Prospects of local sheep & goat breeds for sustainable farming in a changing mediterranean region

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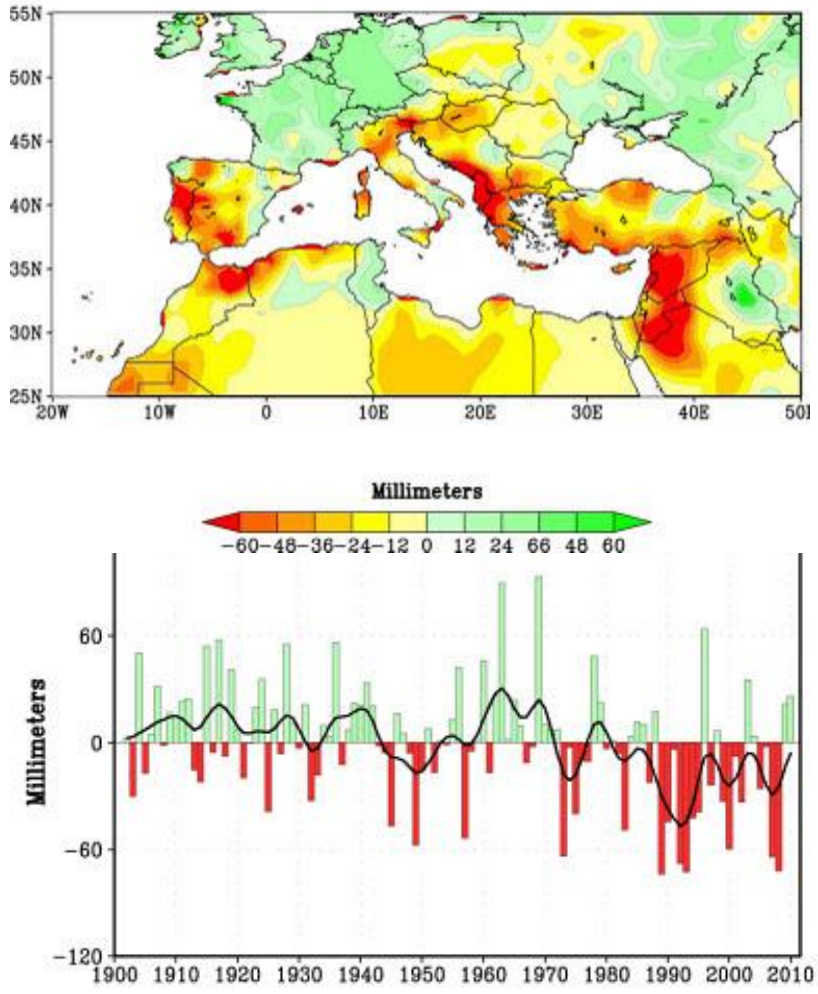
Changing Mediterranean climate?

Drought & Rainfall in the mediterranean

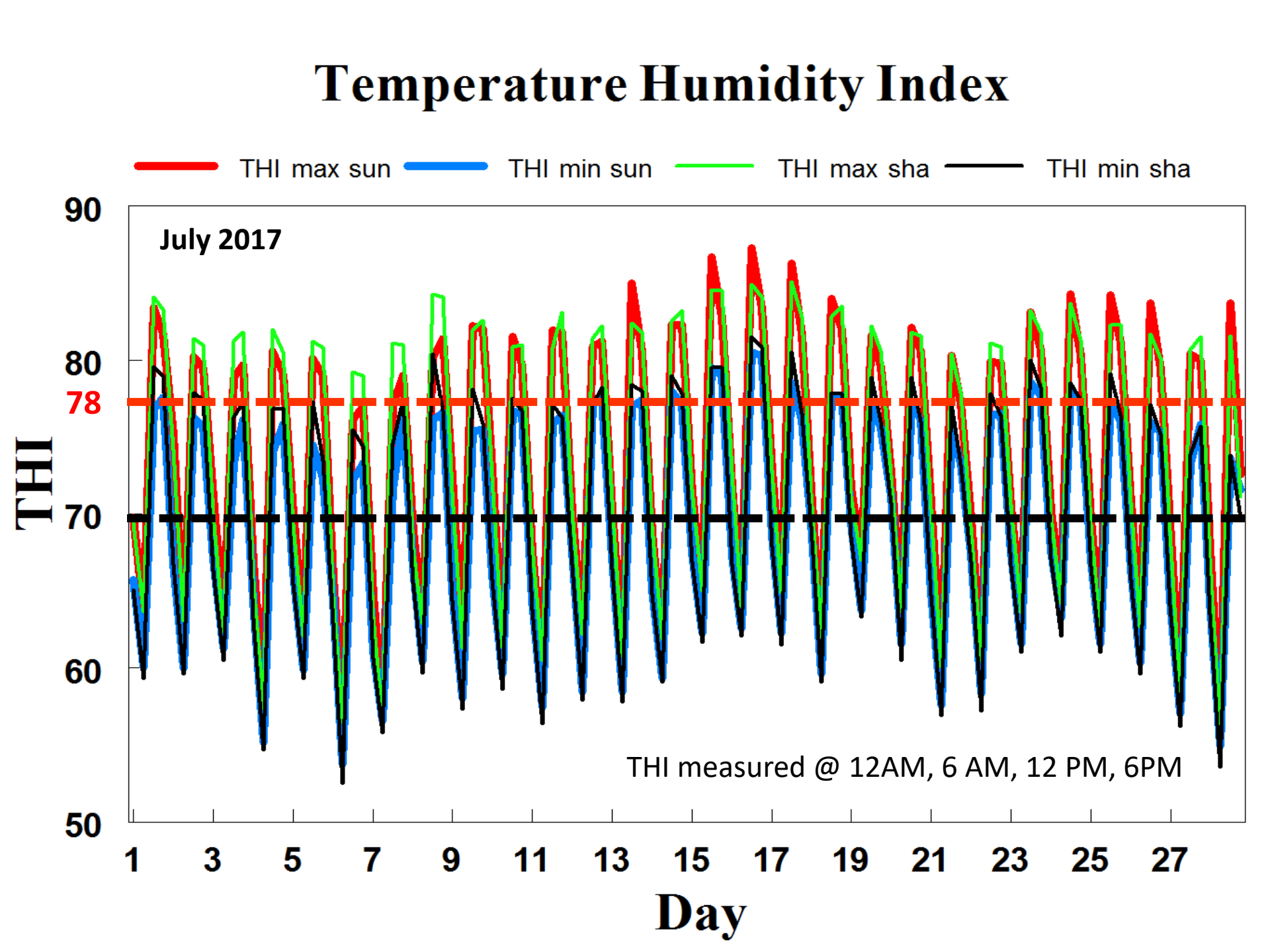


Source: US National Oceanic and Atmospheric Administration, 2011.

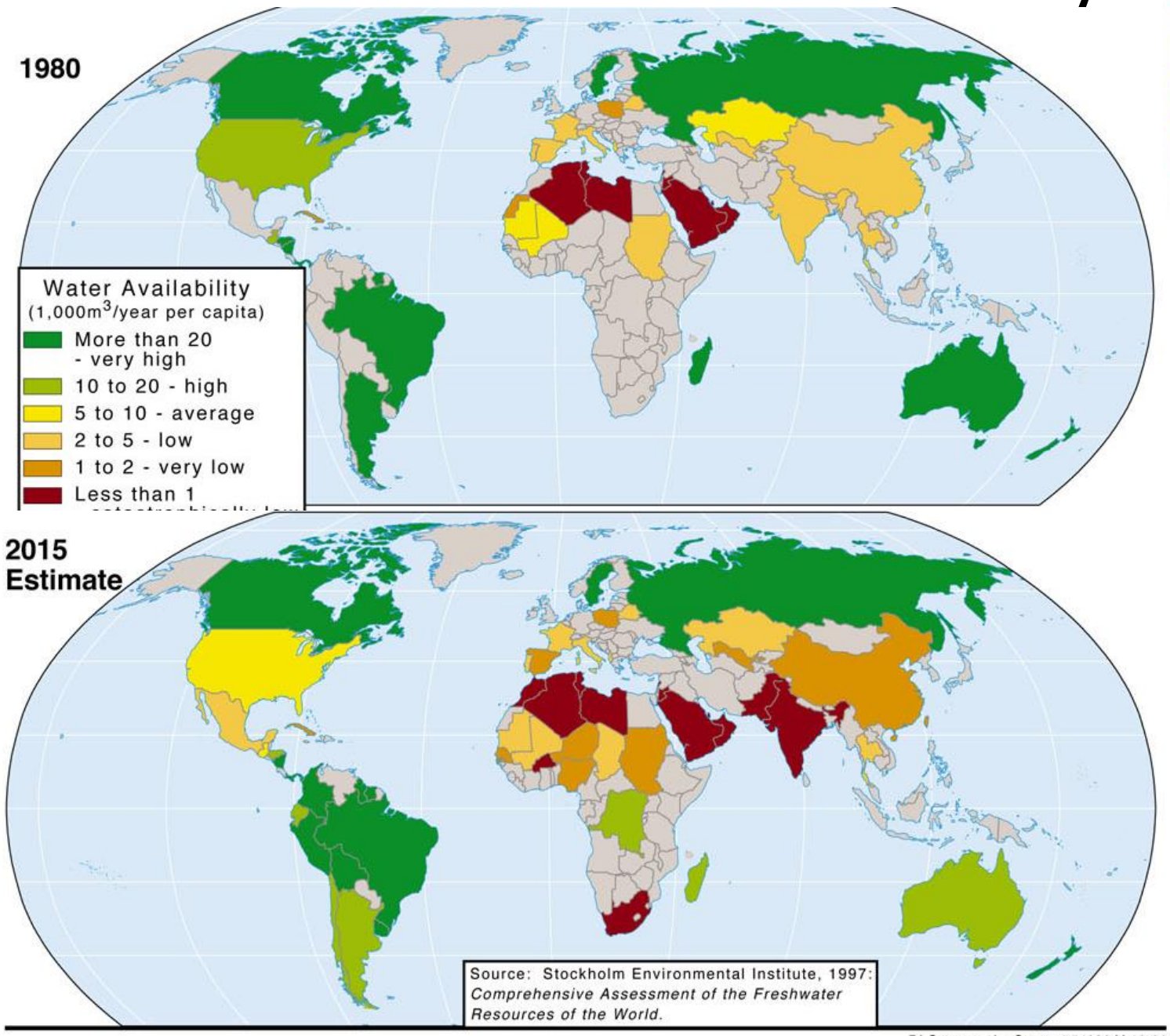
Lebanese estimates for climate change

in Lebanon	2040
Temperatures	↑ 1 to 2ºC
Rainfall	↓10-20%
Drought periods	↑ 9 days
snow cover	↓ 40%
Snow fall Limit	1500m
Sea levels (20mm/year)	↑ 30-60 cm

Source: Lebanese Ministry of Enviroment, 2015.

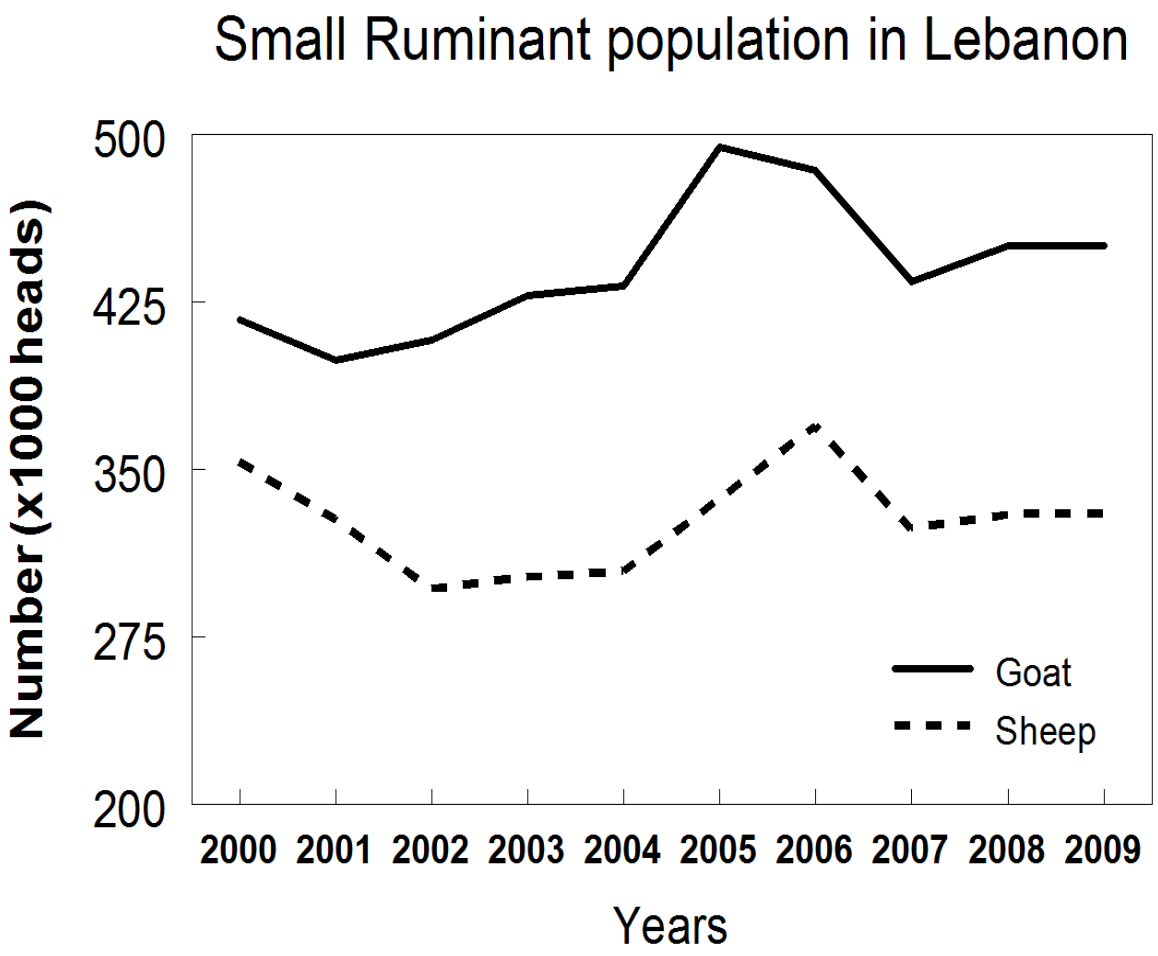

Temperature Humidity Index
THI max sun
THI min sun
THI max sha
THI min sha
July 2017
THI measured @ 12AM, 6 AM, 12 PM, 6PM
THI
Day
90
80
78
70
60
50
1
3
5
7
9
11
13
15
17
19
21
23
25
27

World Water availability



Water Availability
(1,000m3/year per capita)
More than 20
- very high
10 to 20 - high
5 to 10 - average
2 to 5 - low
1 to 2 - very low
Less than 1
- catastrophically low
No data

Breeds & population in Lebanon



	1999
Awassi	378050
Local*	217983
Shami	65395

*recent rise in goat numbers is mainly due to an increase in Saanen and other intensive dairy type goats

LMA survey in 2010 did not classify SR into breeds

Status of Local Breeds

	Local Awassi	Baladi Goat
Lambing rate	80 %	150 %
Weight (Kg)	35-55	25-35
Milk (Kg)	40-80	100-200
Main Use	Meat & Milk, wool	Milk & Meat
Longevity (years)	3-5	3-6
Regulations	++	--

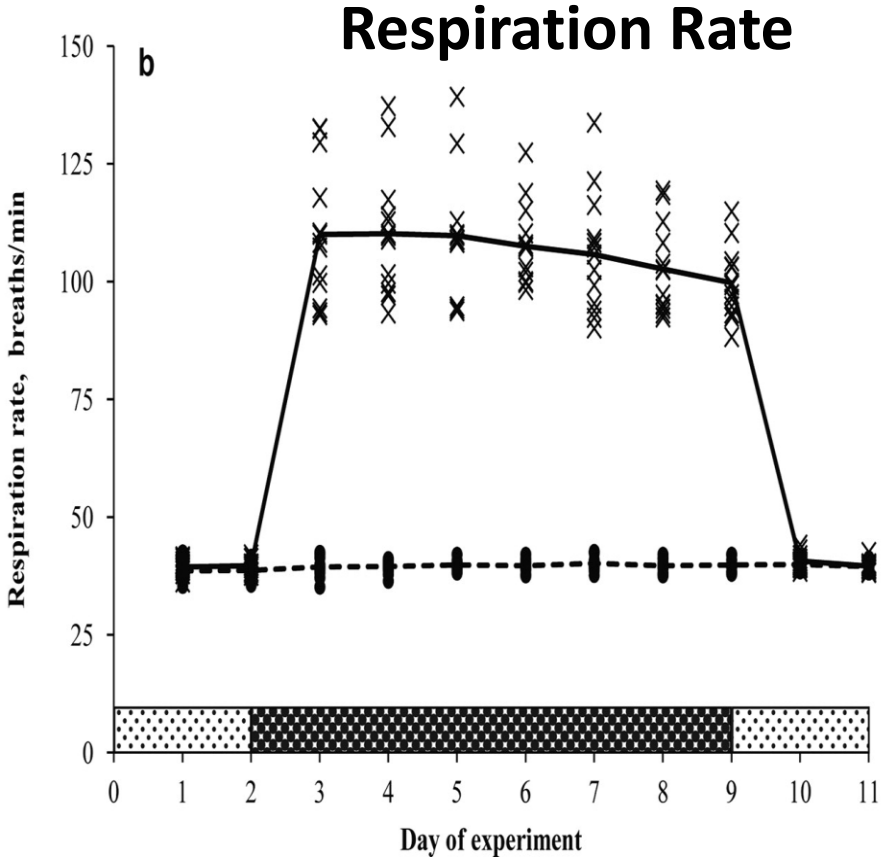
Information on characterization of breeds in Lebanon and assessment of risks to genetic diversity

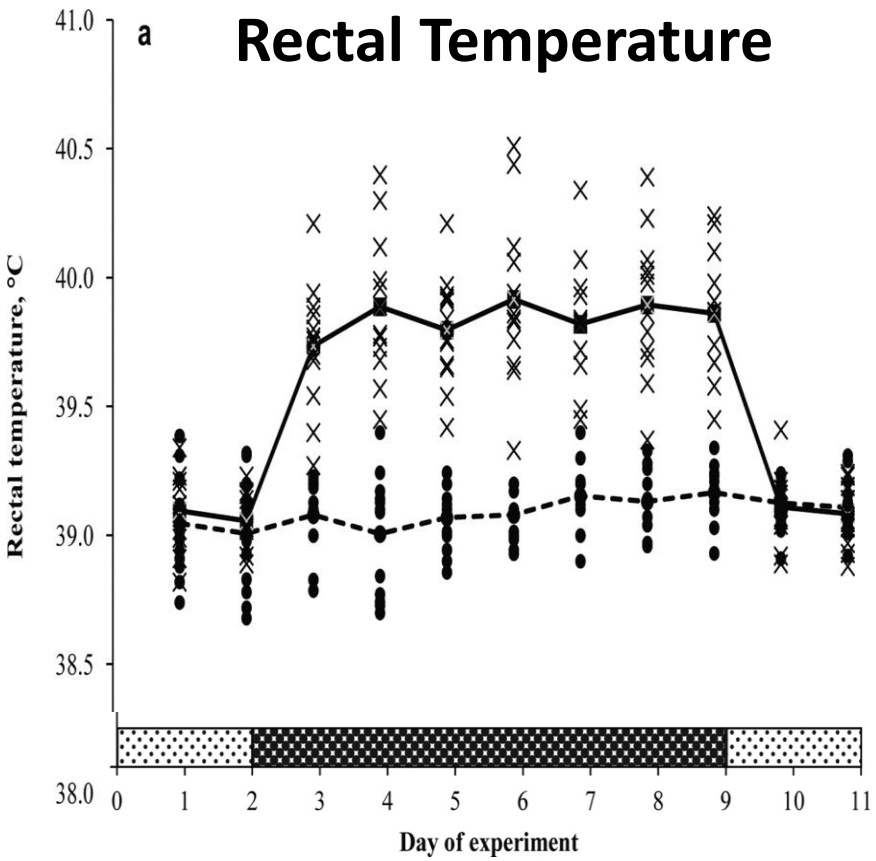
Breed	Documented information	Degree of risk of threat	Comments
Awassi Sheep	Available, limited studies	Low	Conditions for inbreeding are possible in small flocks
Mountainous/Baladi Goat	lack of studies	Medium	Indiscriminate crossbreeding with Shami to improve twinning and milk production that could end in breed substitution
Shami Goat	Available, limited studies	Low	Herd size is small (2-25), risk of inbreeding is high. Population is increasing in view of the breed's ability to produce milk

Performance of Local Breeds under Harsh conditions

- Increased temperature, solar radiation
- Decreased precipitation
  - ➔Poor water quality
  - ➔Lack of natural watering station during travel
- Feed and pasture quality and availability (Travel time for grazing)
  - Dependence on agricultural by-products has increased
  - Large single crop fields has increased
  - Diversification of grazing means increased travel time

7-day heat stress – Merino whethers

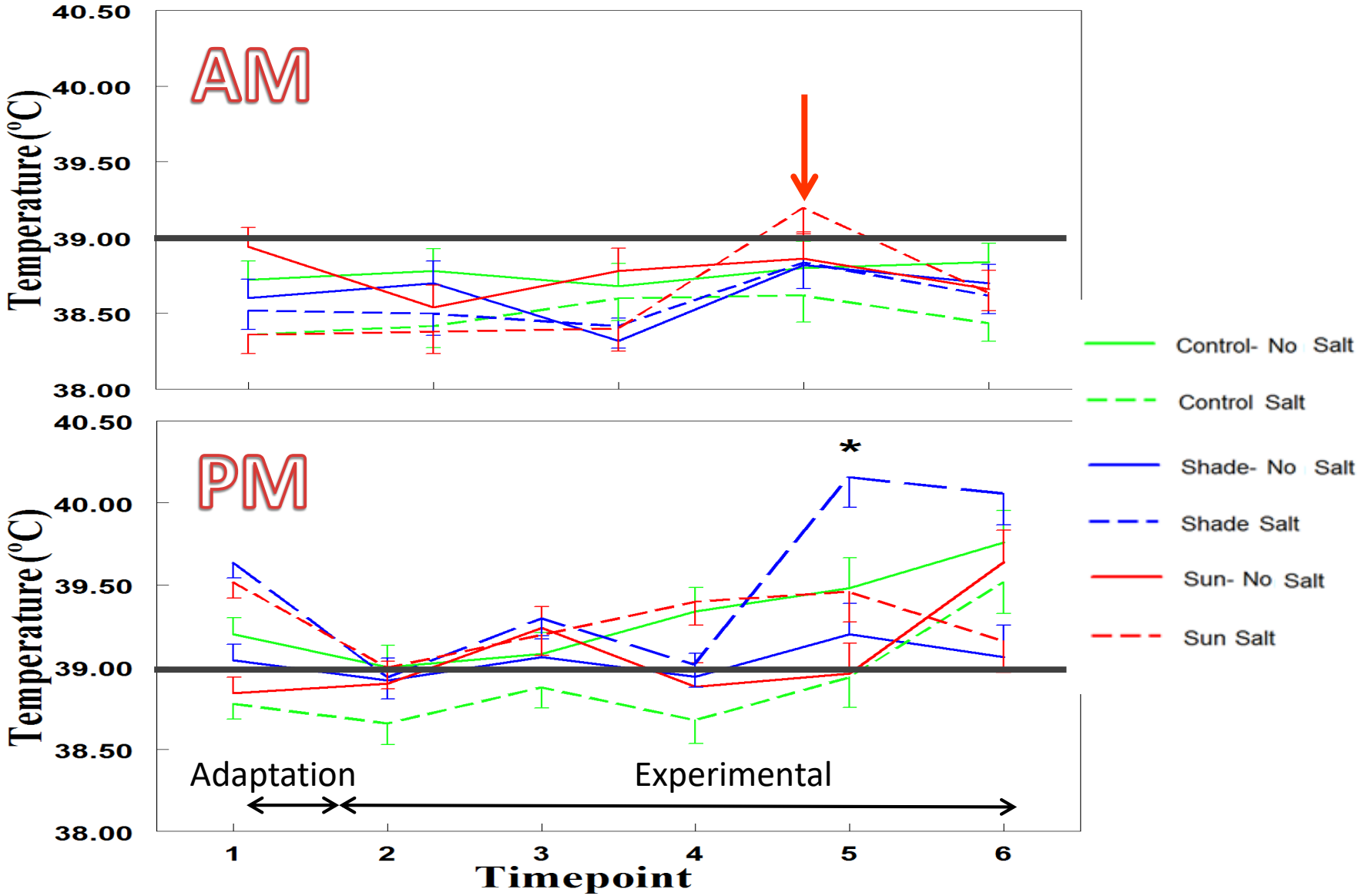




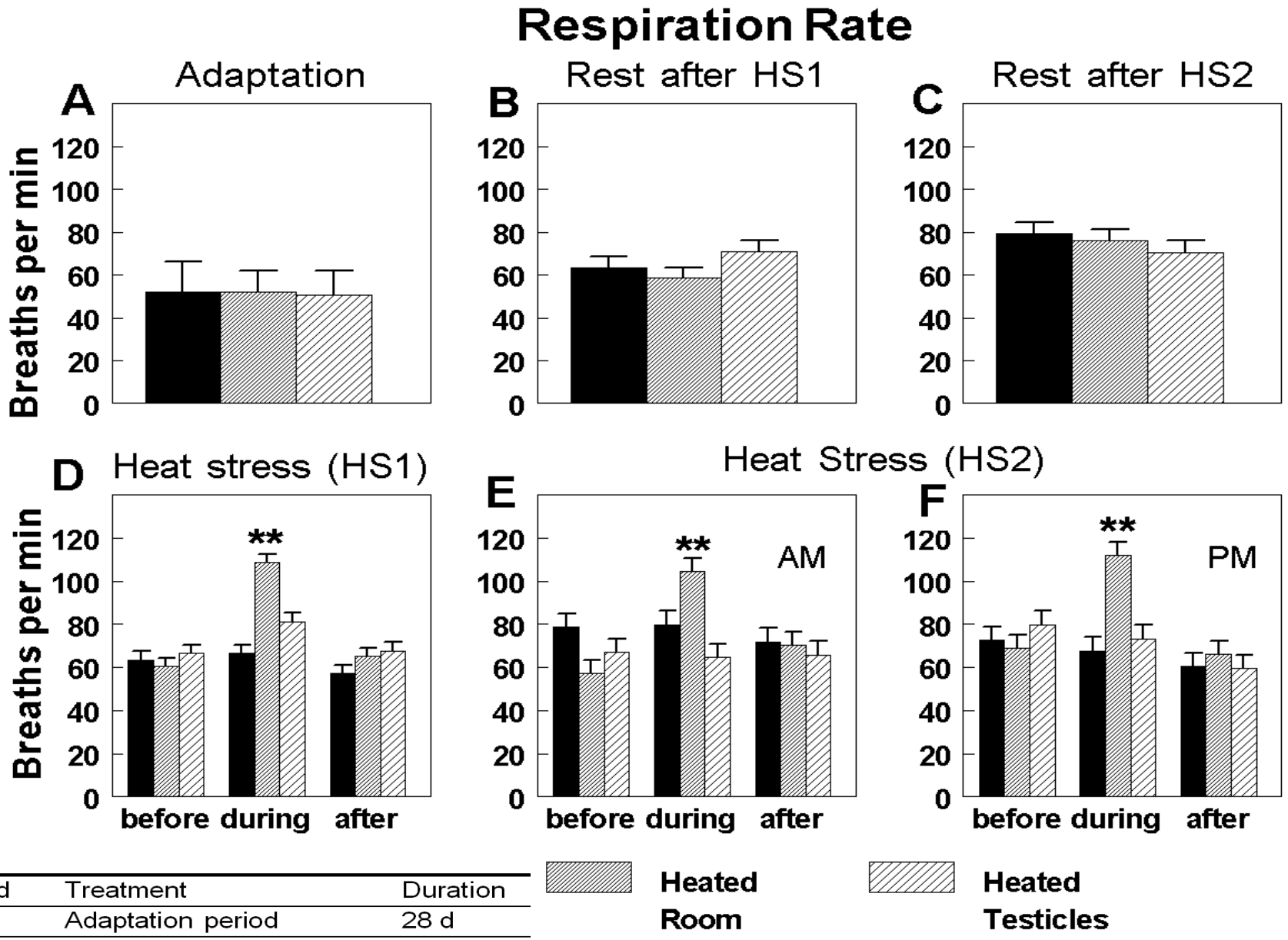
X hot conditions; •, thermoneutral conditions

Al Hidari et al., 2012. J Anim Sci 90: 212-220

Rectal Temperature



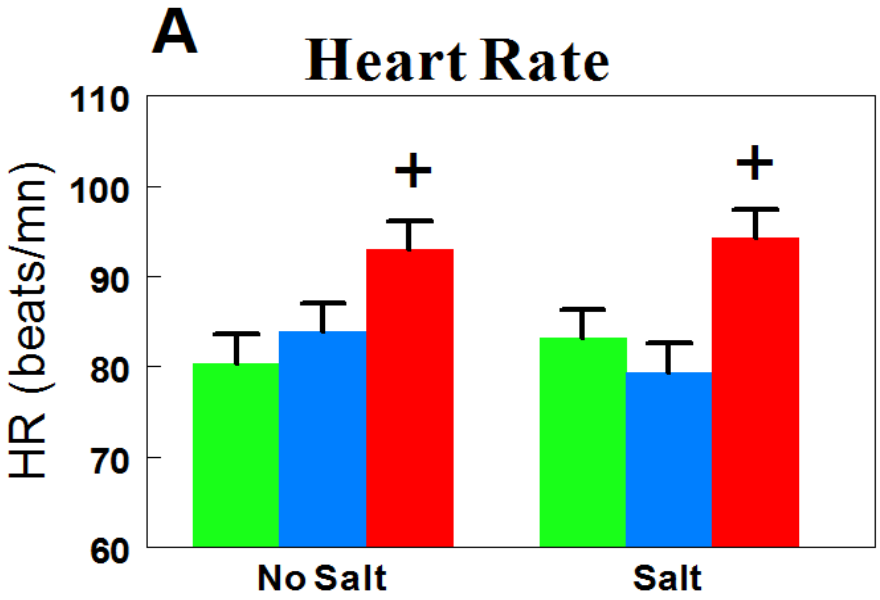
El Masri et al,. 2017, asas annual meeting. Paper in preparation

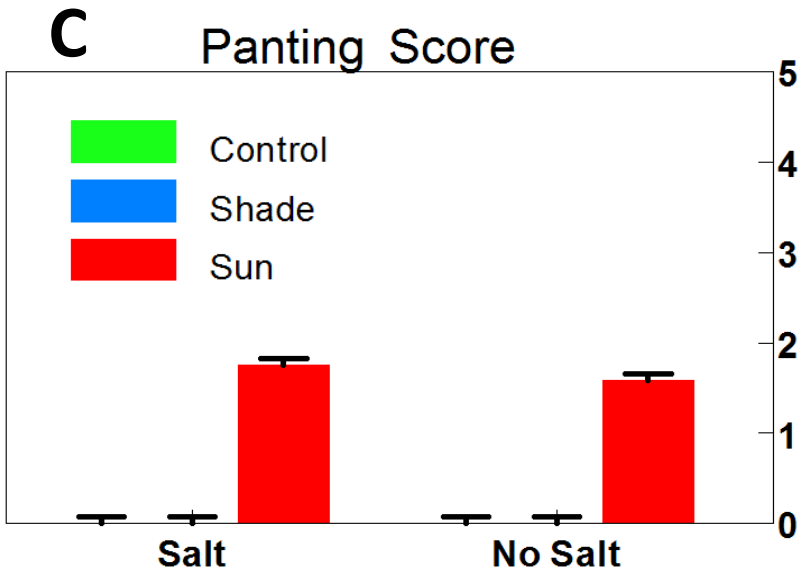


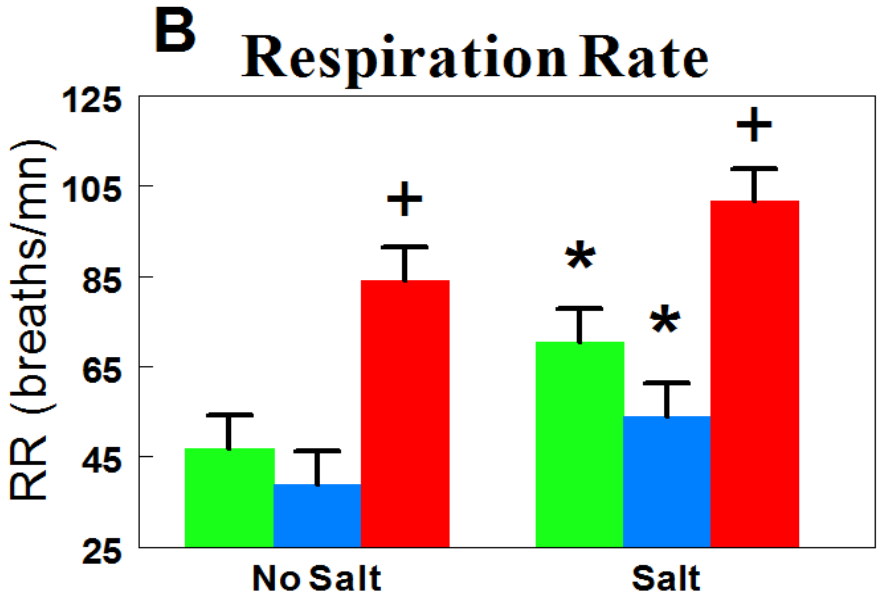
Period	Treatment	Duration
P0	Adaptation period	28 d
HS1	6 h heat stress per day	49 d
R1	Recovery after HS1	30 d
HS2	12 h heat stress per day	21 d
R2	Recovery after HS2	21 d

Abi Saab et al., 2011. Leb. Sci. J. 12:31

Adaptation Parameters







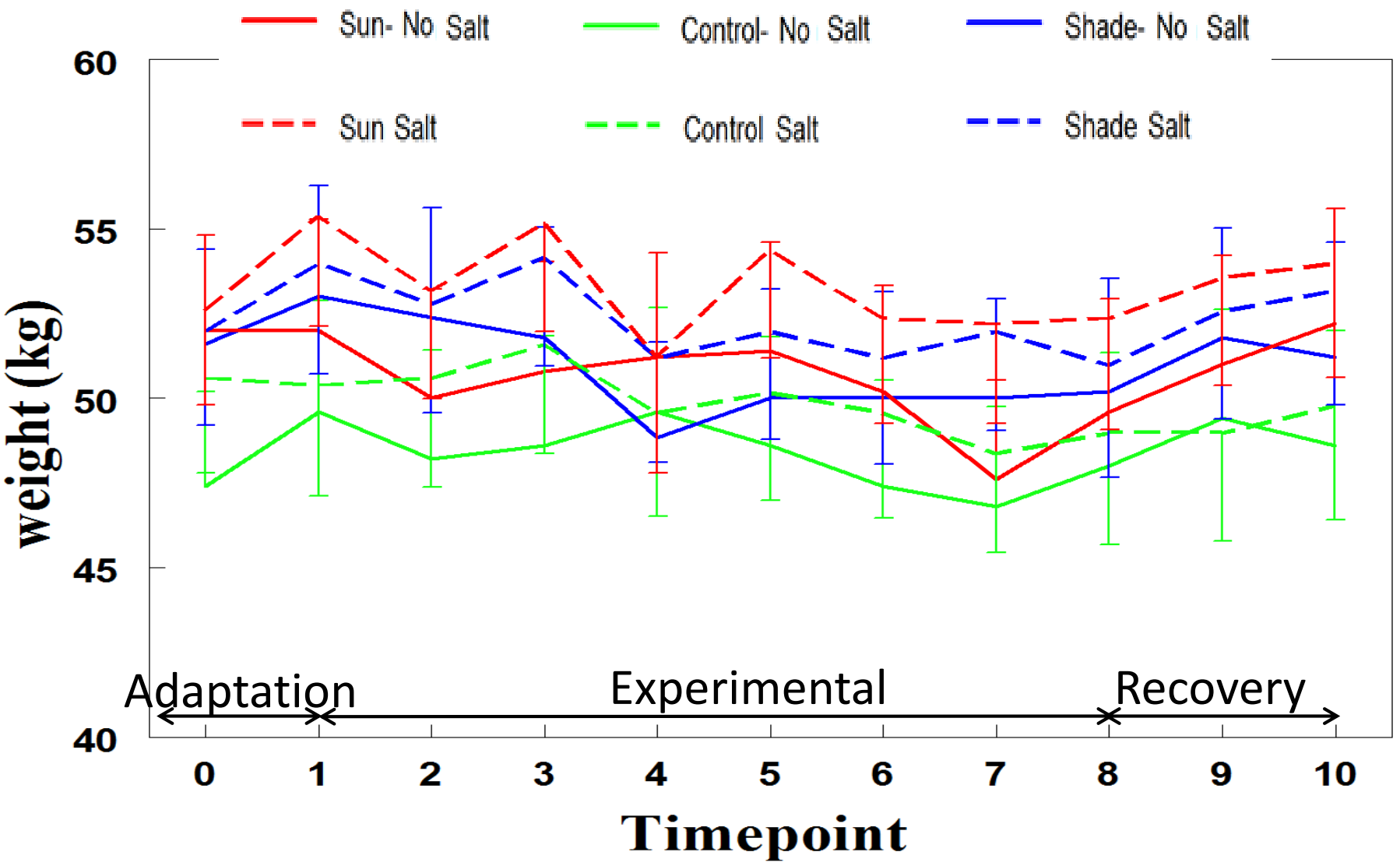
* : LS Means differ from No Salt equivalent ($p<0.05$);

\+ : LS Means differ from Control ($p<0.05$)

- 100% of animals exposed to solar radiation were panting
- Panting score never exceeded 2.5 on a scale of 0 to 5

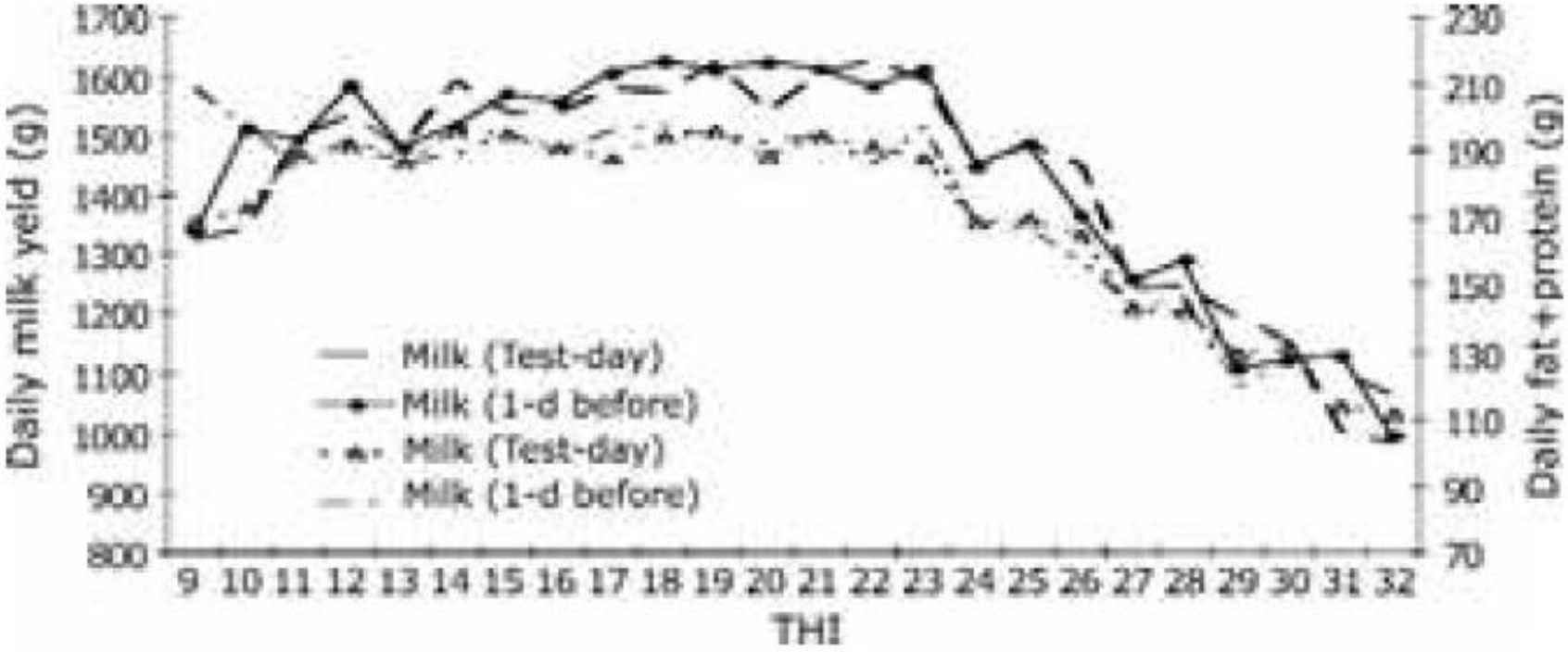
El Masri et al,. 2017, asas annual meeting. Paper in preparation

Body Weight



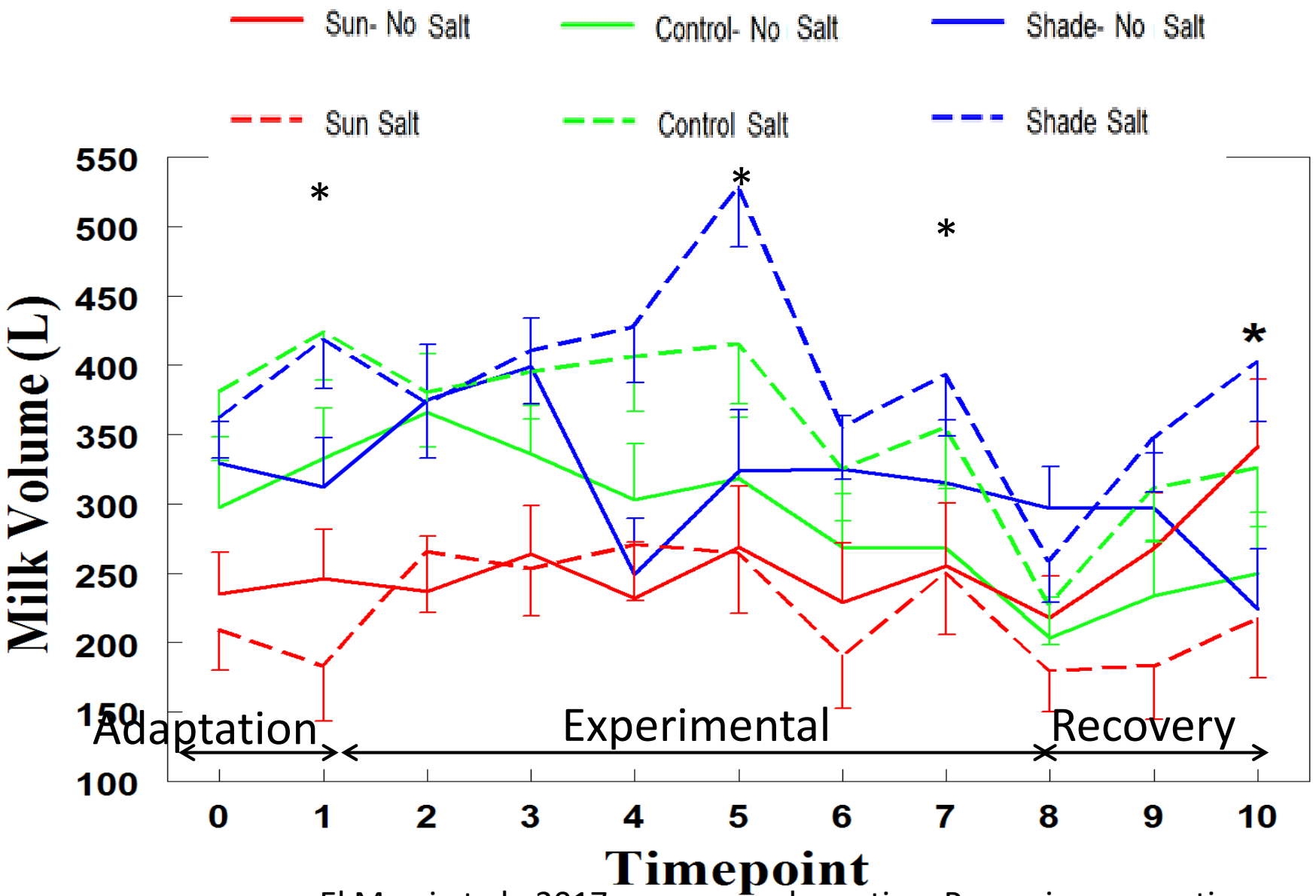
El Masri et al,. 2017, asas annual meeting. Paper in preparation

Effect of Heat Stress on Milk production in dairy sheep



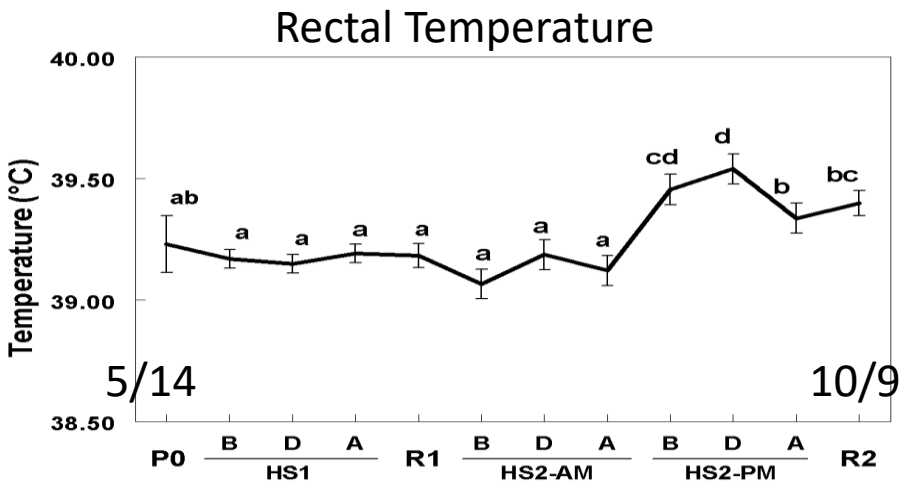
Finocchiaro et al., 2005. Ital J. Anim. Sci. 4 (SUPPL. 2): 70-72

Milk Production



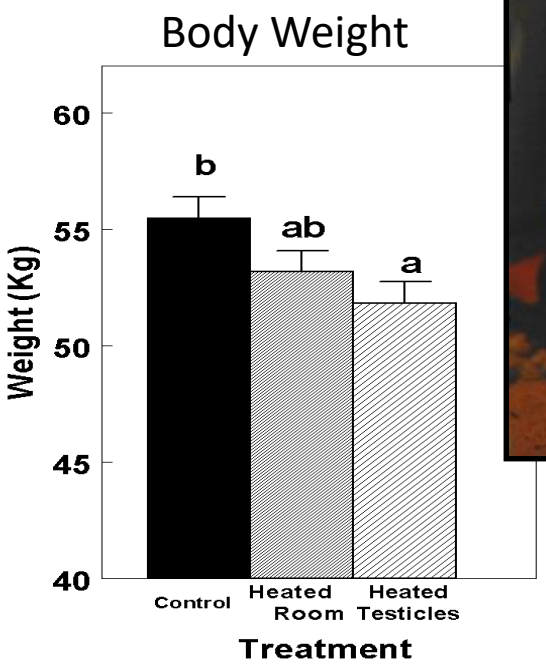
El Masri et al,. 2017, asas annual meeting. Paper in preparation

Male Fertility



P0 = Adaptation
HS1= 6 h heat stress
R1 = Rest after HS1
HS2= 12 h Heat Stress
R2 = Rest after HS2

B=Before HS
D= during HS
A=After HS



Abi Saab et al., 2011. Leb. Sci. J. 12:31

Awassi Reproductive Function under heat stress

Period	Treatment	Duration
P0	Adaptation period	28 d
HS1	6 h heat stress per day	49 d
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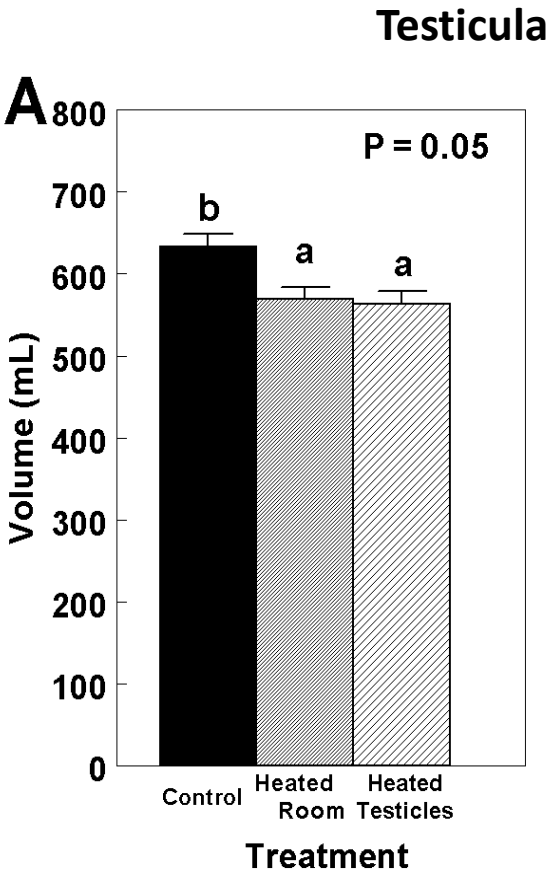

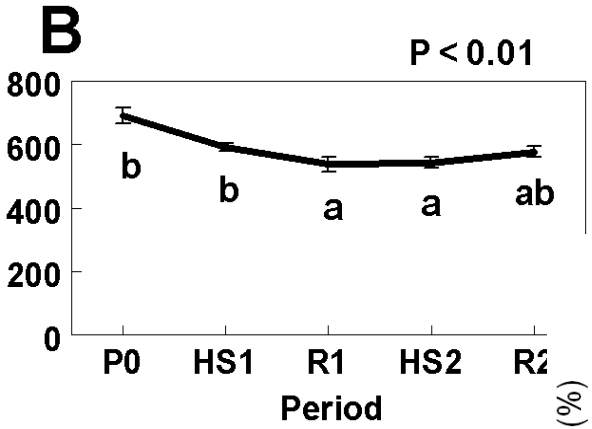

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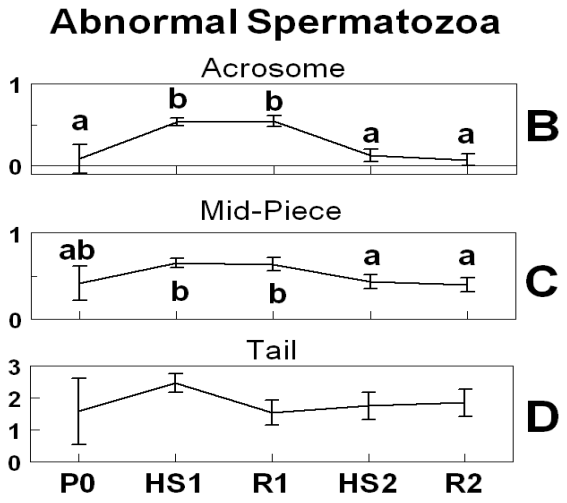
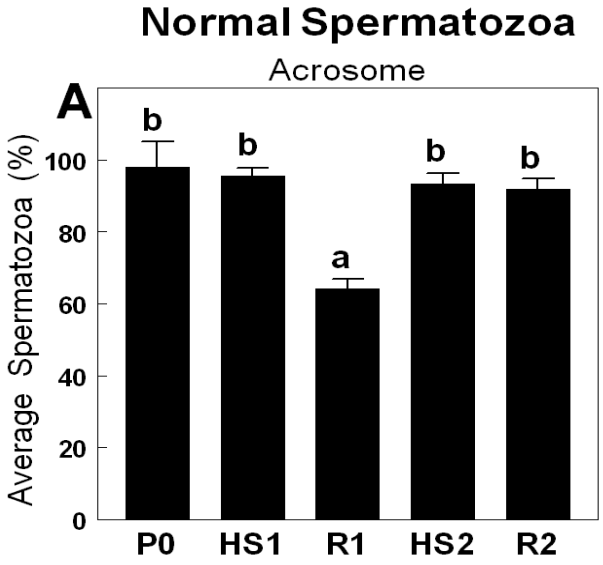




Abi Saab et al., 2011. Leb. Sci. J. 12:31

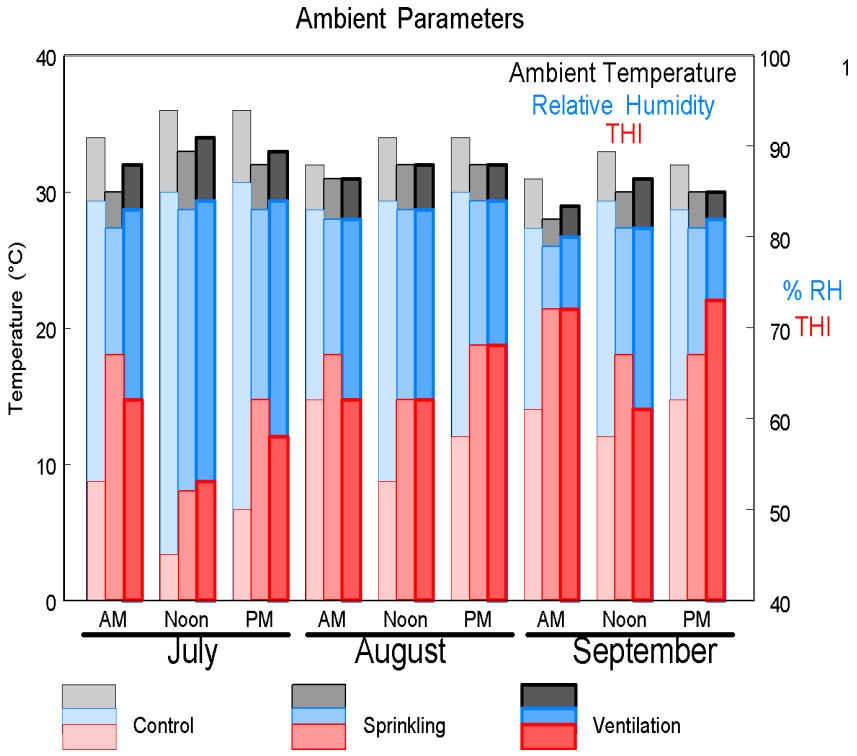
Sprinkling and ventilation

Ventilation of the house

- Decrease in respiration rate and skin temperature in both Awassi and Assaf sheep
- Increase in body weight gain

Koluman et al., 2011
Abi Saab et al., in preparation

Sprinkling



Abi Saab et al, 2014.
Animal Change Conference

Effect of high salt load in water

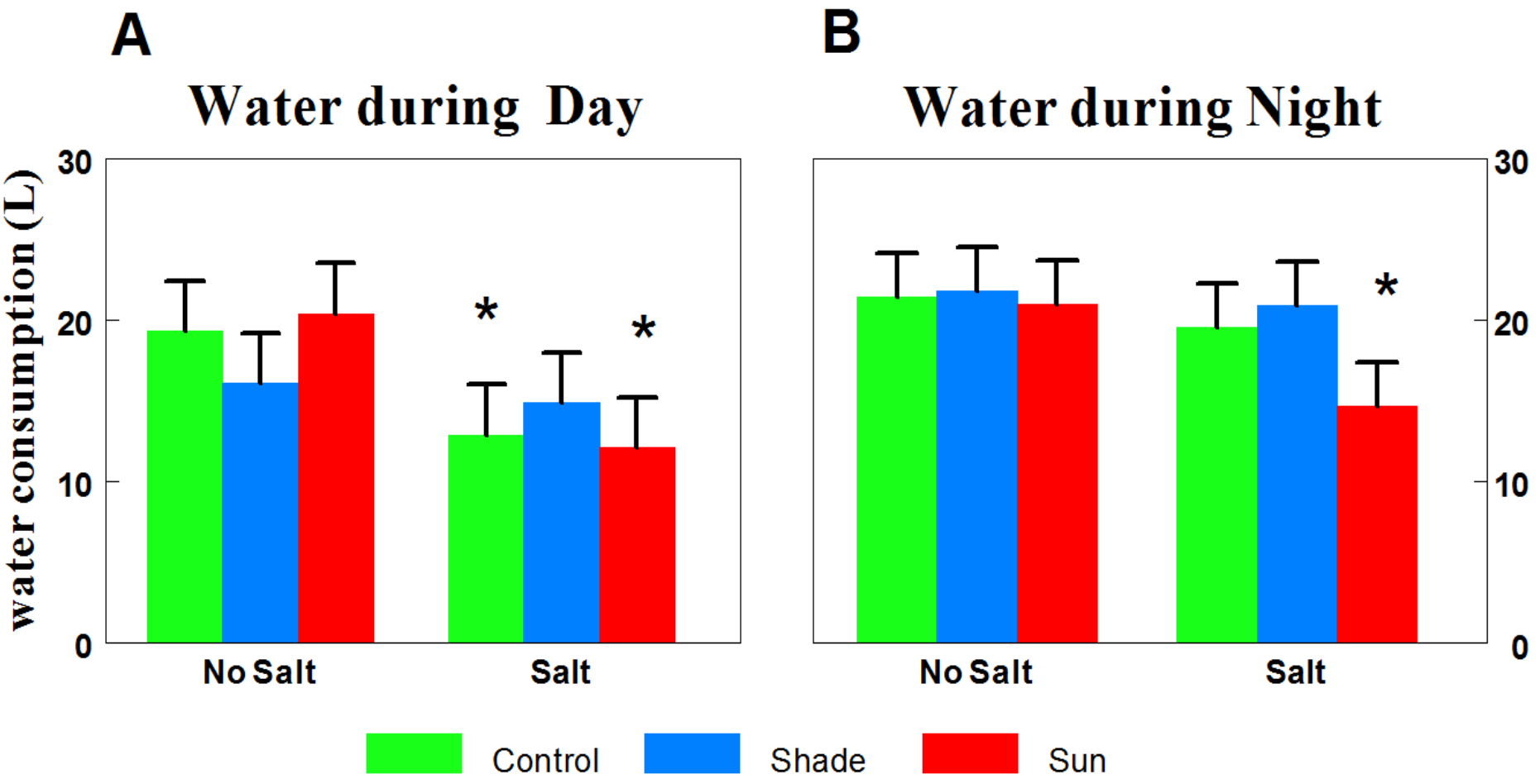
Northwestern coastal desert - Egypt

	Periods				
	P1	P2	P3	P4	P5
Barki ewes					
Sheep					
Average daily water intake (ml/100 kg BW)	5478	4444	3190	3235	2793
Average dry matter intake (g/kg$^{0.73}$ per day)	61.0	51.9	49.7	54.7	49.9
Average nutrient intake (g/kg$^{0.73}$ per day)					
TDN	32.7	32.9	29.6	29.7	24.4
DCP	3.12	2.81	2.09	1.57	1.57
Maintenance (%)					
TDN	116	116	105	105	86
DCP	142	128	95	71	71
Camelus dromedarius					
Camels					
Average daily water intake (ml/100 kg BW)	2276 a	2295 a	1095 b	972 b	1565 b
Average dry matter intake (g/kg$^{0.73}$ per day)	51.0 a	46.7 ab	43.3 b	48.8 a	49.9 a
Average nutrient intake (g/kg$^{0.73}$ per day)					
TDN	31.4	29.0	26.0	27.9	24.8
DCP	2.70	2.67	1.68	1.56	1.21
Maintenance (%)					
TDN	117	108	97	104	92
DCP	125	124	78	72	56
Air temperature (°C)					
Min.	22.1	23.7	12.8	12.0	10.1
Max.	28.8	29.5	23.0	18.9	17.3

[a] a,b means in the same row with the same letter are not significantly different.

Assad and Al Sherif. 2002. Small Ruminant Research 45: 279–290

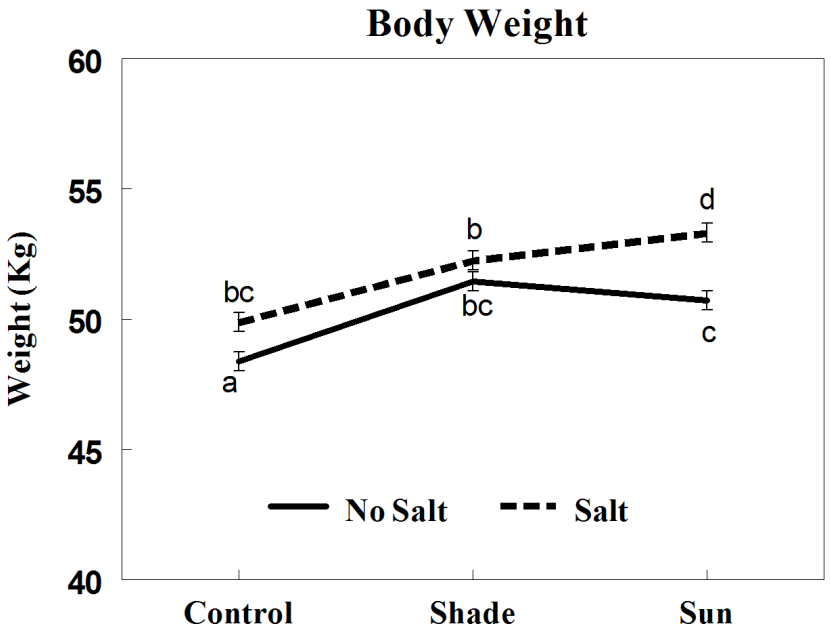
Feed and Water Intake

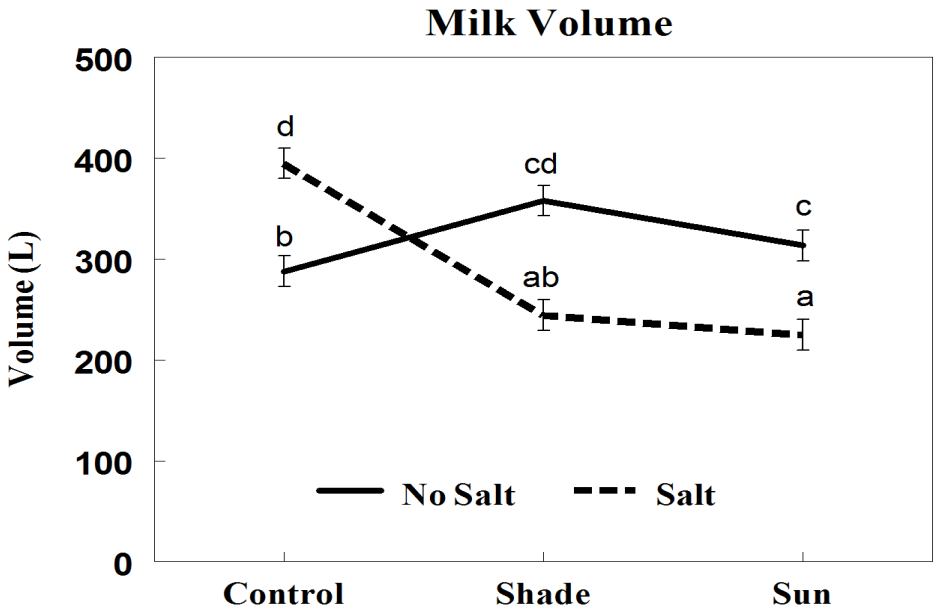


- The animals consumed all their feed even the salty one

El Masri et al,. 2017, asas annual meeting. Paper in preparation

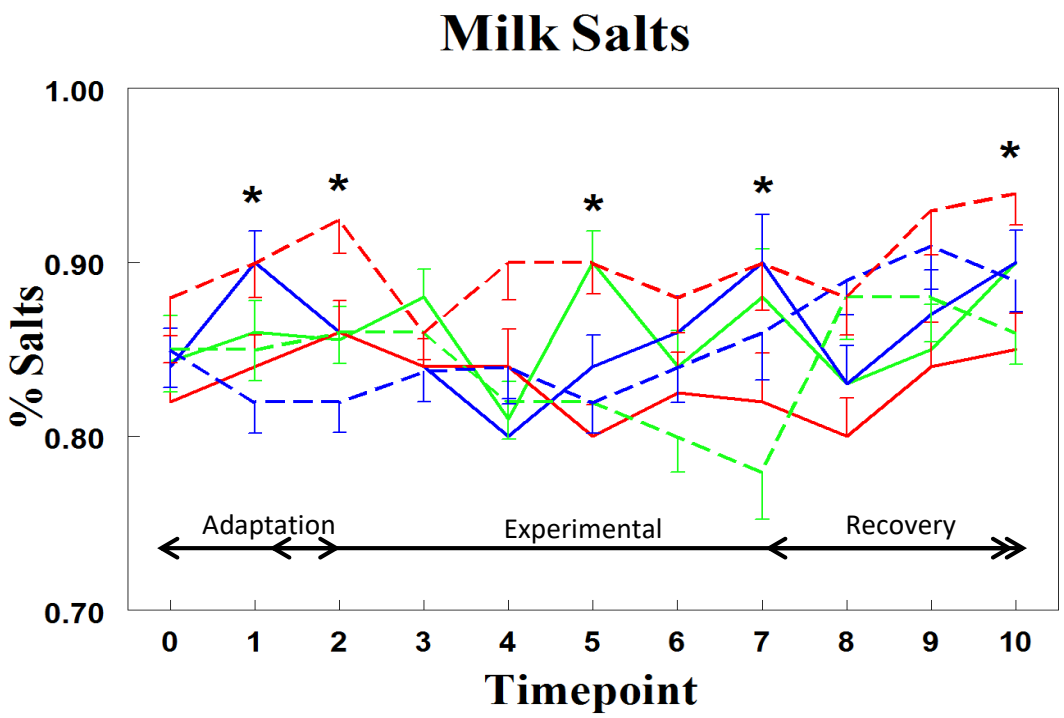
Effect of Low water quality on Awassi



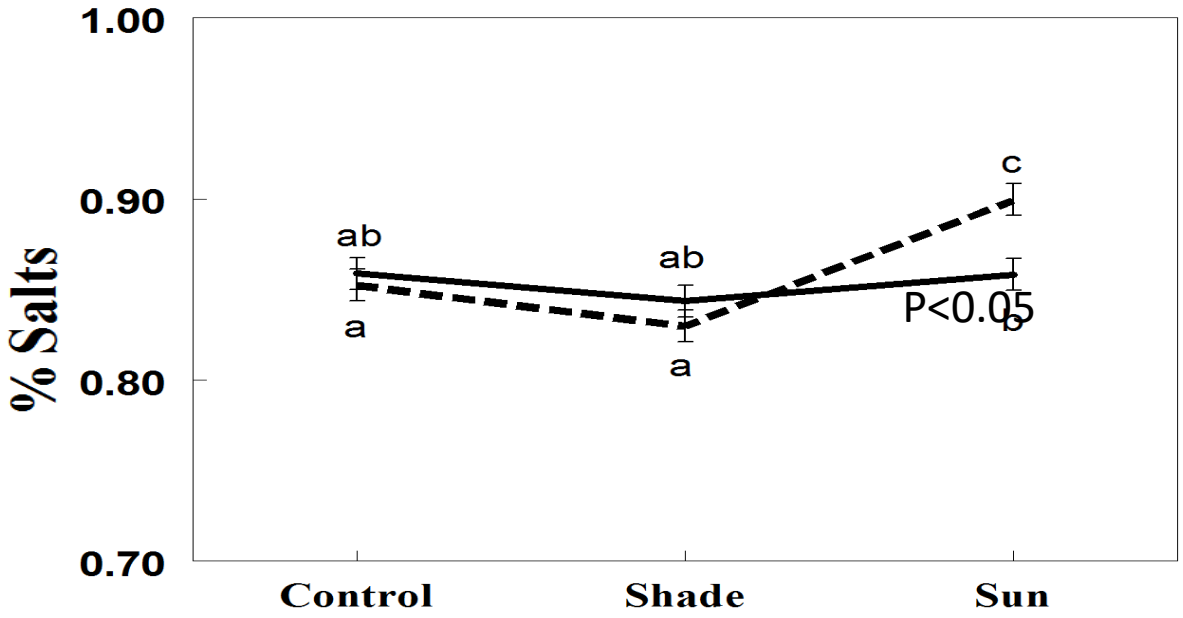


[a,b,c,d] LSmeans without a common superscript differ

El Masri et al,. 2017, asas annual meeting. Paper in preparation

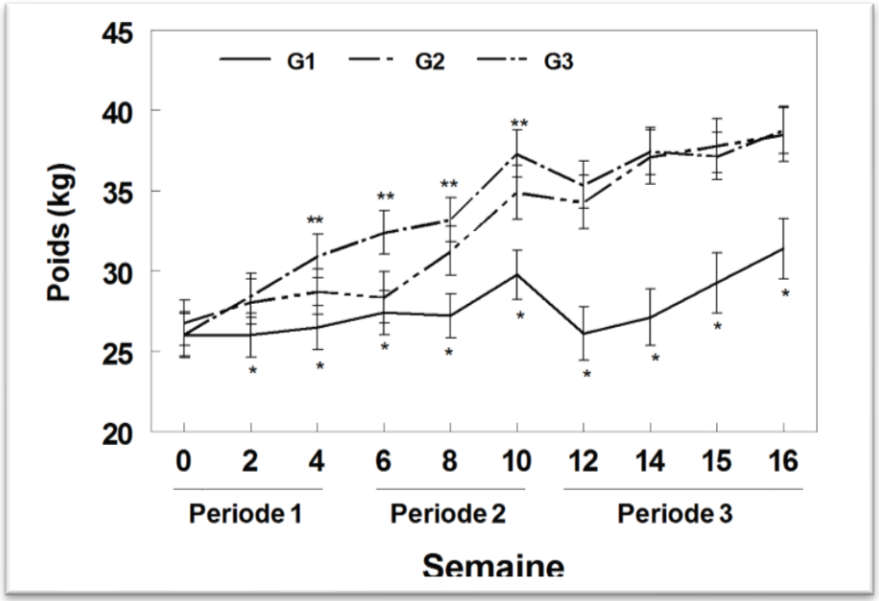


[a,b] LSmeans without a common superscript differ between periods

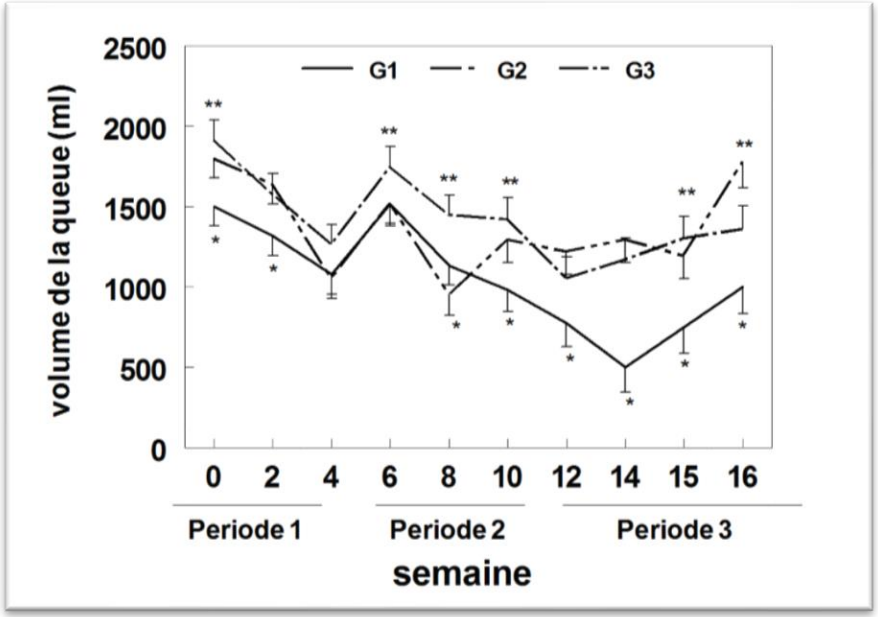


Effect of feed restriction

Body Weight



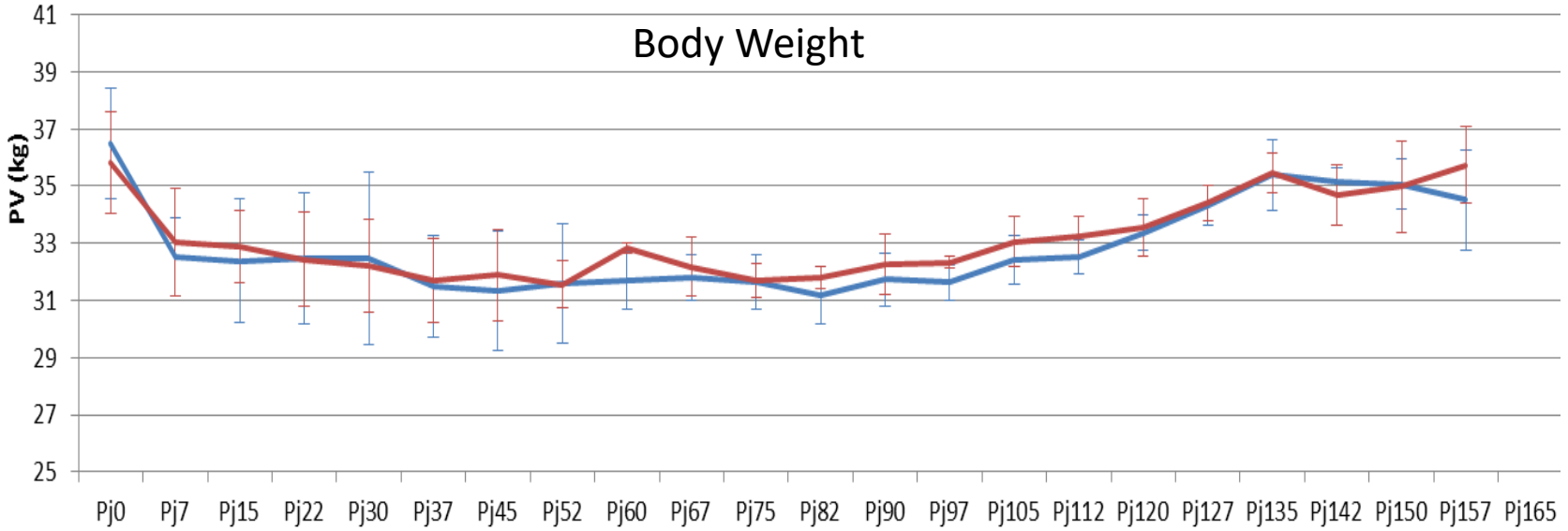
Body Reserves

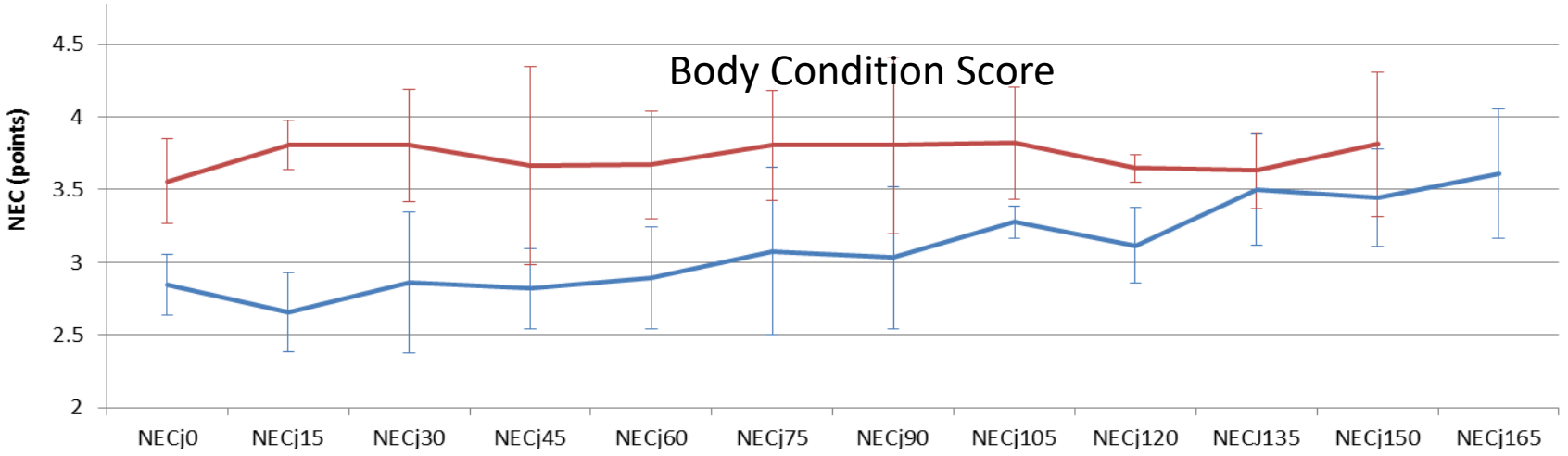


G1: Protein restricted
G2: control
G3: Protein supplementation

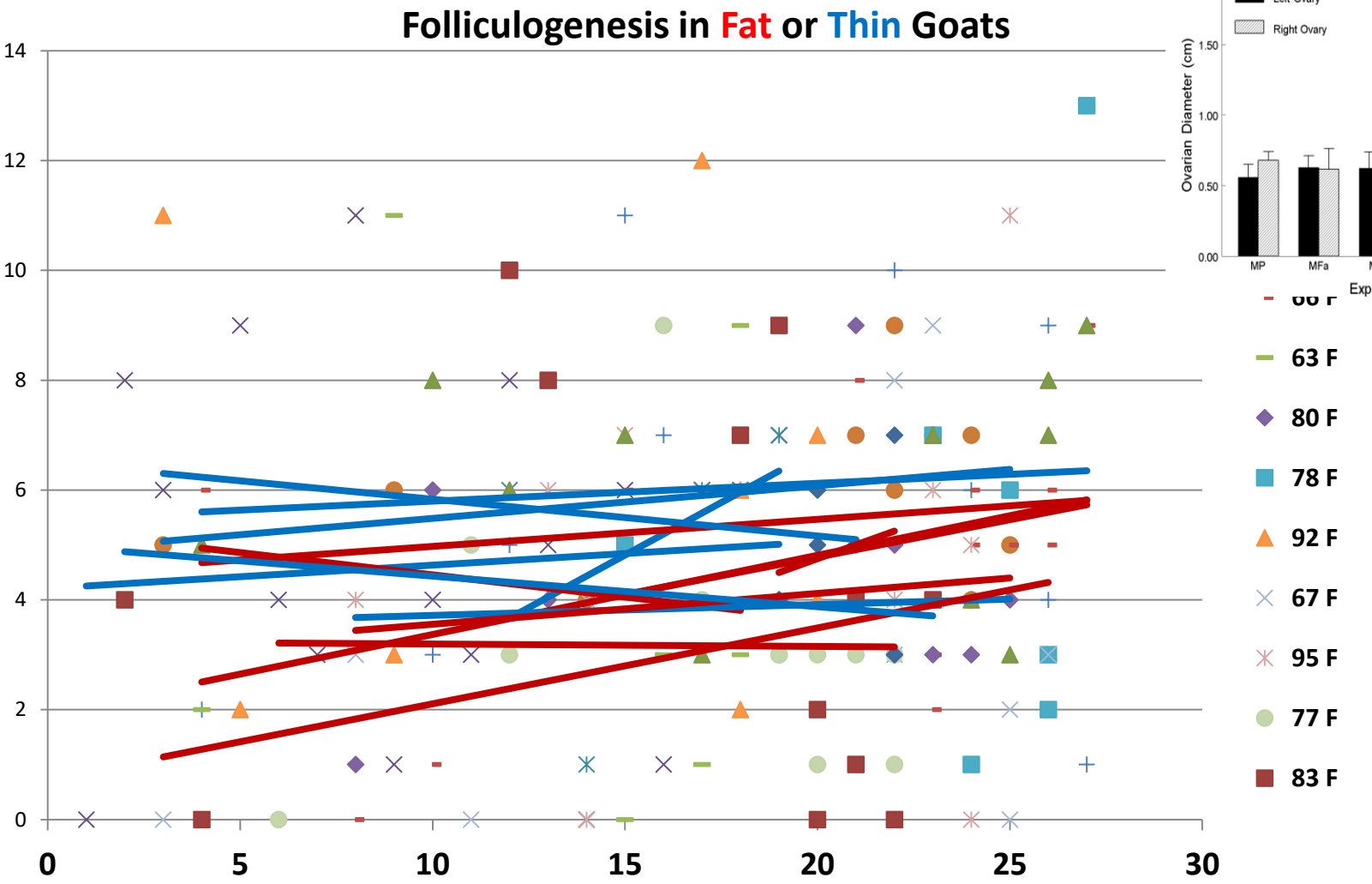
Makdessi et al, 2016

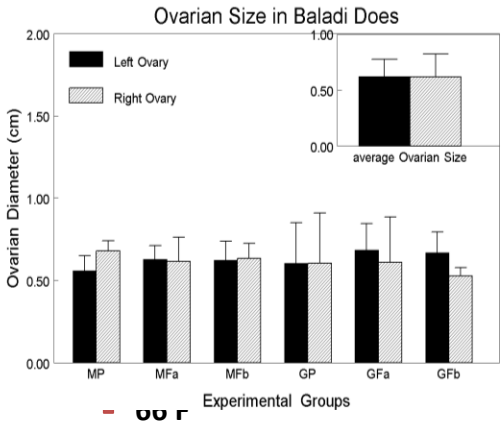
Baladi goats





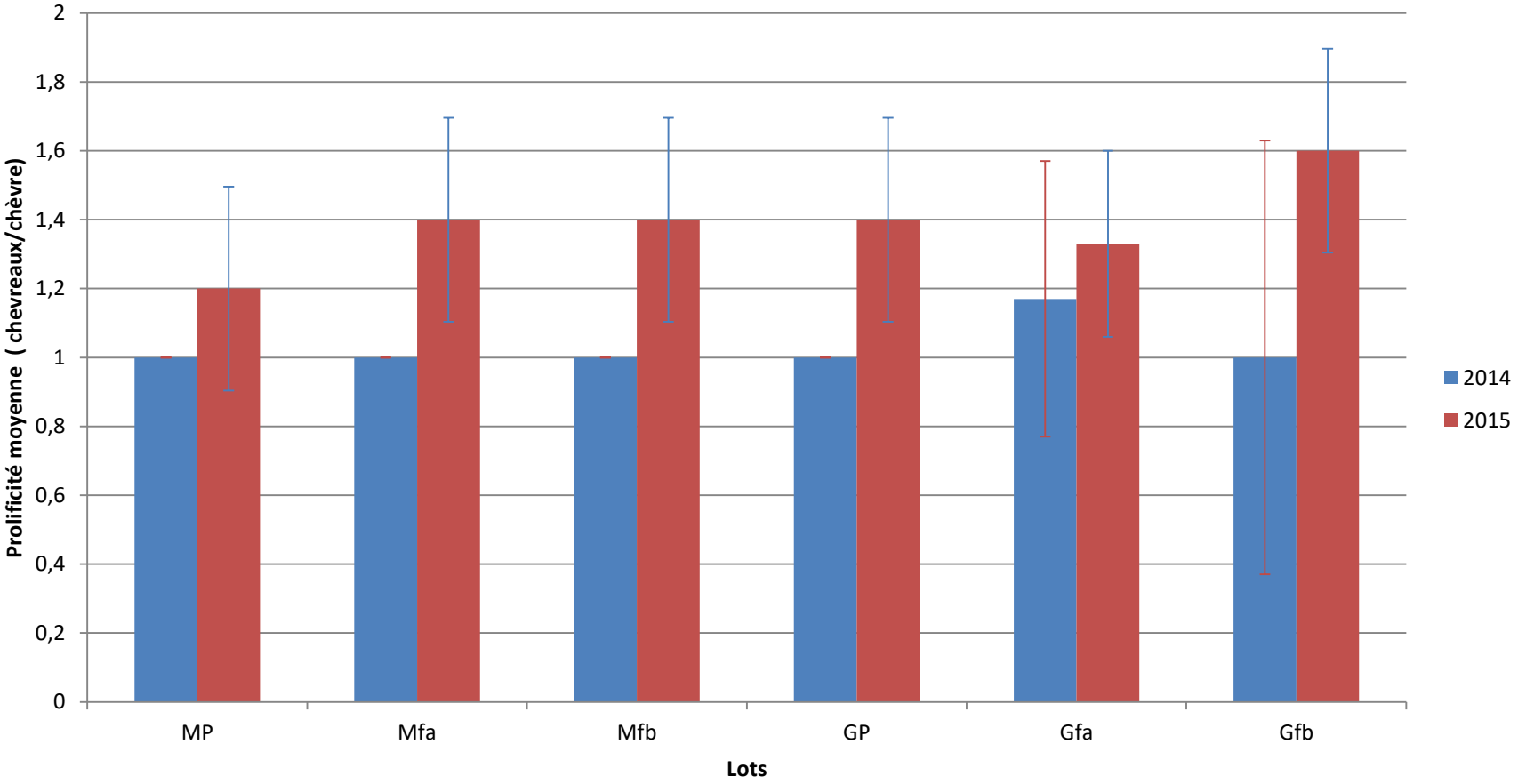
Follicular Activity by goat BCS

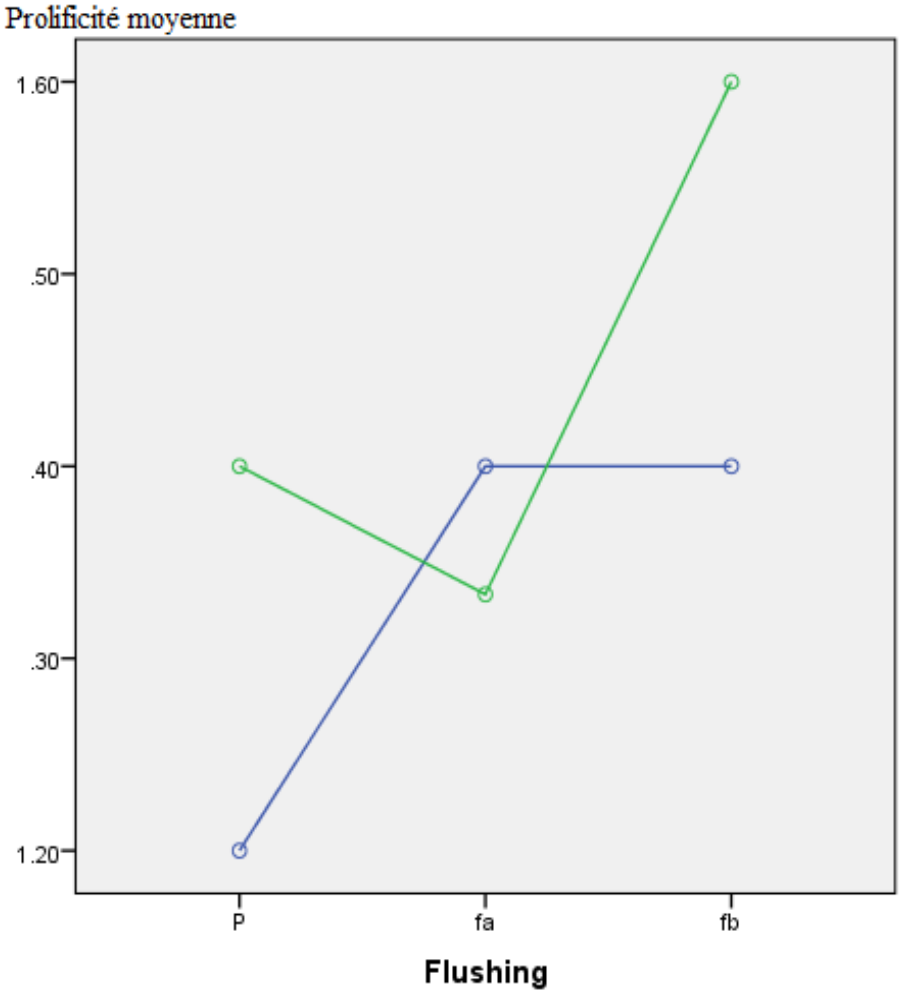


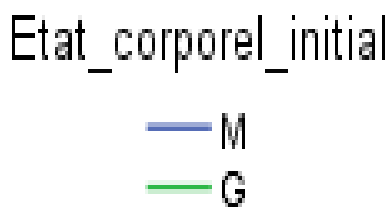


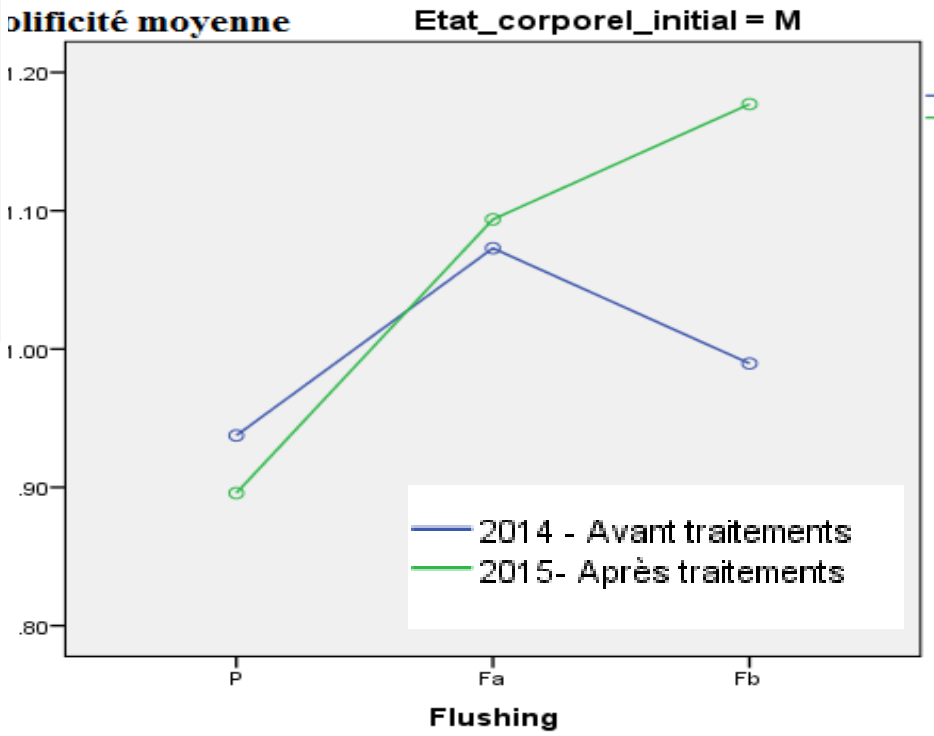
Kharrat et al, in preparation

Effect of flushing on prolificity




Prolificité moyenne
1.60
.50
.40
.30
1.20
P
fa
fb
Flushing


Etat_corporel_initial
M
G


olificité moyenne
Etat_corporel_initial = M
1.20
1.10
1.00
.90
.80
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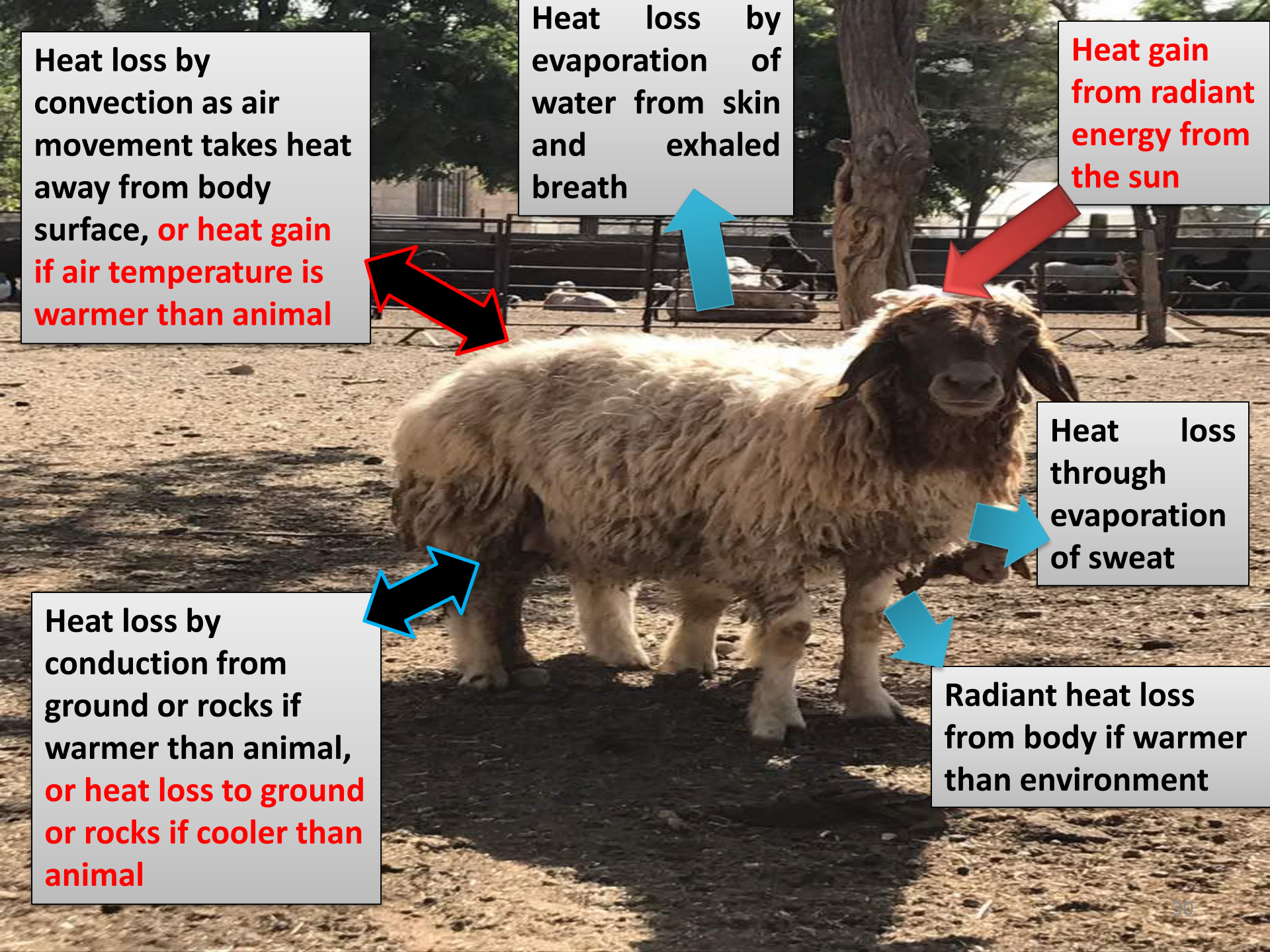
Fa
Fb
Flushing
2014 - Avant traitements
2015- Après traitements


Heat loss by convection as air movement takes heat away from body surface, or heat gain if air temperature is warmer than animal
Heat loss by evaporation of water from skin and exhaled breath
Heat gain from radiant energy from the sun
Heat loss through evaporation of sweat
Heat loss by conduction from ground or rocks if warmer than animal, or heat loss to ground or rocks if cooler than animal
Radiant heat loss from body if warmer than environment

Conclusion

- In Lebanon and other developing nations, the small ruminant sector is very fragile especially due to the socio-economical context

➔ Mitigation strategies include:

- Use of Agricultural by-product to complement poor transhumant pasture diet, especially at key times, in order to Ensure
  - body condition maintenance
  - decrease stress and traveltime
  - adequate weight at birth of the litter
- Housing outdoor at night
- Provide regular watering with “good” water quality
- Develop a decentralized selection strategy for resilience
  - Enhance small holder soci-economical viability
  - Conserve and protect local breeds at a lower cost
- NEED FOR Extension and proper transfer of science

Questions