Precision Livestock Farming in farmers practice

Precision livestock farming for dairy cows in a Protected Designation of Origin (PDO) system: a case study-application

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Content

Introduction

CREA and PLF: from automatic milking to heat stress monitoring

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Welfare Assessment Based on Metabolic and Endocrine Aspects in Primiparous Cows Milked in a Parlor or with an Automatic Milking System*

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Milk Quality and Automatic Milking: Fat Globule Size, Natural Creaming, and Lipolysis*

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Effect of Automatic Milking Systems on Milk Yield in a Hot Environment

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Evaluation of Milk Enzymes and Electrolytes, Plasma Metabolites, and Oxidative Status in Twin Cows Milked in an Automatic Milking System or Twice Daily in a Conventional Milking Parlor

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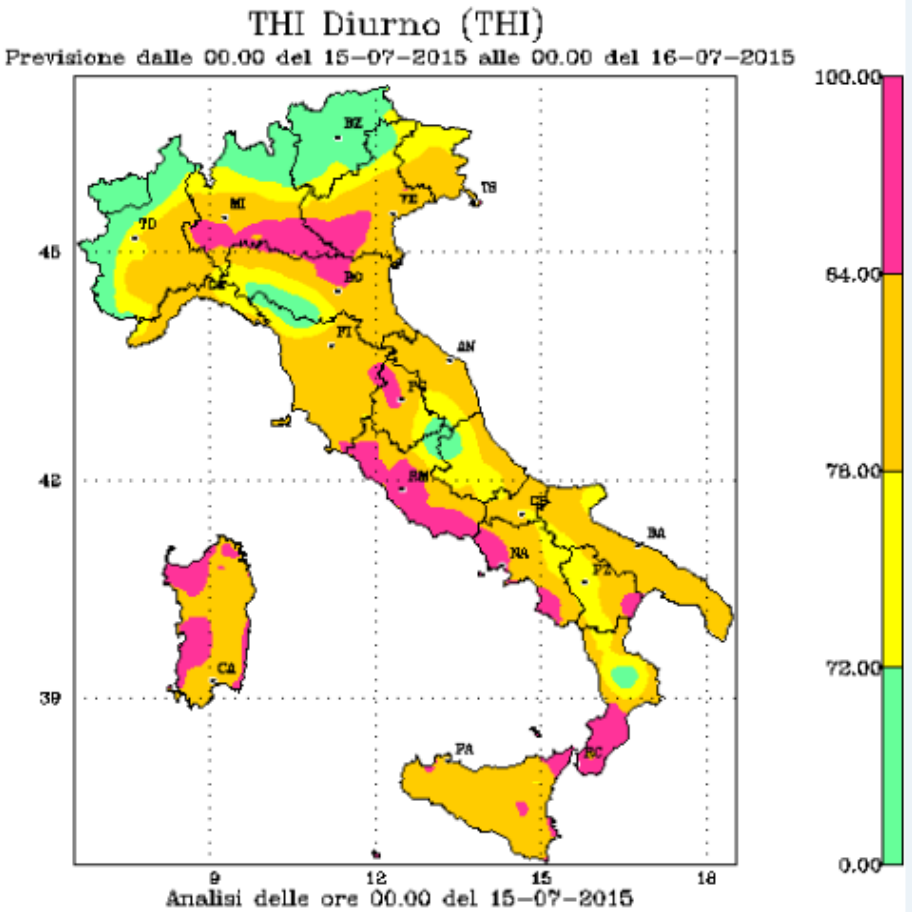
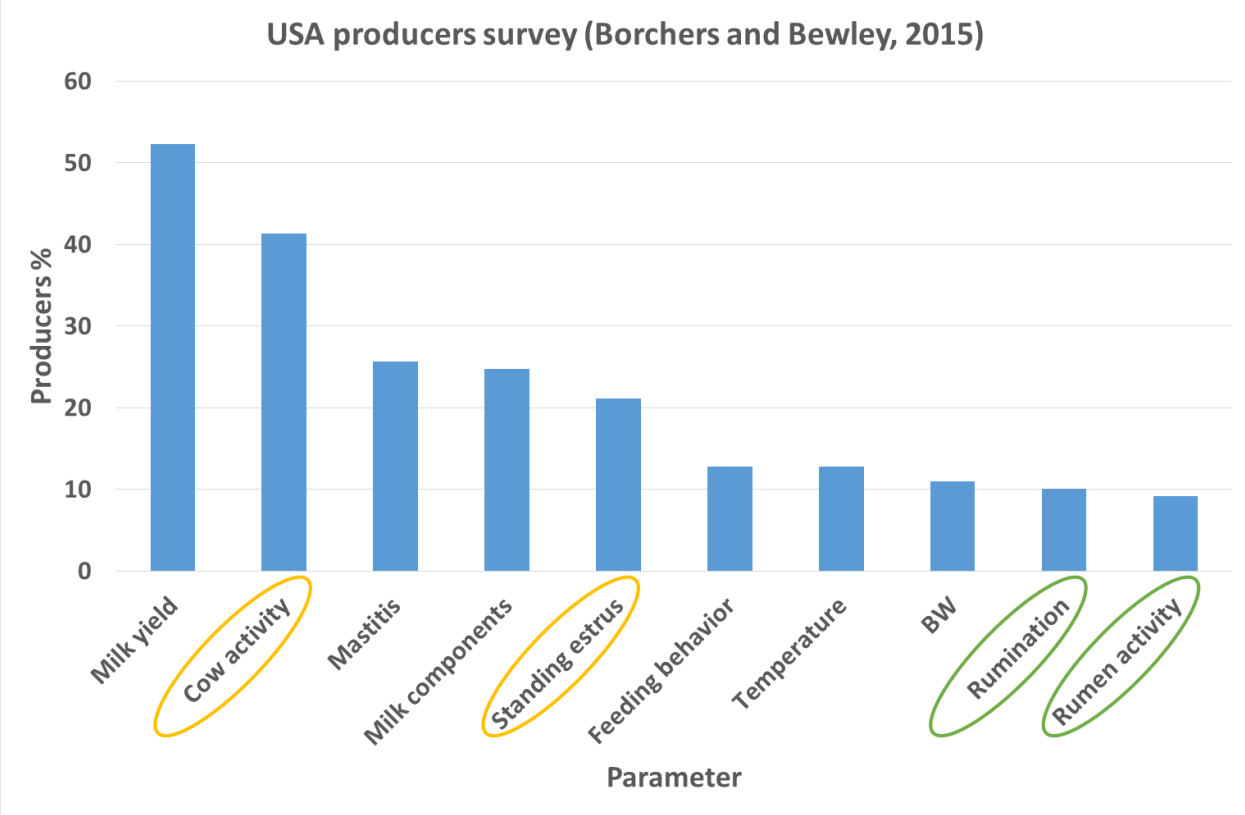


Introduction

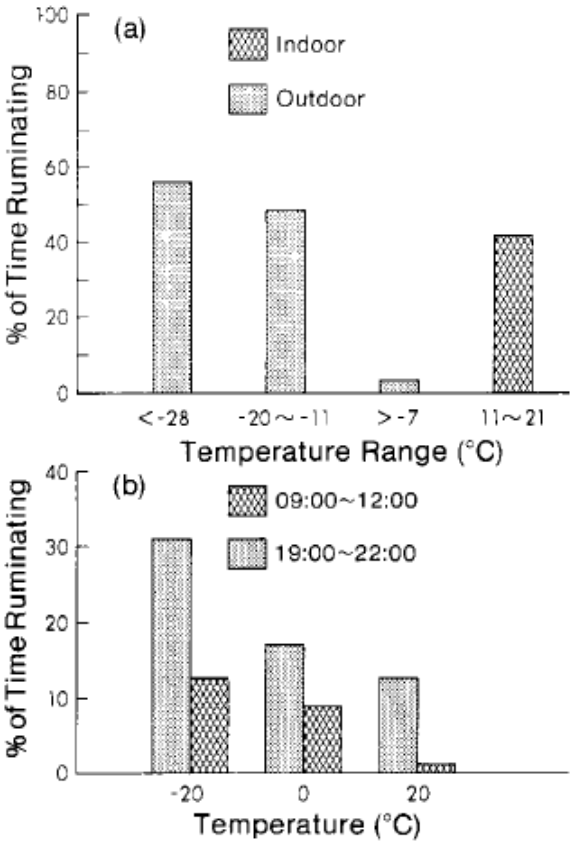
Main tools for dairy cattle PLF (Hady et al., 1994; Borchers and Bewley, 2015; Titler et al., 2015)

Days to first service: **80 → 60 d** + Efficiency of detected estrus: **50 → 60 %** (detecting estrus is the major limitation to achieving a pregnancy) + Conception rates: **35 → 50%** = In a 300-cow dairy herd → **increased net income $ 18,485**



Introduction

Heat stress and PLF in dairy cattle (Christopherson and Kennedy, 1983; Soriani et al., 2013)



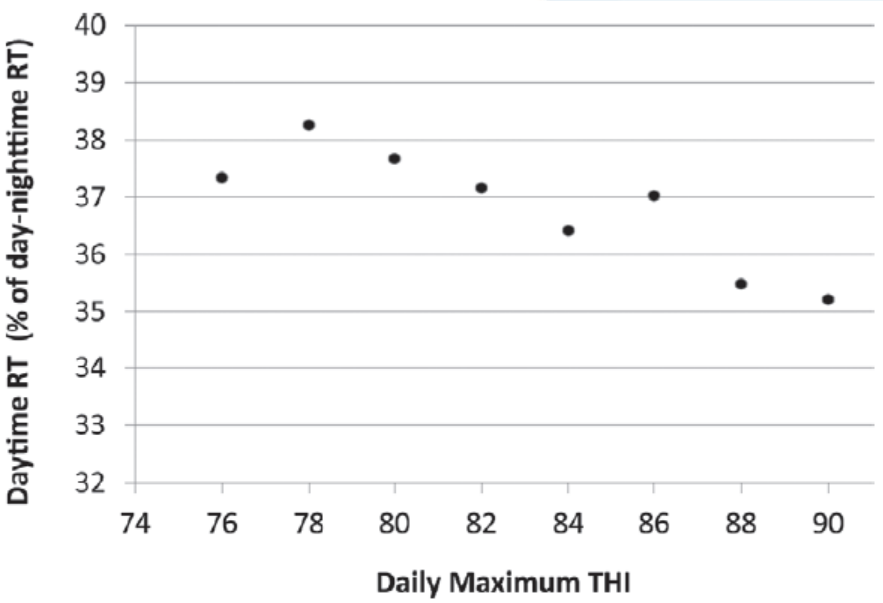


Figure 5. Relationship between daytime rumination time (RT; % of day-nighttime rumination time) and maximum temperature-humidity index (THI) (r = 0.84; $P < 0.01$). Each symbol represents the average value of the percentage in classes of THI according to 2-unit intervals of THI.

Aim

To report a case-study on the application of PLF to manage heat stress related problem in PDO dairy farming

Material and Methods

Location and animals: barn and management

Herd: 58 lactating dairy cows

«Baroncina» experimental farm, Lodi; 87 m a.s.l., Lat. 45°18'52"20 N, Lon. 09°30'14"04 E

Free stall barn, with forced ventilation

Tools: the meteorological station

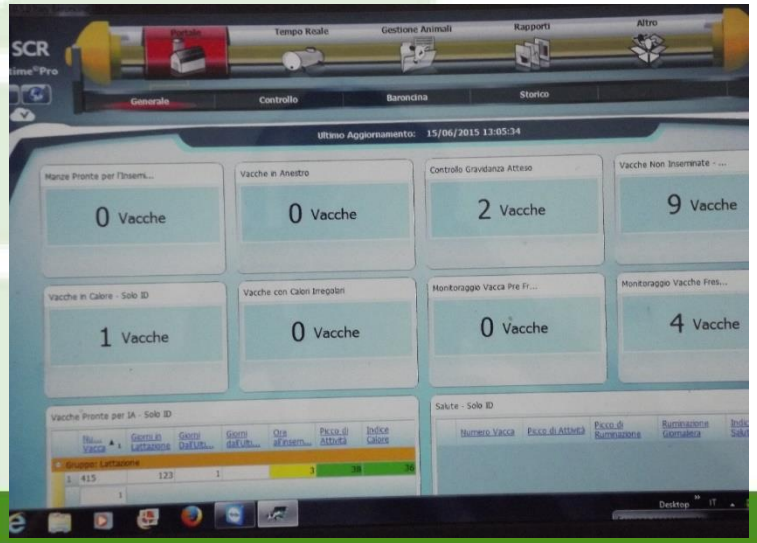
Material and Methods

Tools: the TMR on-line analysis system (Dinamica Generale + Sgariboldi)

Material and Methods

Tools: the SCR-SIVAM system

SCR Heatime® HR System



Material and Methods

The conceptual framework

Diet formulation

Cow data
-rumination
-activity

Climate data

Material and Methods

Location and animals: the data set

3 groups selected according to DIM at the beginning of summer:

a. Early lactation (15-84 DIM)
b. Around peak of lactation (85-154 DIM)
c. Plateau phase (155-224 DIM)

For each record:

Calving date – Parity – Reproductive stage (open, inseminated, pregnant)

Rumination data: minutes/2 h; total day-time rumination minutes (from 08:00 to 20:00); total night-time rumination minutes (from 20:00 to 08:00)

Activity data: activity acts/2 h; total day-time activity acts (from 08:00 to 20:00); total night-time activity acts (from 20:00 to 08:00)

Statistical analysis

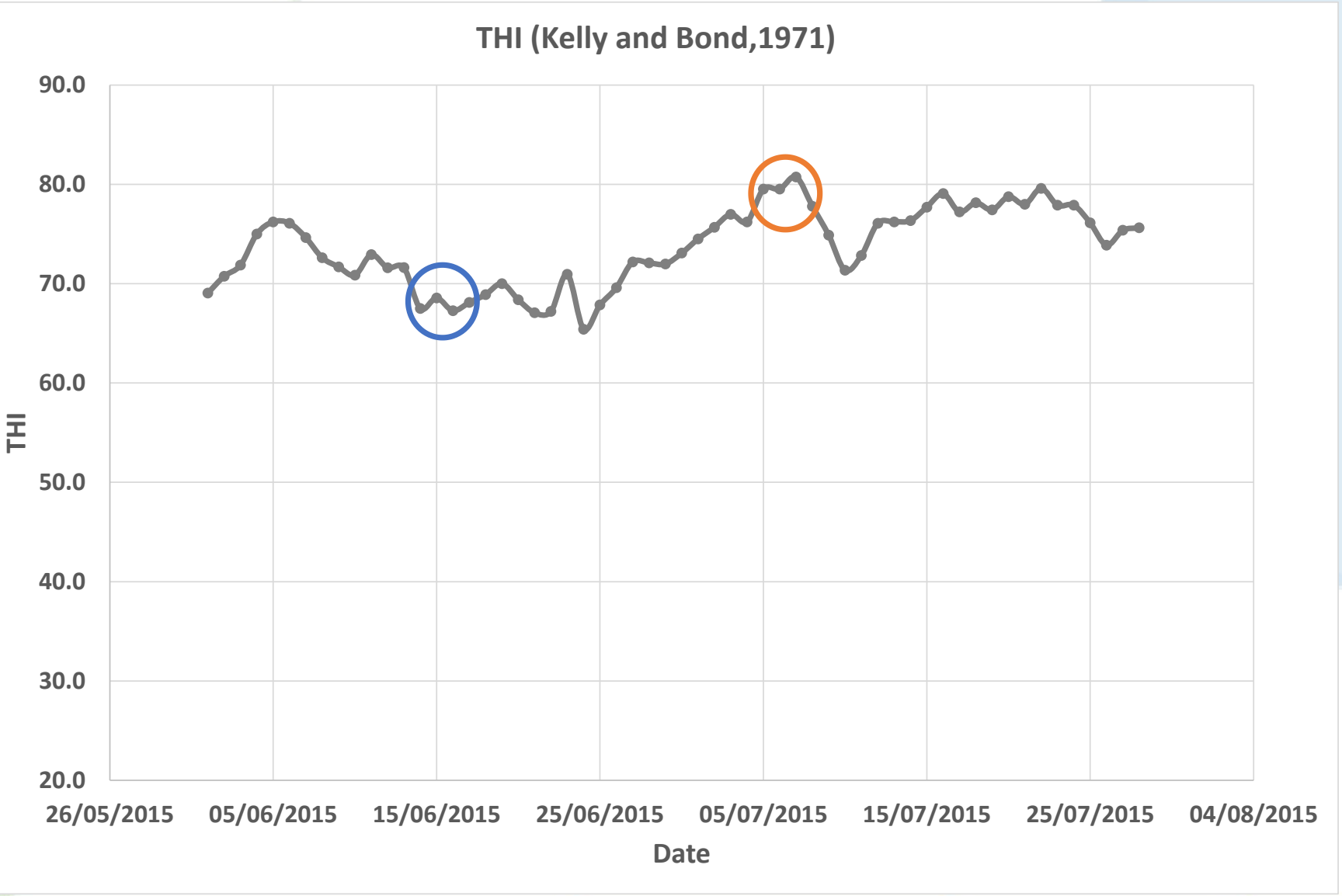
2 ANOVA

$Yi = \mu + a(day) + b(lactation\ stage) + c(day \times lactation\ stage) + A[cow(day \times lactation\ stage)i] + ei$ (for daily records)

$Yi = \mu + a(day) + b(lactation\ stage) + c(time\ of\ the\ day) + d(day \times lactation\ stage) + e(day \times time\ of\ the\ day) + f(lactation\ stage \times time\ of\ the\ day) + A[cow(day \times lactation\ stage)i] + ei$ (for hourly records)

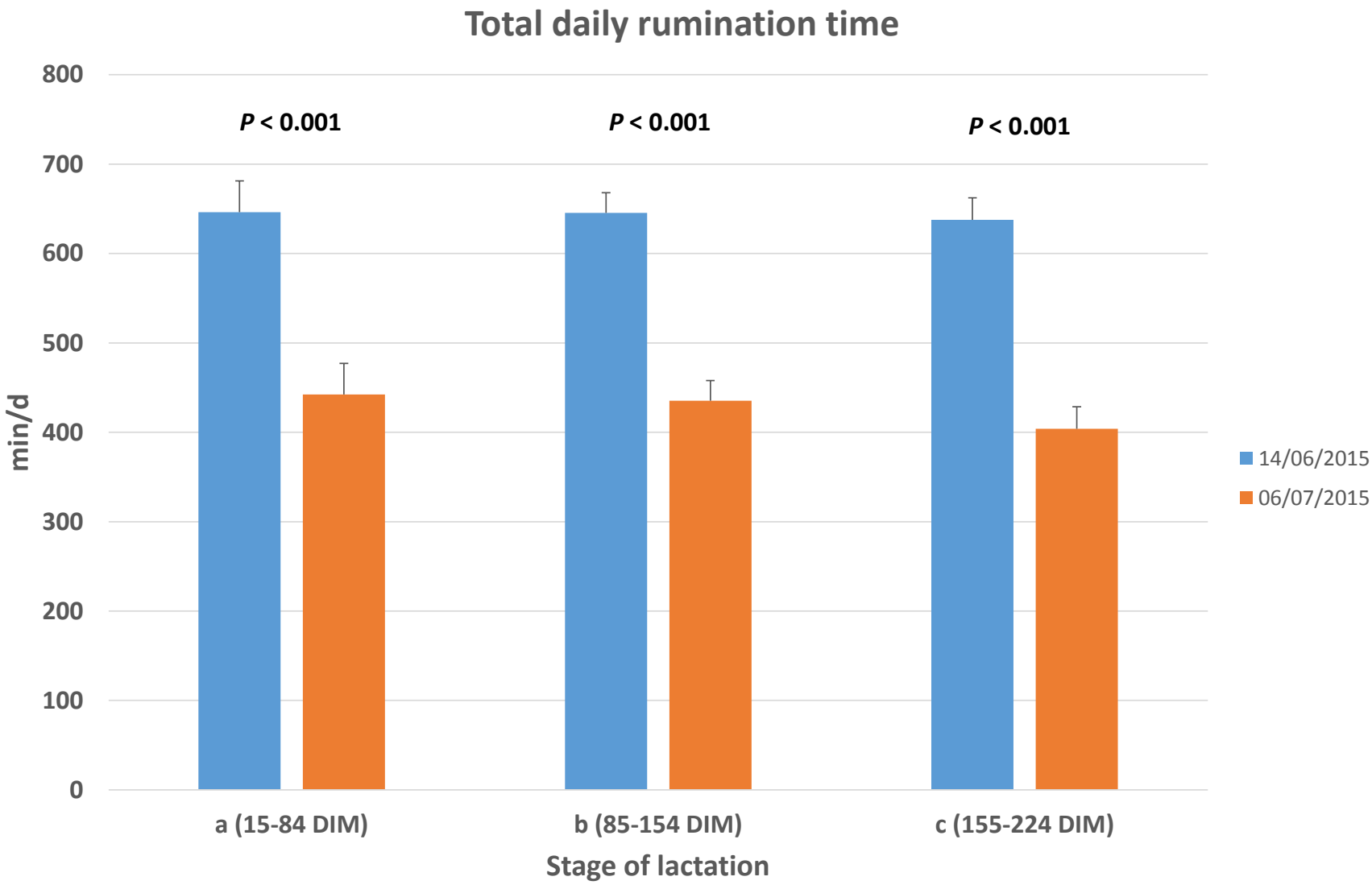
Results and Discussion

Climate data



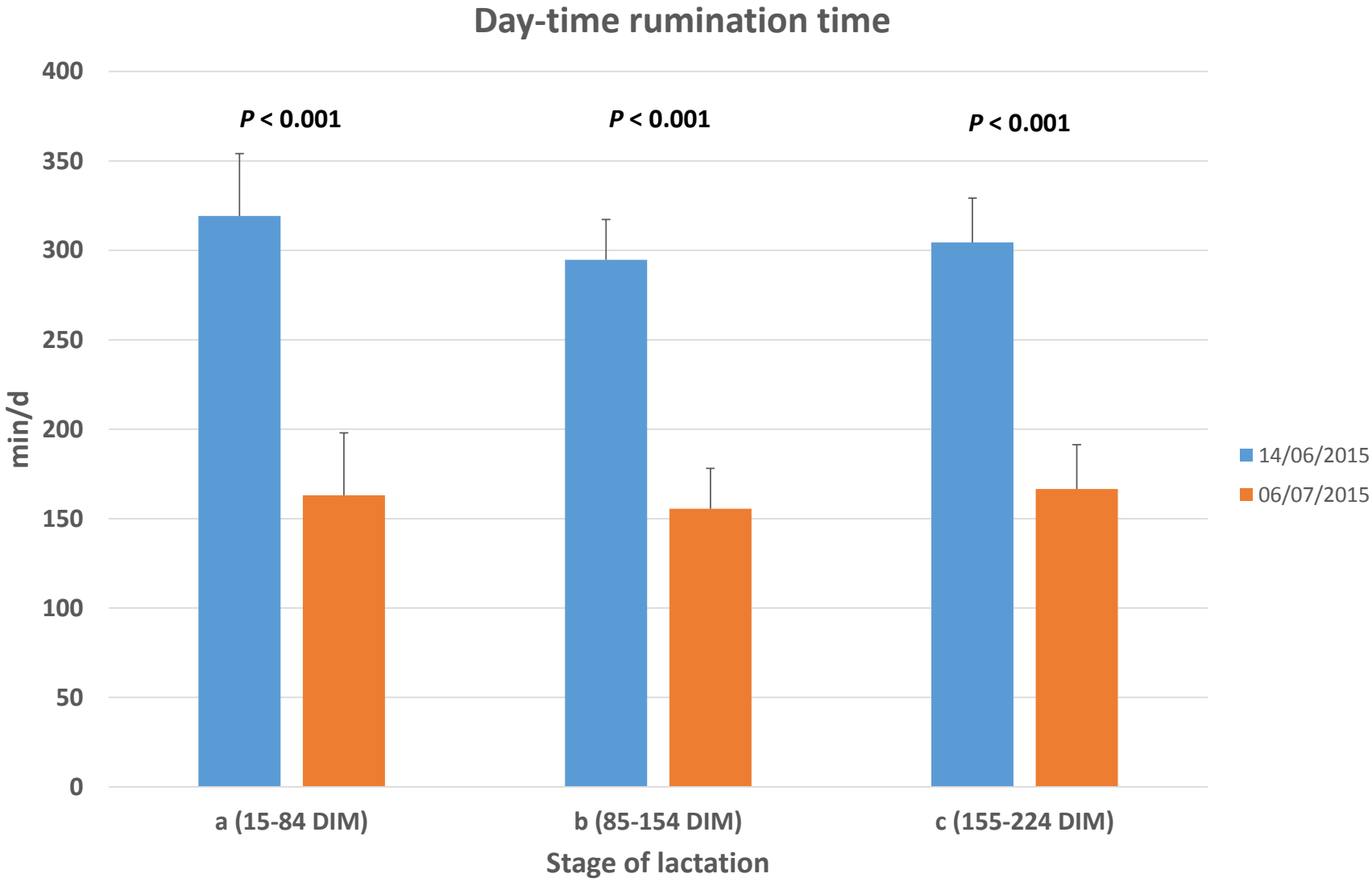
Results and Discussion

Rumination data



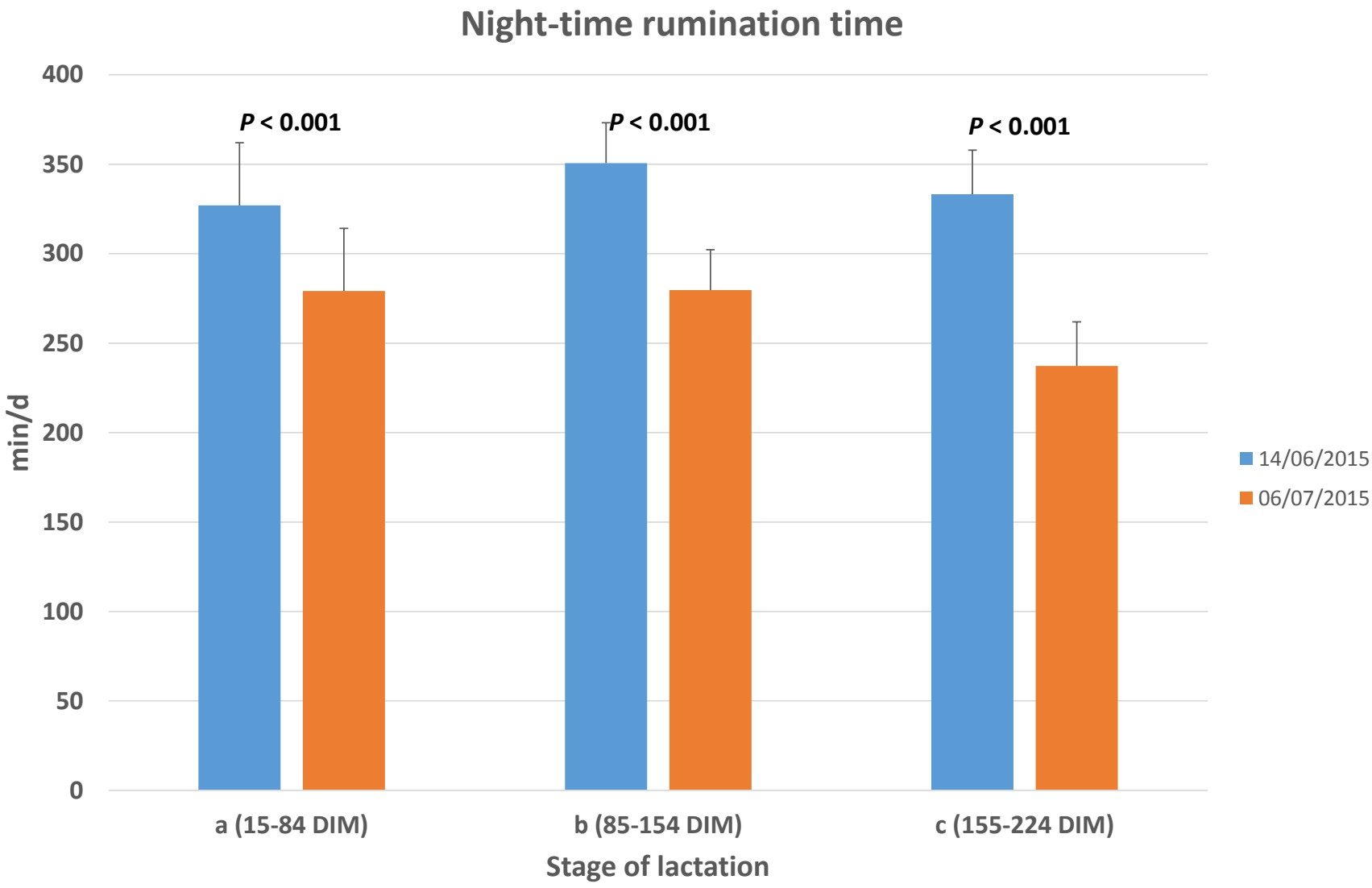
Results and Discussion

Rumination data



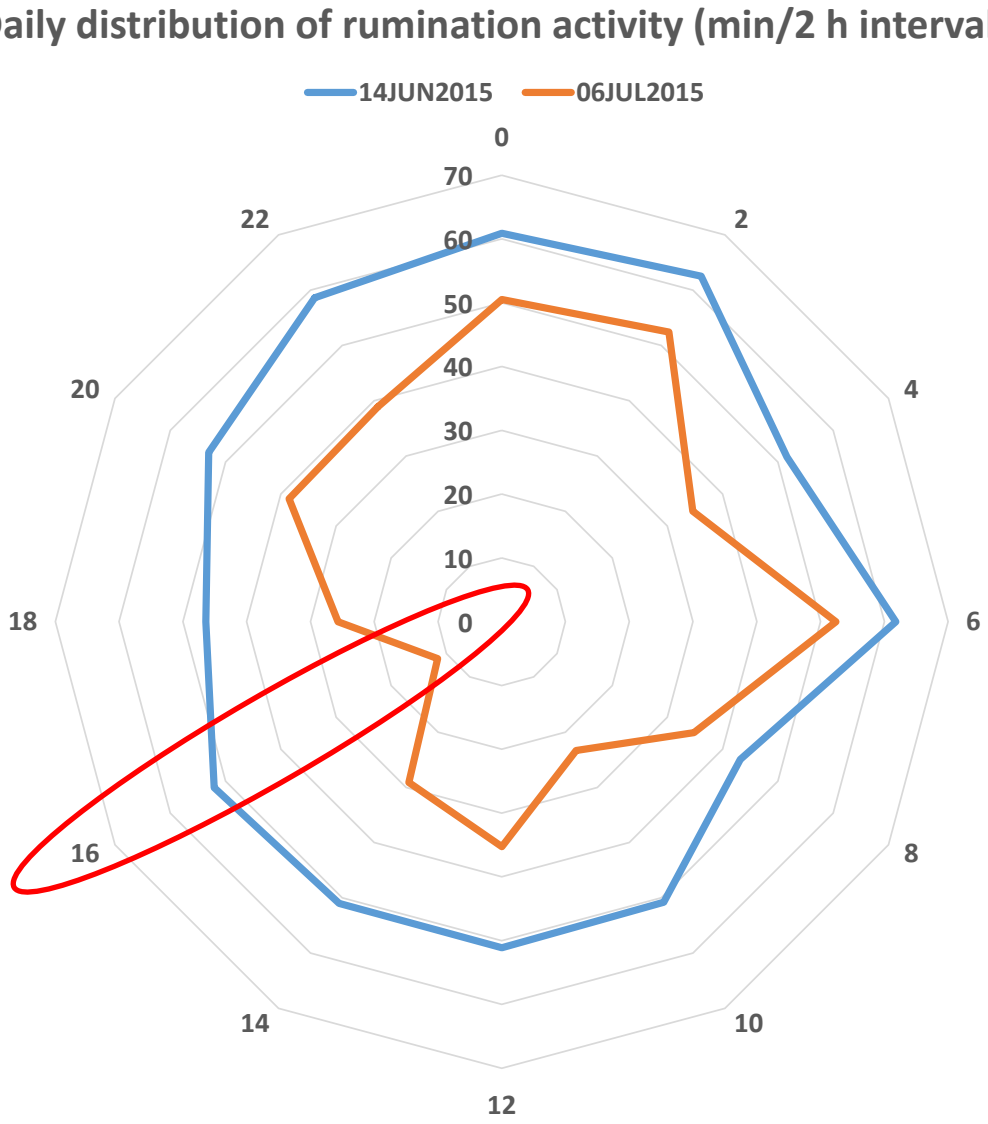
Results and Discussion

Rumination data



Results and Discussion

Rumination data



Max discomfort

Results and Discussion

1. Climate effect on rumination

- ~ 30% reduction in all the stages of lactation during heat stress vs. thermoneutrality
- Reduction concentrated in day-time, less severe in night-time
  - Confirming Soriani et al. (2013)

2. Climate effect on production

- ~ 15% reduction during heat stress vs. thermoneutrality

Conclusion

- From a PLF perspective, we can try to differentiate 2 TMR in a day: one for the night-time (higher rumination) and one for the day-time (lower rumination)

- Further PLF tools would aid us to reduce the negative impact of heat stress on summer milk production, namely for PDO cheeses requiring a higher milk quality for the curd forming process

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FIS