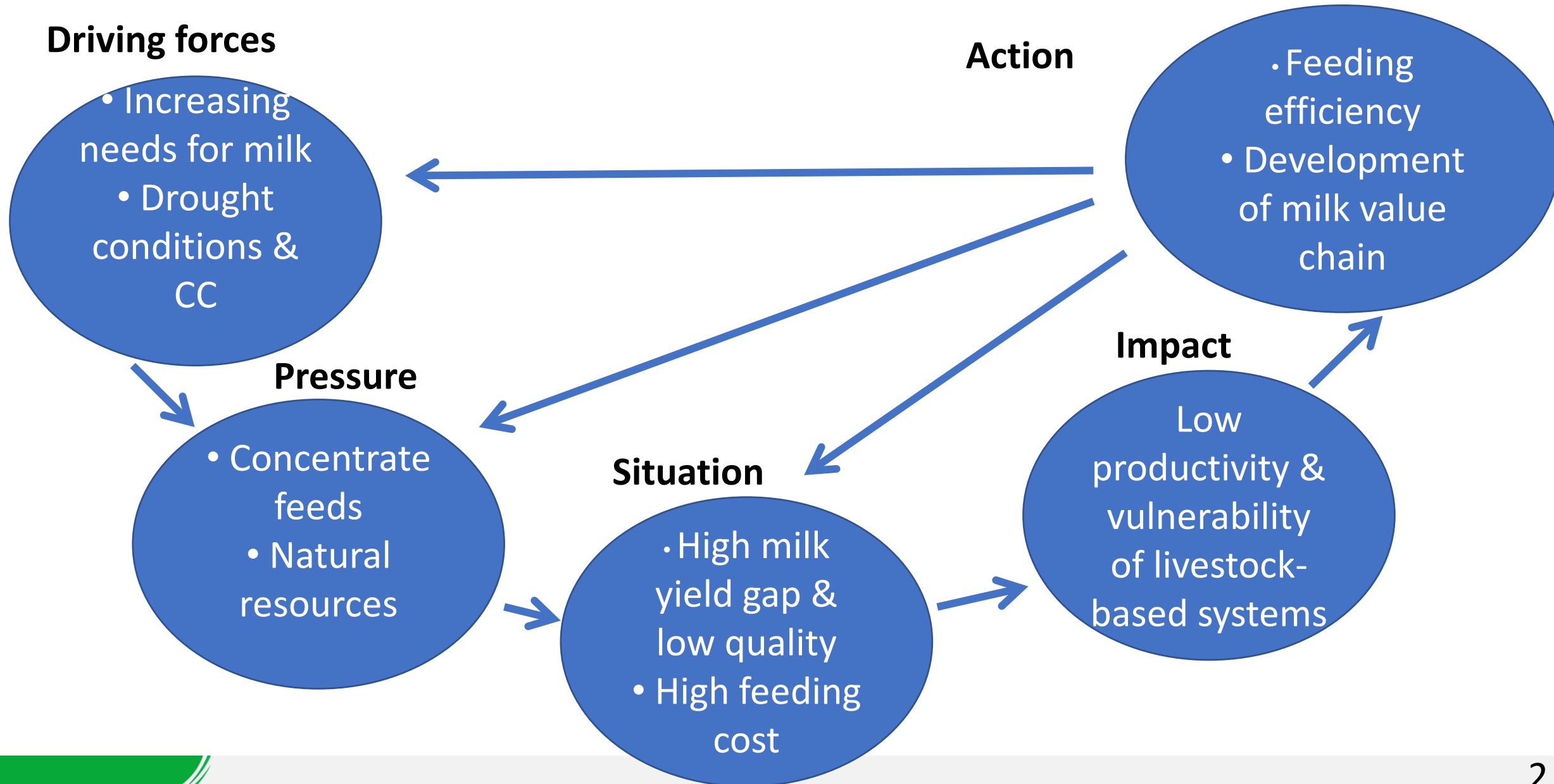


Dairy cattle response to the administration of essential oils: Milk yield & quality

MILQUA Project – PRIMA2

INRAT & INAT contribution

September 2021



Hypothesis – The essential oils of *Thymus capitatus* (EOT) favorably modify rumen microbial populations, thus enhance the efficiency of ruminal fermentation and improve nutrient utilisation in dairy cattle.

Objective – To evaluate the response of dairy cattle to daily administration of EOT in terms of digestion, milk production and fatty acid profile.

Experimental design & feeding – Two groups of dairy cattle ($n = 16$) (Initial milk yield 30.3 ± 3.6 kg/d , average BW 550 ± 42.3 kg) / 15 days adaptation + 30 days measurements / Receiving Total Mixed Diets

- **Diet control (CON):** Oat hay (2.68 kg DM) + Silages (9.24 kg DM) + Concentrate (10.8 kg DM)
- **Diet experimental (EOT):** CON + 6 ml/day/head EOT

First results

- Numerical increase ($P > 0.05$) in EOT-group (CON = 30.0; EOT = 30.3 kg/cattle/day)
- EOT administration had no effect on SFA, MUFA, PUFA
- EOT decreased fat & protein contents and $w3/ w6$ ($P < 0.05$)

- Standardization of PROTOCOLS (T4.1)
- FEED EFFICIENCY AND HEALTH STATUS of dairy cattle being fed EOs (T4.2)

Sub-task 4.2.1. Feed efficiency and health status during the replacement period of dairy calves supplied with EOs along the first two months of life (CSIC)

Sub-task 4.2.2. Sub-task 4.2.2. Feed efficiency, milk yield and quality and health status of adult dairy cattle supplied with EOs during the mid-lactation [LPAF (INRAT)]

EOs

Feed efficiency and health

Mid-lactation

CTRL vs EO group
2×2 design



Adult dairy
cows

- Second experiment with EO in supplied in alternate days
- Deliverables 4.4 (LPAF, M24), **when ?**
- No samples to be shifted to other WPs

List of tasks in WP4

- 💧 Standardization of PROTOCOLS (T4.1)
- 💧 FEED EFFICIENCY AND HEALTH STATUS of dairy cattle being fed EOs (T4.2)
- 💧 EOs as a curative solution applied directly on the udder with MASTITIS (T4.3 and T4.4)

Task 4.3. Mastitis under controlled conditions (CSIC and IDELE)

1. Experimental farm (CSIC) (Bacterial count, SCC)

CONTROL vs.
EOs



Adult dairy
sheep

- 💧 Preliminary study to test the safety and efficacy of EOs when applied intramammary with DMSO

From the 21st of June 2020 to the end of July 2020

Preliminary test 1. Effect of 2 doses of EO (20 vs 80 mg) on gland health (1 ewe)

Preliminary test 2. Effect of 2 doses of EO (10 vs 20 mg) of EO on gland health (1 ewe)

Doses \geq 80 mg of EO/ gland cause irritation and clinical mastitis

Preliminary test 1. Effect of 2 doses of EO (20 vs 80 mg) on gland health (1 ewe)

Preliminary test 2. Effect of 2 doses of EO (10 vs 20 mg) of EO on gland health (1 ewe)

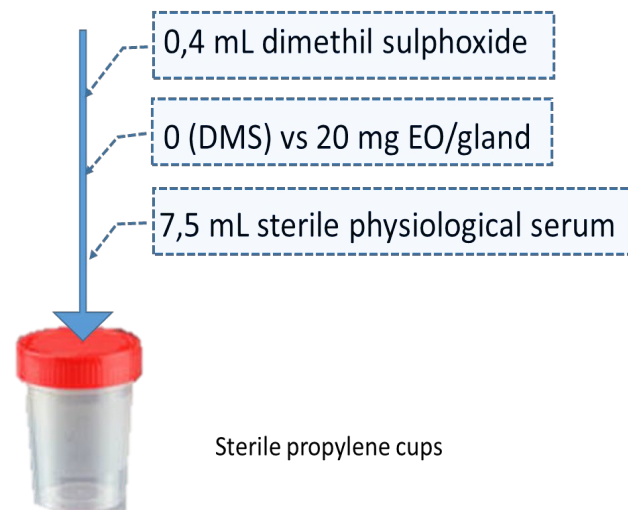
Experimental trial. Effect of a dose of EO (20 mg) on gland health (6 ewes)



Experimental trial. To evaluate the effect of a doses of EO (20 mg) on gland health (6 ewes)



Different doses
were prepared
on sterile cups



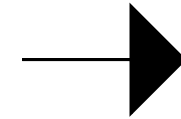
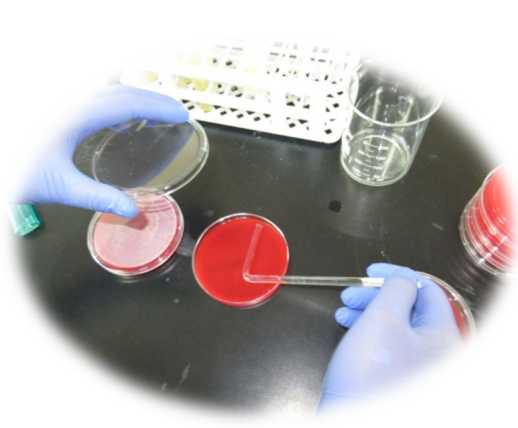
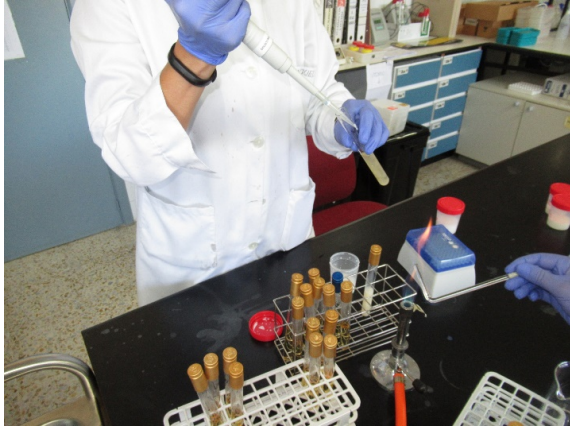
| | Day 1 | Day 2 | Day 3 |
|----------------|----------|----------|----------|
| Gland 1 | DMSO | DMSO | DMSO |
| Gland 2 | 20 mg EO | 20 mg EO | 20 mg EO |



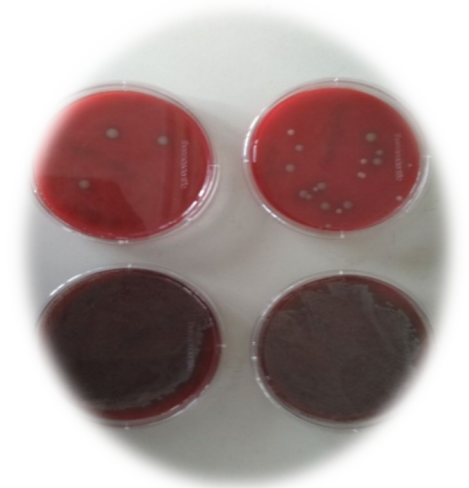


Task 4.3

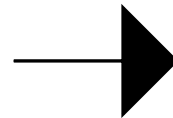
Standard plate count method



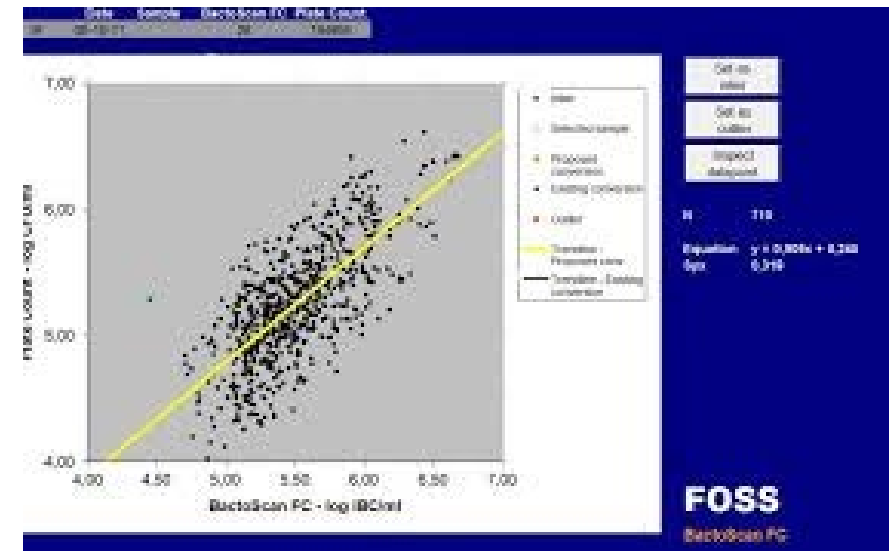
Staphylococcus aureus
Streptococcus pyogenes
Streptococcus pneumoniae



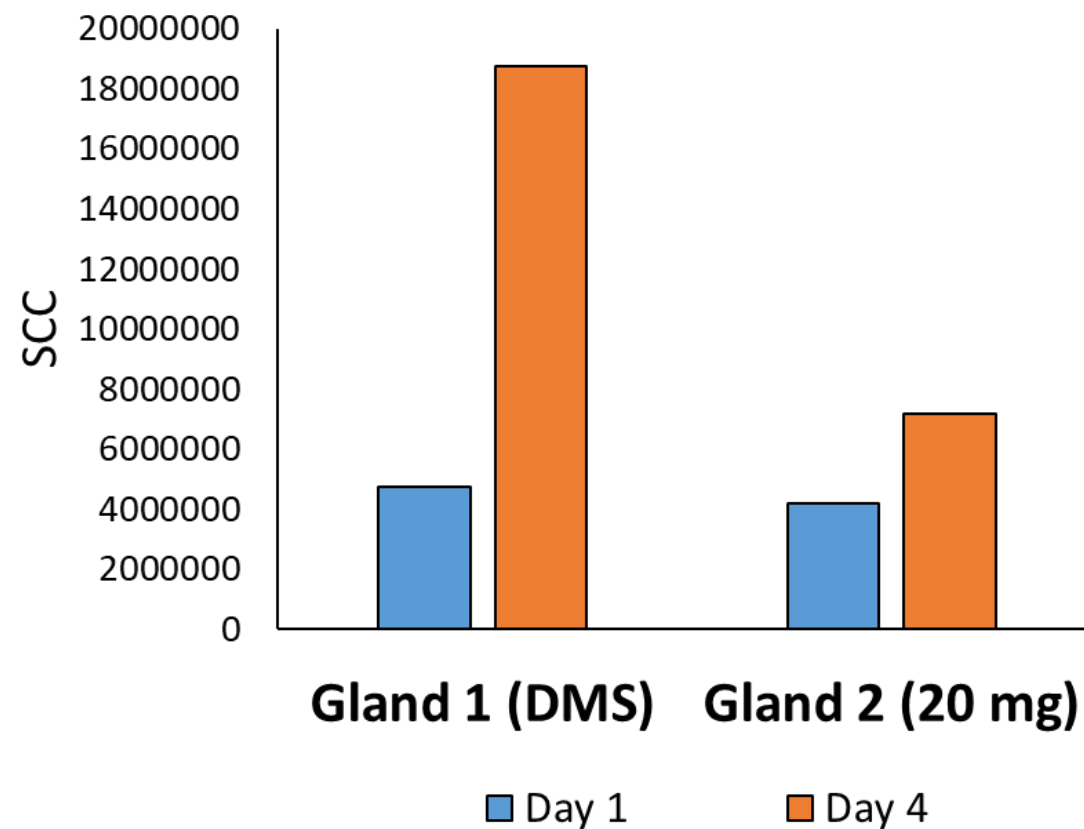
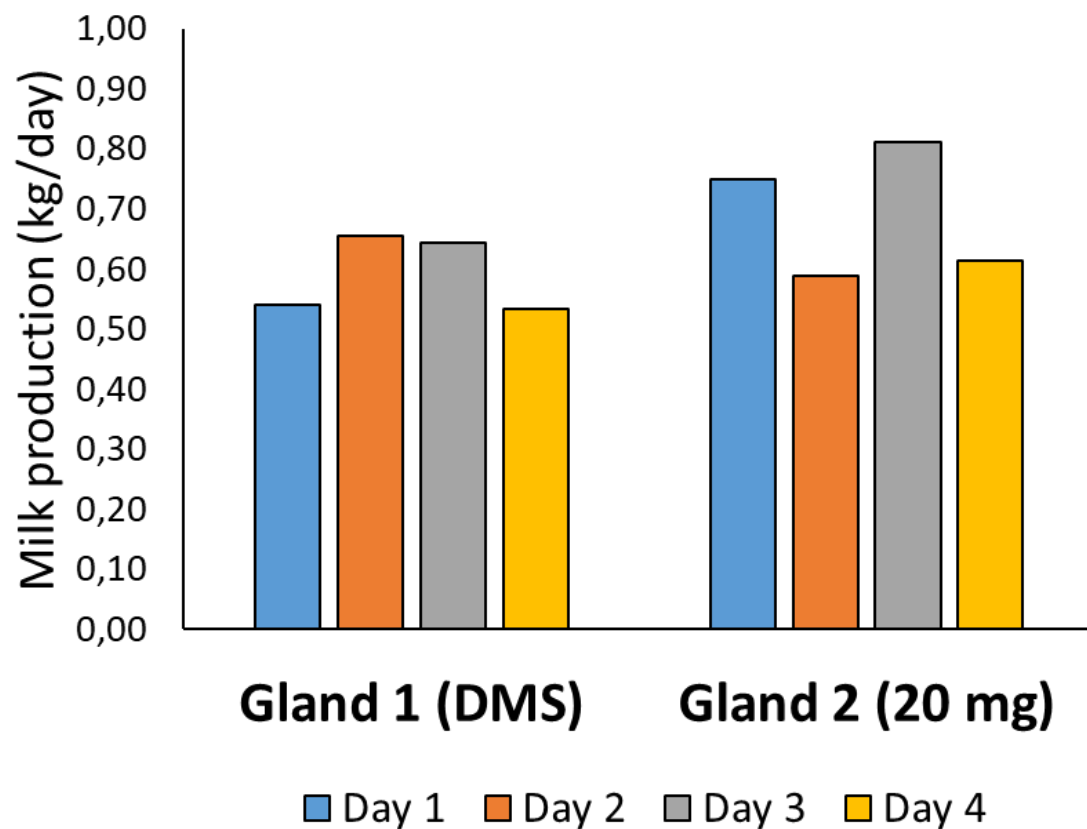
Bactoscan technique

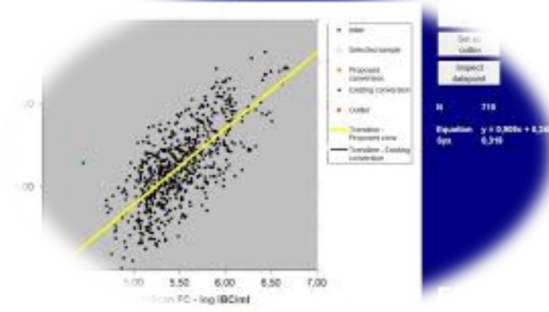


Total n° of bacteria
(Bactoscan impulses)

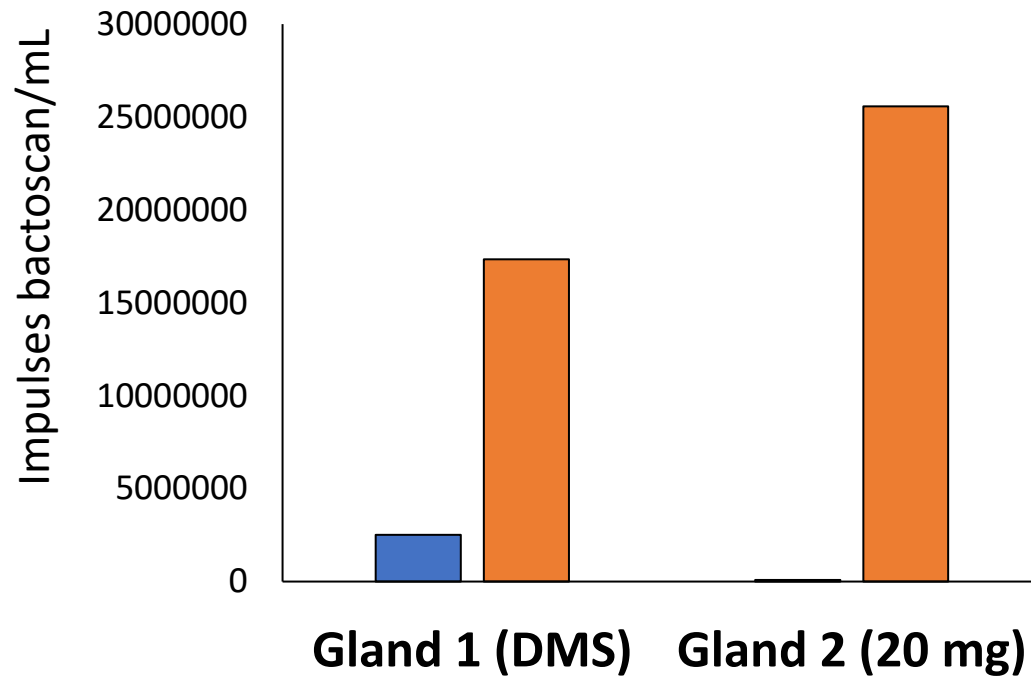


Task 4.3

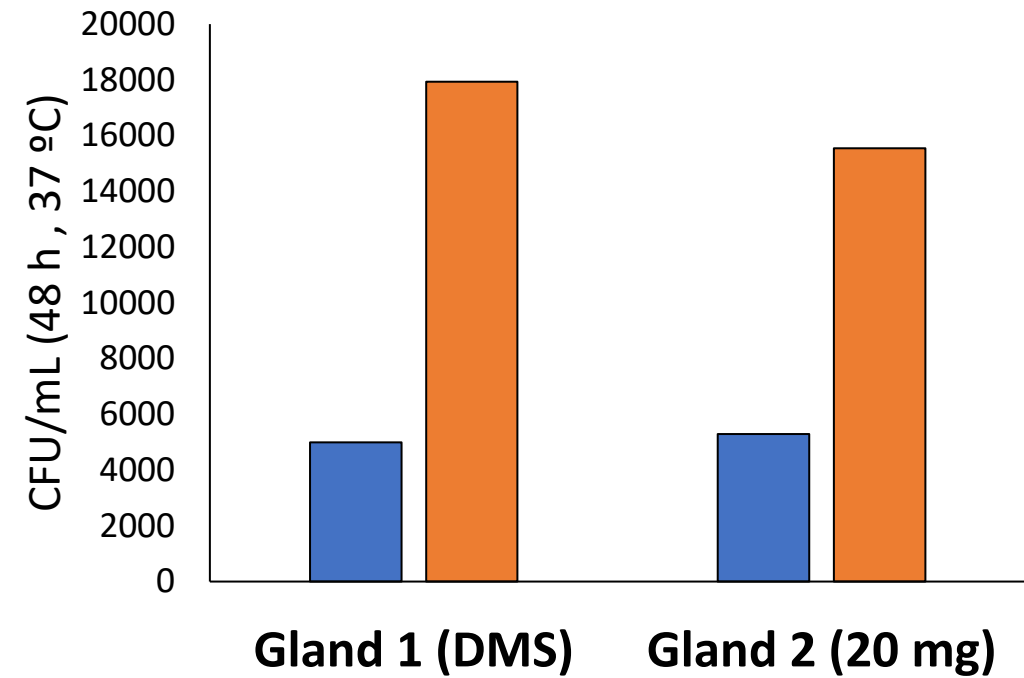




Total bacteria



Staphylococcus aureus
Streptococcus pyogenes
Streptococcus pneumoniae



Preliminary test 1. Effect of 2 doses of EO (20 vs 80 mg) on gland health (1 ewe)

Preliminary test 2. Effect of 2 doses of EO (10 vs 20 mg) of EO on gland health (1 ewe)

Experimental trial. Effect of a dose of EO (20 mg) on gland health (6 ewes)

EO at a dose of 20 mg EO / gland increases SCC or IBC

Deficient management? NO

Too much volume injected intramammary? Probably YES

List of tasks in WP4

- 💧 Standardization of PROTOCOLS (T4.1)
- 💧 FEED EFFICIENCY AND HEALTH STATUS of dairy cattle being fed EOs (T4.2)
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Task 4.3. Mastitis under controlled conditions (CSIC and IDELE)

1. Experimental farm (CSIC) (Bacterial count, SCC)
2. Experimental farm (INRA) (Pathogenes, SCC)

CONTROL
EOs
AB
EOs+AB



Adult dairy
cows

....by Ralph Neme (IDELE)

List of tasks in WP4

- 💧 Standardization of PROTOCOLS (T4.1)
- 💧 FEED EFFICIENCY AND HEALTH STATUS of dairy cattle being fed EOs (T4.2)
- 💧 EOs as a curative solution applied directly on the udder with MASTITIS (T4.3 and T4.4)

Task 4.3. Mastitis under controlled conditions (CSIC and IDELE)

Task 4.4. Mastitis, large scale study in Tunisian farms (ENMV)

1. Large scale study (Pathogens, SCC)

CONTROL
EOs
AB
EOs+AB



Adult dairy
cows



WP2 - In vivo evaluation of bioactive molecules and extracts

Discussion, brainstorm



MilkQua

- 💧 **How to (better) valorise results/data?**
- 💧 **What can we improve?**
- 💧 **How to better cooperate?**
- 💧 **What potential innovations derived from the WP can we expect?**
- 💧 **What to expect from other WPs?**

International congresses

- World Buiatric Congress, Madrid 2022 (September 4th - 8th).
- EAAP 2022, Oporto (Portugal)

National congresses

- AIDA-ITEA (2023)

Repositories for data sets:

- The importance of sharing data sets of Milkqua, FAIR guidelines
- Institutional repositories (e.g., digital CSIC for CSIC data). Reusability, increased impact (ScholeXplorer)
- CODATA Data Science Journal (more interesting for those re-using data?)
- Repositories filtering data according to social challenges (e.g., sustainability).

October 24, 2019

Report

Open Access



Investigating the Link Between Research Data and Impact

 Jensen, Eric A.; Reed, Mark

Contact person(s)

 Wong, Paul

Researcher(s)

 Norberto, Jessica; Smith, Benjamin;  Jensen, Aaron; Lorenz, Lars; Moll, Christian

The Institute for Methods Innovation – a research charity registered in the United States and United Kingdom – was commissioned by the Australian Research Data Commons (ARDC) to investigate how research data contributes to non-academic impacts, drawing on existing impact case studies from the UK Research Excellence Framework.


Project overview

The research involved analysing impact cases from the UK's Research Excellence Framework (REF). These cases were sifted to only review high scoring cases with a strong emphasis on 'data'. Relevant text to this research was extracted from the larger impact narratives. A content analysis was conducted to identify patterns, linking research data and impact in the narratives. This analysis achieved a high level of reliability, based on established methodological standards.

1,578

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Publication date:

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DOI:

DOI 10.5281/zenodo.3543505



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Highlights

-  **COAR launches a new site for its 3 Controlled Vocabularies for Repositories** [23/07/2021]
This week COAR has launched a [new site to publish and manage its three controlled vocabularies for repositories](#). The launch has also included a major update of its [Resource types Vocabulary](#), with 30 new concepts, most notably in the realm of research data. The release also responds to recent developments and future expectations in scholarly publishing such as [COAR's Next Generation Repositories Initiative](#) and the [COAR Notify Project](#). DIGITAL.CSIC has participated in this initiative since its inception in 2014. Read the full [COAR release](#).
-  **Slides of FAIRsFAIR Spain's National Roadshow** [23/07/2021]
The contributions delivered in the workshop co-organized together with FAIRsFAIR on past June 23rd are available at [the page of the event](#). The online seminar targeted the



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A multiscalar global drought dataset: the SPEIbase: a new gridded product for the analysis of drought variability and impacts

[S Beguería](#), [SM Vicente-Serrano](#)... - [Bulletin of the American ...](#), 2010 - JSTOR

Drought is a period of deficient precipitation with impacts on agriculture, water resources, and the natural ecosystems. It is the natural hazard that affects more people with the most negative consequences in the world, being responsible for extreme economic loss, famine, epidemics, and land degradation. In many developing countries, drought increases structural problems, causing unemployment, impoverishment, decreases in crop yields, and even forced migrations. Thus, improving our knowledge about the spatial and temporal ...

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Essential oils encapsulated in liposomes: a review

Mirna, Sherry , Catherine, Charcosset , Hatem, Fessi , Hélène, Greige-Gerges

In the recent years there has been an increased interest toward the biological activities of essential oils. However, essential oils are unstable and susceptible to degradation in the presence of oxygen, light and temperature. So, attempts have been made to preserve them through encapsulation in various colloidal systems such as microcapsules, microspheres, nanoemulsions and liposomes. This review focuses specifically on encapsulation of essential oils into liposomes. First, we present the techniques used to prepare liposomes encapsulating essential oils. The effects of essential oils and other factors on liposome characteristics such as size, encapsulation efficiency and thermal behavior of lipid bilayers are then discussed. The composition of lipid vesicles membrane, especially the type of phospholipids, cholesterol content, the molar ratio of essential oils to lipids, the preparation method and the kind of essential oil may affect the liposome size and the encapsulation efficiency. Several essential oils can decrease the size of liposomes, homogenize the liposomal dispersions, increase the fluidity and reduce the oxidation of the lipid bilayer. Moreover, liposomes can protect the fluidity of essential oils and are stable at 4-5 °C for 6 months at least. The applications of liposomes incorporating essential oils are also summarized in this review. Liposomes encapsulating essential oils are promising agents that can be used to increase the anti-microbial activity of the essential oils, to study the effect of essential oils on cell membranes, and to provide alternative therapeutic agents to treat several diseases

dataset 2020

Chemical composition and biological activities of the essential oils from *Vitex-agnus castus*, *Ocimum campechianum* and *Ocimum carnosum*

LARA P. RICARTE , GABRIELI P. BEZERRA , NIRLA R. ROMERO , HORLANDO C. DA SILVA , TELMA L.G. LEMOS , ANGELA M. C. ARRIAGA , PÉRICLES B. ALVES , MARCELO B. DOS SANTOS , GARDENIA C.G. MILITÃO , THIAGO D.S. SILVA , RAIMUNDO BRAZ-FILHO , GILVANDETE M.P. SANTIAGO

2020-01-01

Abstract The essential oils obtained by hydrodistillation from fresh leaves of *Vitex agnus-castus* and *Ocimum campechianum*, and from fresh inflorescences of *Ocimum carnosum* were analysed by GC-FID and GC-MS. The major components of *V. agnus-castus* essential oil were identified as 1,8-cineole (47.9%), terpinyl α -acetate (11.6%), sabinene (11.2%) and caryophyllene oxide (9.7%), while in the *O. campechianum* essential oil were eugenol (72.1%), β -elemene (6.8%), (E)-caryophyllene (6.4%) and bicyclogermacrene (5.2%). Linalool (79.0%), α -epi-cadinol (5.4%), terpinen-4-ol (3.2%) and 1,8-cineole (2.8%) were the major constituents in the *O. carnosum* essential oil. The essential oils were subsequently evaluated for their larvicidal and cytotoxic activities. Larval bioassay against *Aedes aegypti* of *V. agnus-castus*, *O. campechianum* and *O. carnosum* essential oils showed LC50 values of 97.55 ± 0.35 , 81.45 ± 0.35 and 109.49 ± 0.35 $\mu\text{g/mL}$, respectively. The in vitro cytotoxic activities of the essential oils has been evaluated on breast adenocarcinoma (MCF-7), lung carcinoma (NCI-H292), pro-myelocytic leukemia (HL-60), and cervical adenocarcinoma (HEP-2) human cell lines, and pro-myelocytic leukemia cells lines (HL-60) were found to be the most sensitive to all the essential oils tested than the others. This is the first report on larvicidal and cytotoxic activities of these essential oils.

doi: [10.6084/m9.figshare.12171207.v1](https://doi.org/10.6084/m9.figshare.12171207.v1)

doi: [10.6084/m9.figshare.12171207](https://doi.org/10.6084/m9.figshare.12171207)

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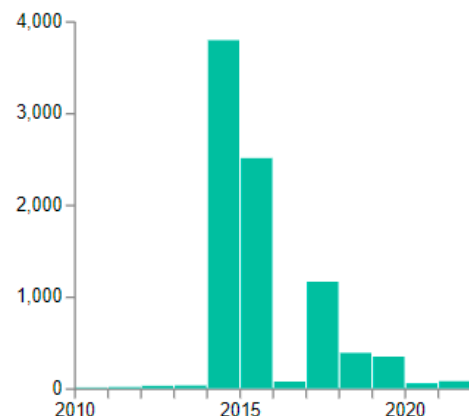
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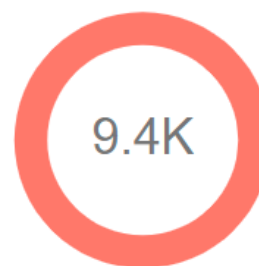
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| <input type="checkbox"/> 2014 | 3,791 |

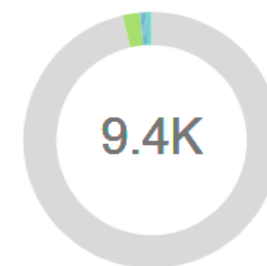
Publication Year



Work Type



License



Data from: Matching genetics with oceanography: directional gene flow in a Mediterranean fish species

Celia Schunter, Josep Carreras-Carbonell, Enrique Macpherson, Joaquin Tintoré, Enrique Vidal-Vijande, Ananda Pascual, Paolo Guidetti & Marta Pascual

Version 1 of Dataset published 2011 in [DRYAD](#)



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Data note

Criteria



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Giuseppe Bee

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MilkQua

Milk Quality along the Dairy
Chain for a Safe and
Sustainable MILK

THE EFFECTS OF ESSENTIAL OILS AGAINST BOVINE MASTITIS



Ralph NEHME

first-year PhD

Paris / STLO, Rennes

27/09/2021



INRAE



The PRIMA programme is supported under Horizon 2020, the European Union's Framework Programme for Research and Innovation

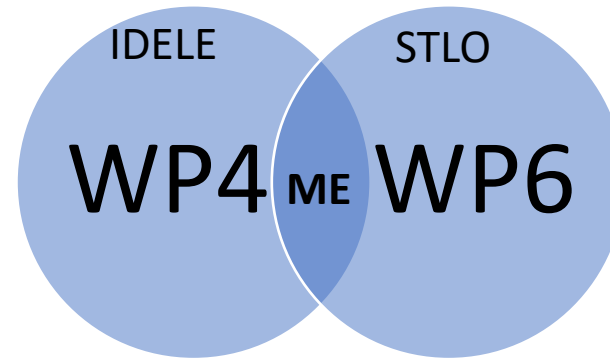


1. Presentation
2. Context
3. Aim of the study
4. Experimental Design
 1. In vivo study
 2. In vitro Study
5. Results & Discussion
6. Conclusion



- EOs as a curative solution applied directly on the udder with mastitis (T4.3).
- Small case study on curative effects of 10 Tunisian essential oils on mastitis

Effects of using EOs on milk quality + Encapsulation of oils



- Collaboration with WP3
- First year of PhD → WP4

- Mastitis is the inflammation of the mammary tissue
- High cost + complicated treatment
- Increase in the resistance of bacteria *vis a vis* the antibiotics and antibioresistance
- A high number of papers studied the effect of EOs on Mastitis *in vitro* ≠ *In vivo* studies

| Clinical Mastitis | Subclinical mastitis |
|--|--|
| Number of somatic cells > 100 000 cells/mL | Number of somatic cells > 300 000 cells/mL |
| Presence of bacteria in the milk | Presence of bacteria in the milk |
| Visible symptoms | No visible symptoms |

Abboud et al 2015, Cho et al 2015, Gupta et al 2020

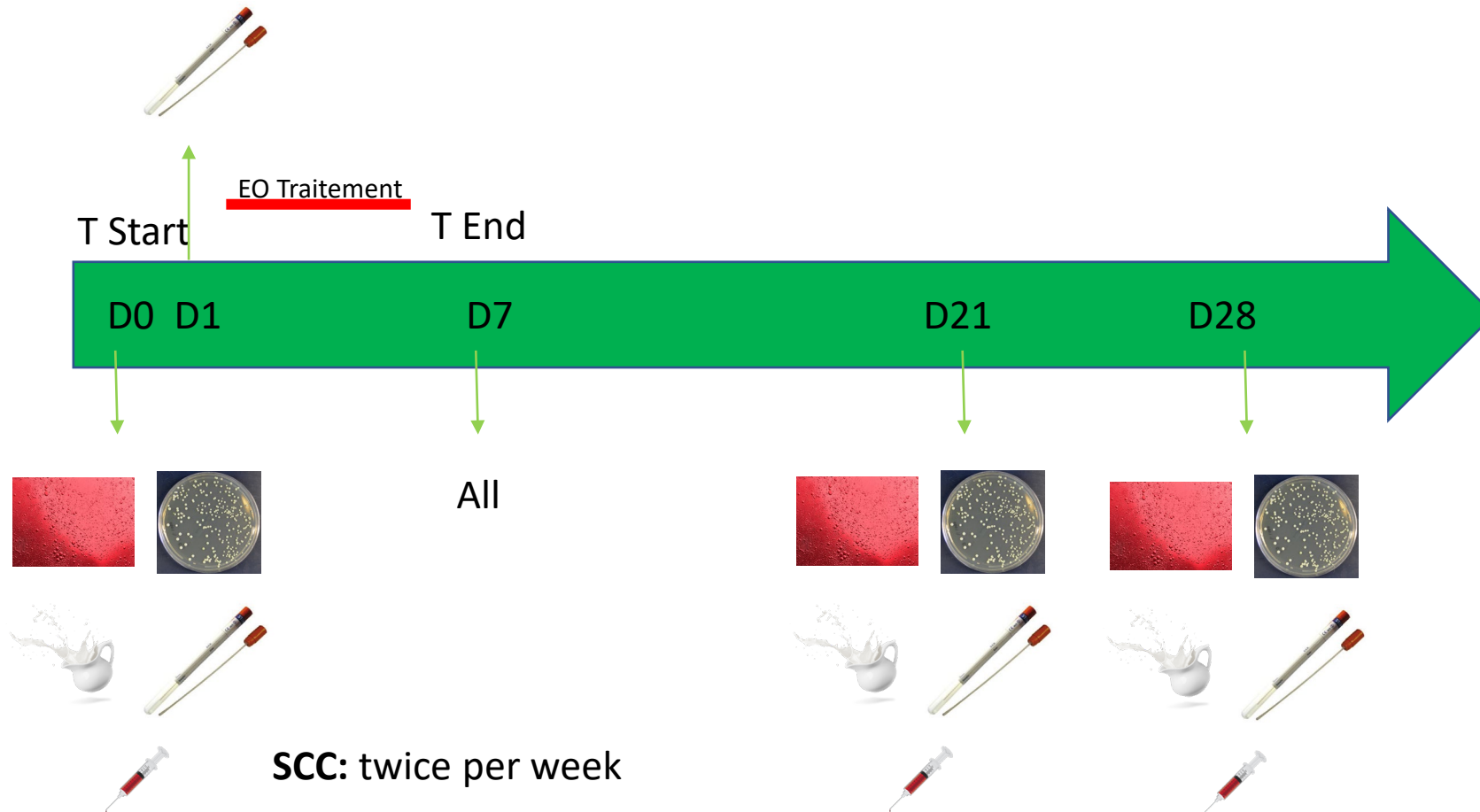
IN VIVO

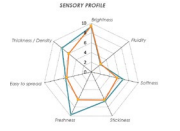
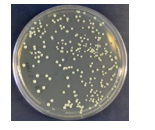




- Study the *in vivo* effects of EO on subclinical mastitis.
- Effects of the treatment on the milk quality and properties.
- Effects of EOs on microbiome

IN VITRO

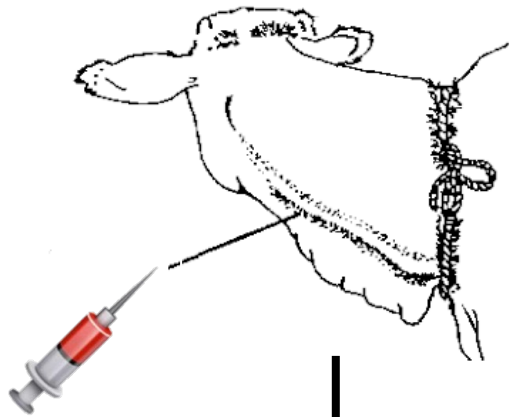
- Effects of EOs on immunitary system and inflammation processes (inflammatory responses of PBMC after stimulation with EOs and toxins)

- 12 cows with subclinical mastitis
- Treatment group (6 cows) : milking grease + *Thymus capitatus* VS Placebo group (6 cows)



| | |
|-----------------------------------|---|
| • Organoleptic analysis |  |
| • Microbiologic analysis |  |
| • Blood analysis + PBMC isolation |  |
| • Technological analysis |  |
| • Milk microbiota |  |
| • Skin microbiota |  |

- Organoleptic analysis and microbiological analysis
- Blood analysis and PBMC (Peripheral Blood mononuclear Cell) isolation: → QPCR to quantify inflammatory cytokine genes (IL1- α , IL1- β , IL4, IL2- β , COX2, IFN, IFN- α , IL6 and IL12- β)
- Technological analysis : Viscosity...
- Milk and skin microbiota, lipidome and transcriptome : UMIL (WP5)



Plasma

White blood
Cells

Red blood
cells

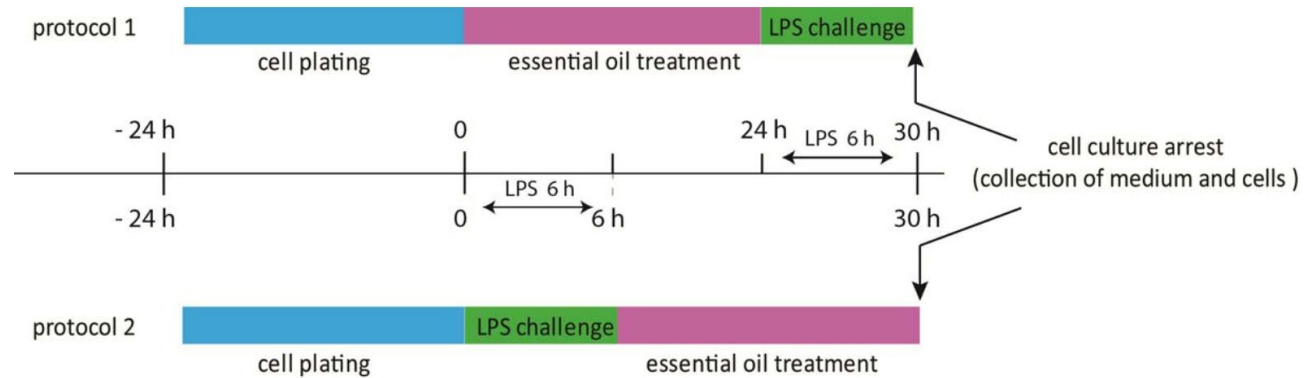


PBMC stimulation



MILLIPLEX®
Bovine
Cytokine/Chem
okine Magnetic
Bead

- Stimulation with thymol, carvacrol, terpinenes, p-Cymene and the combination. (after a MTT essay)
- Stimulation with *Staphylococcus aureus* toxins or LPS (*E.coli*)
- 2 protocols: preventive and curative



Bacteriological results

- D0:

Staphylococcus coagulase negative (SCN) (85% of infections)

+ 2 cases *Corynebacterium* et 1 case *Micrococcus*

| Day | D0 | D8 | D21 | D28 |
|---------------|-----|-----|-----|-----|
| Control group | 0/8 | 1/8 | 1/8 | 2/8 |
| Treated group | 0/8 | 1/8 | 2/8 | 2/8 |

- In some cases: fluctuation in the nature of bacteria (from *SCN* → *micrococcus*)

Somatic cells results

- Slight decrease in the number of somatic cells for both group (non-significant)

| Treatment | SCC Average pre (*1000) | SCC Average post (*1000) |
|---------------|-------------------------|--------------------------|
| Control group | 138 | 137 |
| Treated group | 147 | 141 |

- Non significant difference were detected in SCC post (p=0.766, Type III Wald chisquare tests)

Ongoing in vitro studies and omics

- microbiome, lipidome and transcriptome : WP5
- Inflammatory and immunity response and mechanism of action of EOs (determine gene and protein candidate for targeting EOs)
- Encapsulation of EOs
- Rheological studies

Issues

- French legislation → *Thymus capitatus* over the 10 EOs → change the route of administration for in vivo studies...

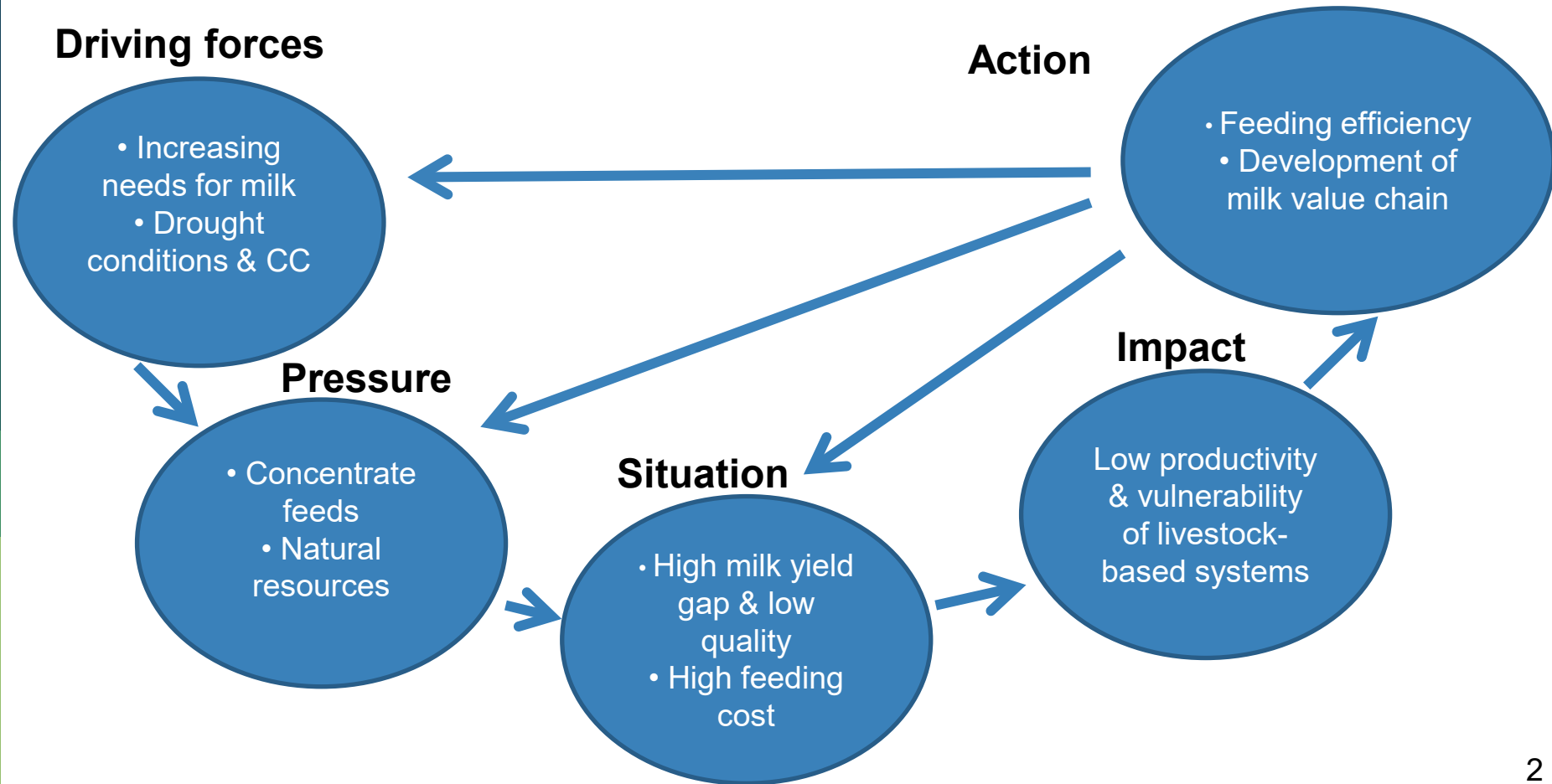
Thank you



Dairy cattle response to the administration of essential oils: Milk yield & quality

*MILQUA Project – PRIMA2
INRAT & INAT contribution*

Italy, 27-29 Septembre 2021



Hypothesis – The essential oils of *Thymus capitatus* (EOT) favorably modify rumen microbial populations, thus enhance the efficiency of ruminal fermentation and improve nutrient utilisation in dairy cattle.

Objective – To evaluate the response of dairy cattle to daily administration of EOT in terms of digestion, milk production and fatty acid profile.

Experimental design & feeding – Two groups of dairy cattle ($n = 18$) (Initial milk yield 30.3 ± 3.6 kg/d , average BW 550 ± 42.3 kg) / 15 days adaptation + 30 days measurements / Receiving Total Mixed Diets

- **Diet control (CON):** Oat hay (2.68 kg DM) + Silages (9.24 kg DM) + Concentrate (10.8 kg DM)
- **Diet experimental (EOT):** CON + 6 ml/day/head EOT

First results

- Numerical increase ($P > 0.05$) of milk yield in EOT-group (CON = 30.0; EOT = 30.3 kg/cattle/day)
- EOT administration had no effect on SFA, MUFA, PUFA
- EOT decreased fat & protein contents and w3/ w6 ($P < 0.05$)

Challenges

- COVID-19 since March 2020 (total/partial confinement, interdiction/restriction of moving from a province to another, etc.)
- Research at Private farms should not bother normal functioning of the farm mainly dari farms
- Agricultural Research centres in Tunisia haven't experimental cattle's flock

Constraints

- Complicated procedures & time-consuming fund's management by ANPR (e.g. the provider of essential oils used in the current experiment is waiting since a year to be paid by ANPR, a private veterinary who took blood samples and made health control of the experimental cattle hasn't received yet his fees
- The manager of the private farm refused the individual housing of the experimental cattle making impossible the determination of individual feed & diet intakes

On-going activities under WP4-MILQUA

- Many research studies on the administration of EOs on dairy cattle and ewes and the current experiment didn't show any significant effect on diet intake
- INRAT is ready to share milk samples for analysis of volatile compounds
- INRAT will start soon a second experiment on the effect of alternate day administration of EOs on milk yield and quality

Post-project collaboration INRAT-MILQUA team

- INRAT would be pleased to collaborate more with MILQUA team
- Recommended topics:
 - Enhancing milk production & quality with the administration of a combination of secondary compounds (e.g. EOs-saponins, EOs-Tannins, Tannins-Saponins, etc.)
 - Feed-milk safety (e.g. fungi & mycotoxin-free feeds and milk)