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THE GENOTYPE FOR COAT COLOUR GENES AS A CRITERION IN THE DESIGN OF SEMEN BANKS IN THE JACA NAVARRA BREED

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SEMEN BANKS

- **Advantages**
  - ✓ **Low storage requirements**
  - ✓ **Enlarge generation interval**
  - ✓ **Reduce genetic drift** { ΔF ; **Loss of diversity** }
  - ✓ **Avoid adaptation to captivity**

Function ⇒ genetic reservoir

- ✓ **Population back up**

  ⇒ **reconstitution in case of extinction**

- ✓ **Modify the evolutionary trends**

  ⇒ **reverse natural or artificial selection**

- ✓ **Reinforce management of living population**

  ⇒ **increase the population size**

OBJECTIVE *(main)*

- ✓ **Maximise the genetic information stored in the bank**

CRITERION

- ✓ **Contributions proportional to coancestry**

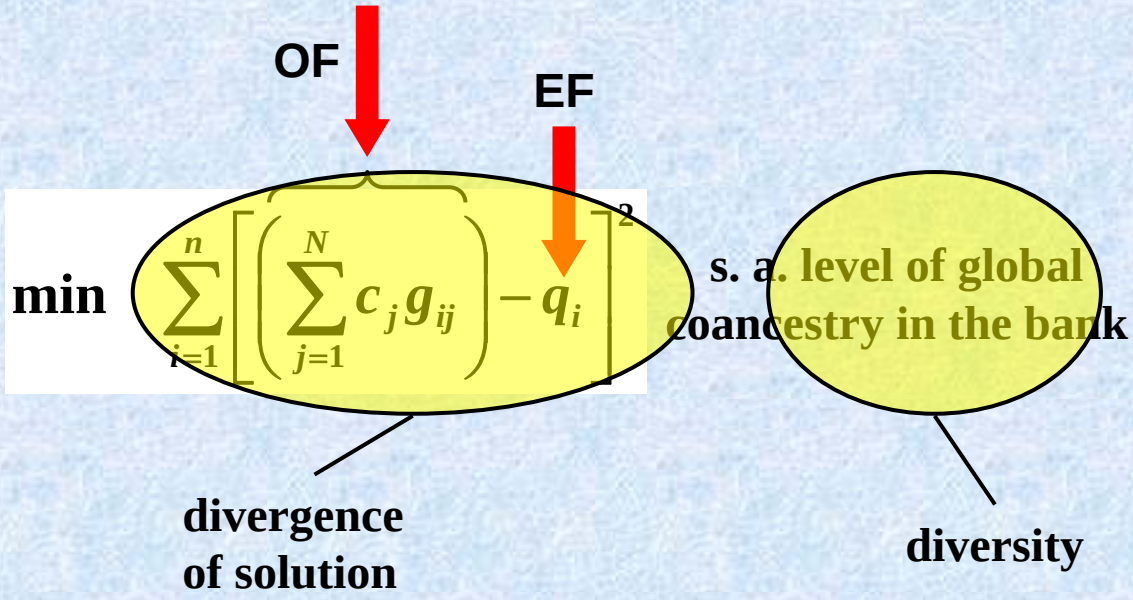
$$\min \sum_{i=1}^{N}\sum_{j=1}^{N} c_i c_j f_{ij}$$

N : no. candidate donors
c_i : contribution of donor i
f_{ij} : coancestry between individulas i and j

Sometimes …

… genetic trait to maintain/avoid

- **Unknown genes**
  - ✓ **Use of phenotypes**
- **Known genes**
  - ✓ **Control of the allelic frequencies**



N : no. candidate donors

c_j : contribution of donor i

f_{kl} : coancestry between individuals i and j

n : no. alleles in the controlling locus

g_{ij} : % of gametes with allele i produced by individual j

q_i : desired frequency for allele i

Fernández et al. (2006)

HORSE'S COAT COLOUR

- ✓ **Controlled by MC1R and ASIP**
- ✓ **Dominant allele and one or two recessives**

	A _	a a
E _	bay	black
e e	chestnut	chestnut

JACA NAVARRA

- **Spanish pony / Cantabrian-Pyrenean group**
- **Bred for meat**

- ✓ **Only bay animals accepted**
  - **Chestnut and black culled**
  - **Recessive carriers avoided**

STRATEGIES

- ✓ **Only dominant alleles** D
  - ⇒ **Same as in living populations**
- ✓ **Only recessive alleles** R
  - ⇒ **Keep diversity from culled animals**
- ✓ **Original frequencies** O

RESTRICTIONS

- ✓ **Different levels of global coancestry**

DATA

- ✓ **Stud book with 793 horses**

  $\Rightarrow$ **few know generation / low coancestry values**

- ✓ **23 available and genotyped stallions**

Locus A

Strategy	Restr.	No. don.	Global *f*	Frec. dom.	Frec. rec.	Max. %
D	NO	12	0.05	1.00	0.00	9.4
D	< 0.04	17	0.04	0.96	0.04	8.7
D	< 0.03	22	0.03	0.84	0.16	6.9
D	< 0.01	22	0.03	0.71	0.29	5.4
R	NO	2	0.25	0.00	1.00	50.0
R	< 0.10	11	0.10	0.20	0.80	30.1
R	< 0.05	18	0.05	0.36	0.63	15.6
R	< 0.01	22	0.03	0.70	0.30	5.6
O	NO	22	0.03	0.72	0.28	5.5
O	< 0.01	22	0.03	0.71	0.29	5.4

SUMMARISING …

- **Awkward results for extreme strategies**
  - ✓ **alleles at low frequencies**
- **Restrictions on global coancestry improves the solutions**
- **Maximal restriction recovers original frequencies and diversity levels**

THANK YOU FOR YOUR ATTENTION!!

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