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INVESTIGACIÓN Y TECNOLOGÍA AGROALIMENTARIA

DO THE GENES INVOLVED IN LONGEVITY INTERACT WITH INFARM TEMPERATURE IN RABBIT FEMALES?

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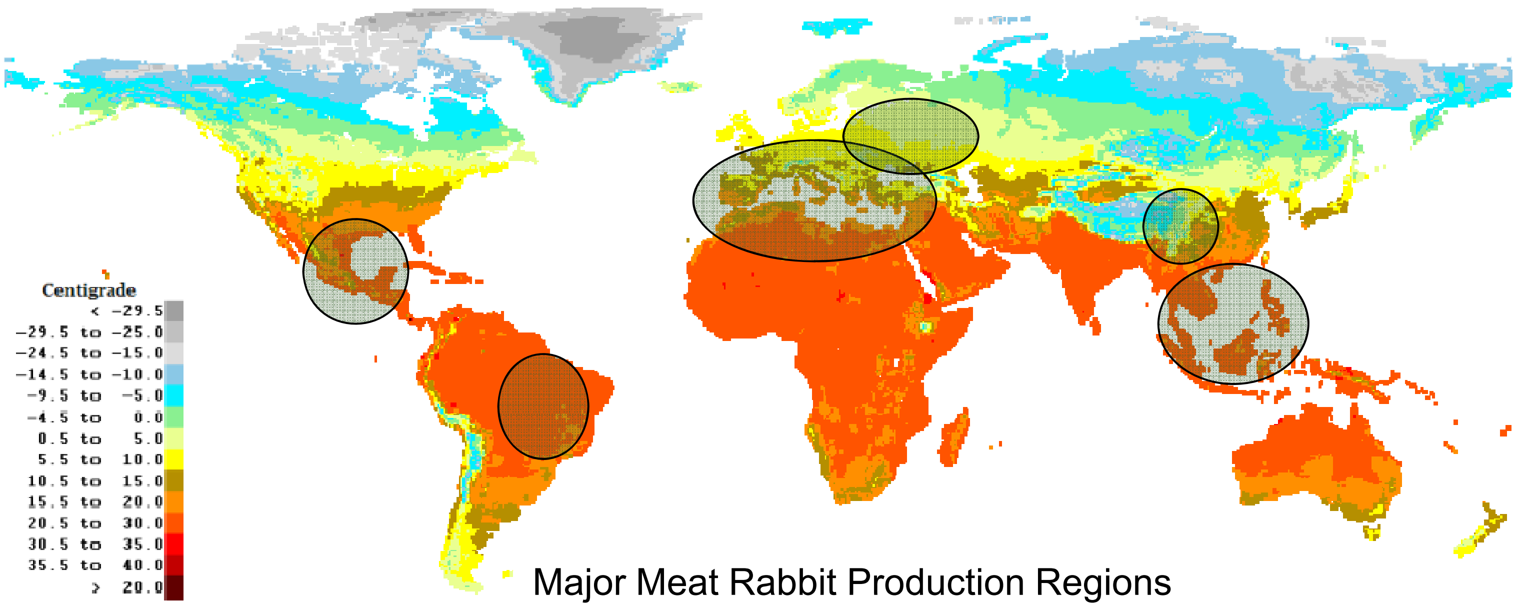

Raise tolerance to heat in order to keep performances not matter the temperature.

LONGEVITY is one of the traits determining farm performances:

Direct Impact:

↓ replacement rates, ↓ medical treatment, shift population structure to higher producer age classes.

Indirect Impact:

Welfare, Health, Social Concerns

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OBJECTIVE

The aim of this study was to assess the magnitude of the interaction between additive genetic effects on longevity and infarm temperature

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HISTORICAL DATA FROM CALDES LINE

Selected for GROWTH RATE after Weaning

November 1983 -- October 2008

Semi-intensive Reproductive Rhythm(E(PI)=42d)

Length-of-Productive Life (LPL)

Days between first mating and death or involuntary culling

	N	Mean	Min.	Max.
Censored	2267 (33.6%)	213.4	12	694
Uncensored	4476 (66.4%)	112.7	11	567

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PROPORTIONAL HAZARD ANIMAL MODELS

NULL MODEL:

$$h_i\left(t \mid \boldsymbol{\beta}, a_i\right) = h_0(t) \times \exp\left\{x_i'(t)\boldsymbol{\beta} + a_i\right\}$$

$h_0(t)$: Stepwise (death times) exponential function

$\boldsymbol{\beta}$: year - season (YS), physiological state (PS), litter size (LS) , ordinal of pregnancy (OP)

a_i : Additive genetic effect

$$p(\mathbf{a}) \sim MVN\left(\mathbf{0}, \sigma_a^2 \cdot \mathbf{A}\right)$$

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PROPORTIONAL HAZARD ANIMAL MODELS

ALTERNATIVE MODEL:

$$h_i\left(t \middle| \boldsymbol{\beta}, \mathbf{a}_i\right) = h_0(t) \times \exp\left\{x_i'(t)\boldsymbol{\beta} + a_{i,1} + T(t) \times a_{i,2}\right\}$$

$h_0(t)$: Stepwise (death times) exponential function

$\boldsymbol{\beta}$: year - season (YS), physiological state (PS), litter size (LS), ordinal of pregnancy (OP)

$T(t)$: average across week of daily average T^{a}

$\mathbf{a}_i$: Additive genetic effects

$$p\begin{pmatrix}\mathbf{a}_1 \\ \mathbf{a}_2\end{pmatrix} \sim MVN\left(\begin{matrix}\mathbf{0} \\ \mathbf{0}\end{matrix}, \mathbf{G}_0 \otimes \mathbf{A}\right)$$

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BAYESIAN MCMC

Adaptative Rejection Samplig

1.- Burn-in

100K interations

2.- From solutions at the end of burn-in.

100 chains (different seeds)

20000 rounds

100-rounds sampling interval

CALENDULA

Castilla y León Supercomputational Center

http://www.fcsc.es/index.php/en/

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GOODNESS-OF-FIT
DIC

	NULL	ALT
DIC	45934	45883

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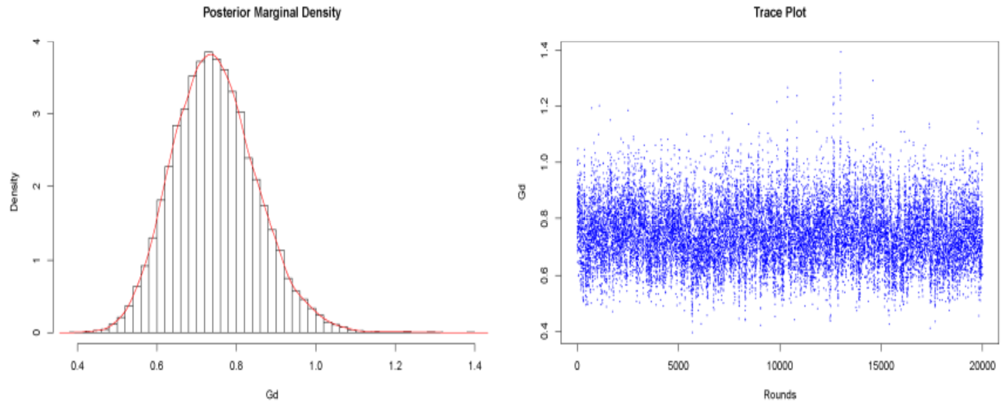
NULL MODEL PARAMETERS

	mean	median	SD	HPDa	HPDb	ESS
Gd	0.75	0.74	0.11	0.55	0.96	982

TRACE PLOT



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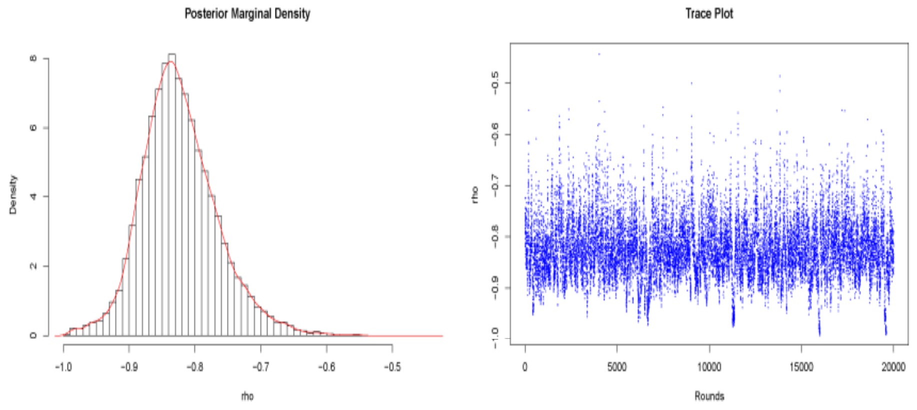
ALTERNATIVE MODEL PARAMETERS

	mean	median	SD	HPDa	HPDb	ESS
G1	2.07	2.00	0.50	1.21	3.06	322
Gcov	-0.05	-0.05	0.02	-0.10	-0.02	288
G2	0.002	0.002	0.001	0.0002	0.004	258
rho	-0.82	-0.83	0.06	-0.93	-0.70	650

RHO TRACE PLOT



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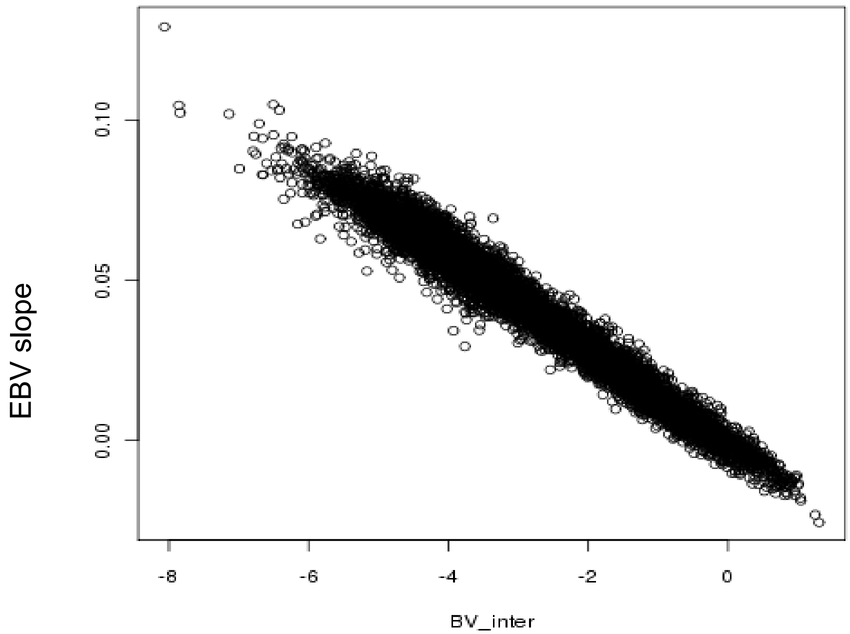
CORRELATION BETWEEN EBV

Positive slopes: When Tª ↑ → Risk of death ↑ : This would be expected due to the negative effect of Tª



EBV intercept

Animals with the most favorable (negative) BV get deteriorated their BV with temperature more rapidly than animlas with the worst (less negative) BV.

Temperature-Dependent-Survivalability (slope) is antagonish to survivalability defined by any other factor (intercept).

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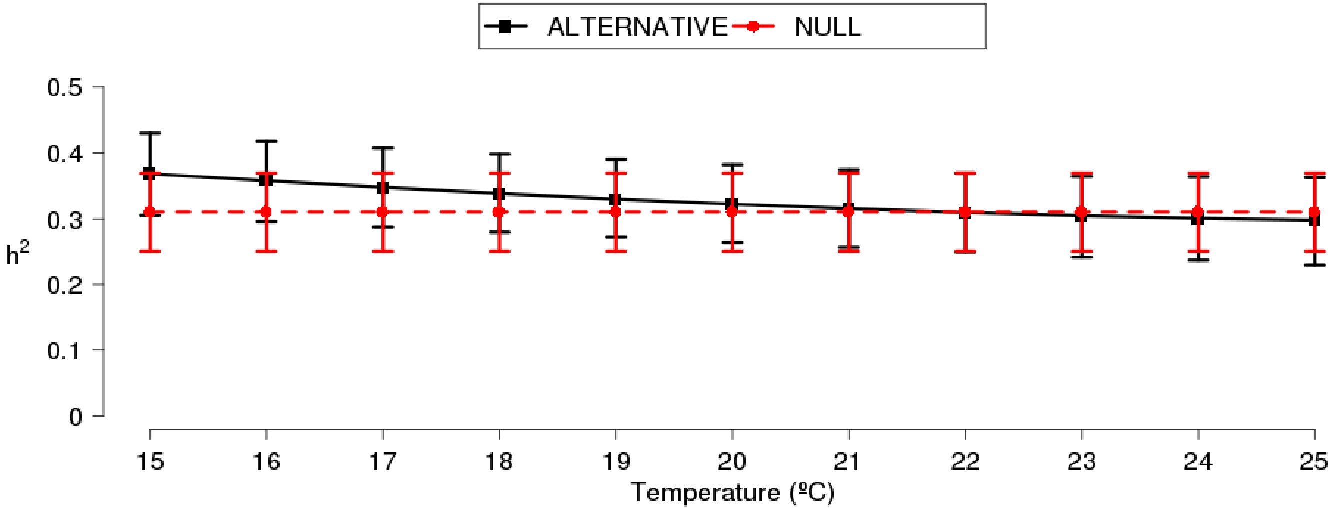
EFFECTIVE HERITABILITY AS FUNCTION OF Tª



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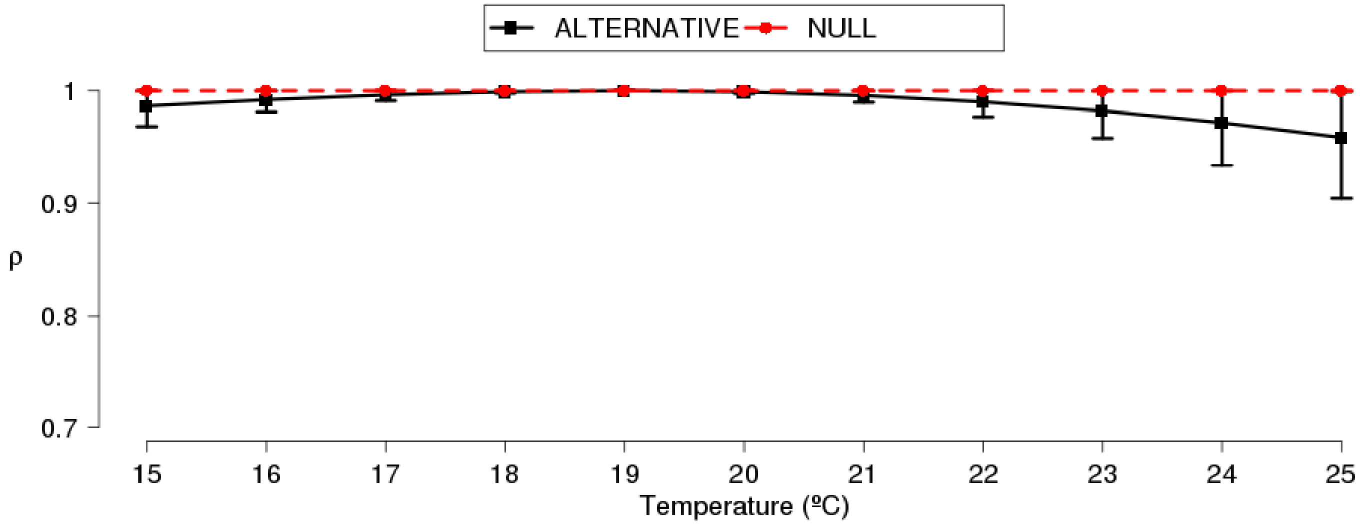
GENETIC CORRELATION AS FUNCTION OF Tª



1. High genetic variation for longevity has been estimated in this population:
   i) Some interactions should be needed to be considered (PS x OP)
   ii) Fitting residual terms extracts individual variation which otherwise it is assigned to be of genetic origin.

2. Low genetic variability is involved in the definition of Temperature-Dependent-Survivalability.

3. Temperature-Dependent-Survivalability is genetically antagonist to survivalability determinate by any other factor.

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