Potential benefits of distributing males and females among phenotyping candidates in genomic selection

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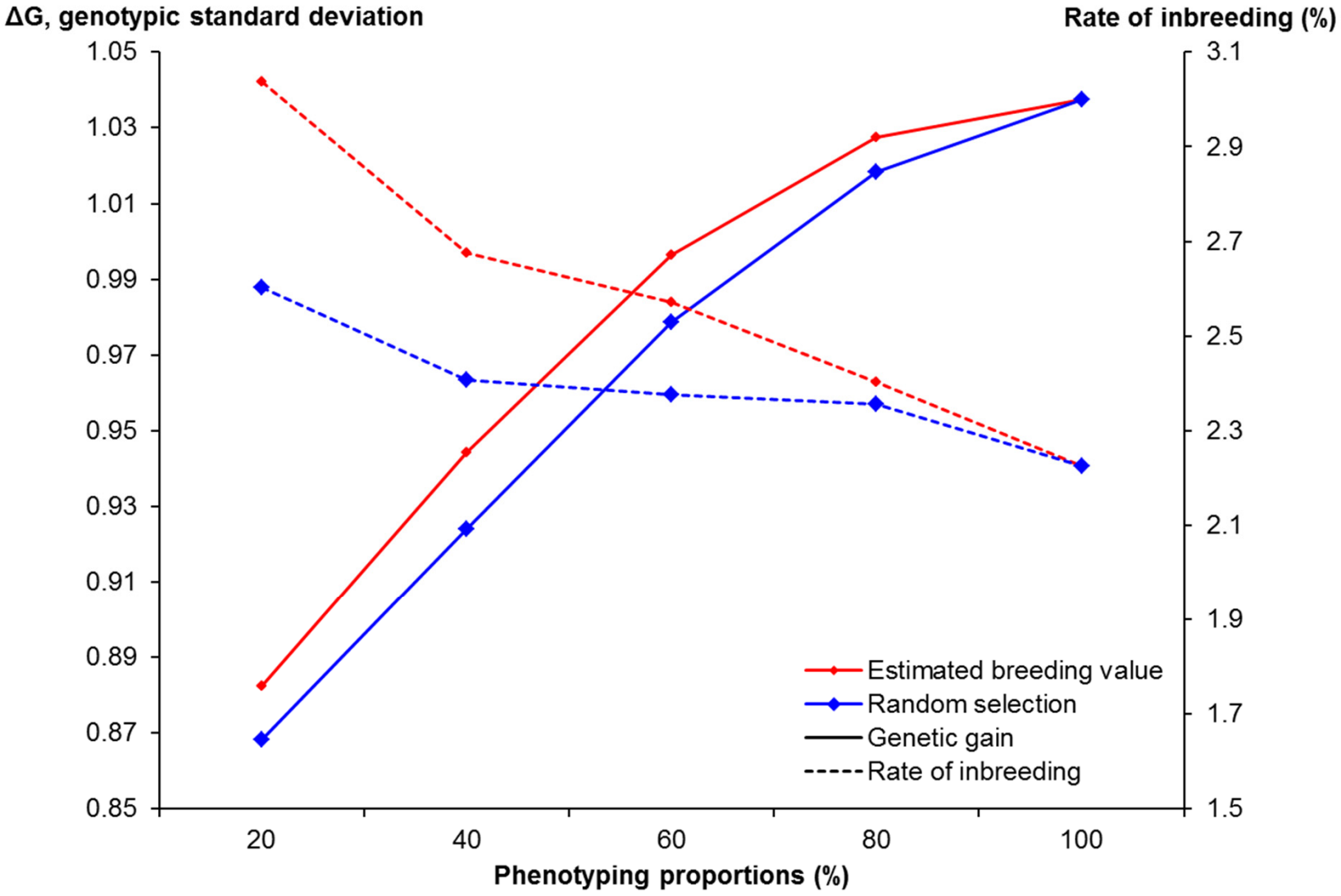
Previous study - Diminishing marginal returns from genomic selection as more selection candidates are phenotyped- *WCGALP*

- **Hypotheses**
  - ✓ There is diminishing marginal return from genomic selection as more candidates are phenotyped
  - ✓ Phenotyping candidates based on *a priori* information is beneficial


ΔG, genotypic standard deviation
Rate of inbreeding (%)
1.05
1.03
1.01
0.99
0.97
0.95
0.93
0.91
0.89
0.87
0.85
3.1
2.9
2.7
2.5
2.3
2.1
1.9
1.7
1.5
20
40
60
80
100
Phenotyping proportions (%)
Estimated breeding value
Random selection
Genetic gain
Rate of inbreeding

- ✓ Diminishing return to genomic selection as more candidates are phenotyped

- ✓ Use of *a priori* information to select phenotyping candidates is beneficial

- ❑ Most benefits of genomic selection can be realised by phenotyping only high ranking selection candidates

- ❖ The effect of phenotyping candidates' sex ratio on returns to genomic selection was not considered

Objective

- To determine the effect of male-to-female ratio of the phenotyping candidates on returns to genomic selection

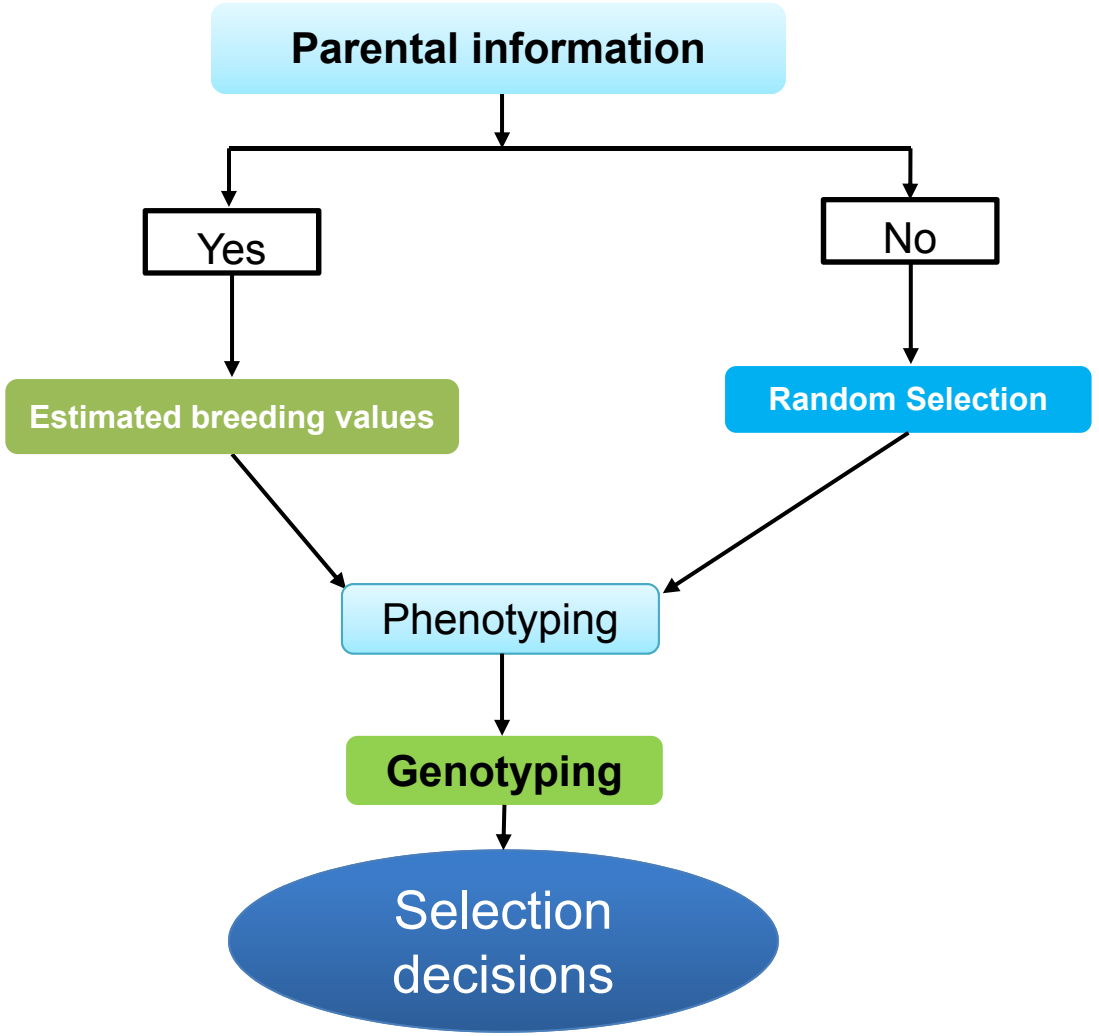
Methodology

- **Simulation design**
  - ✓ Genetic gain

- Phenotyping proportions
  - ✓ 20-50%

- Male:Female sex ratio
  - ✓ 100:0
  - ✓ 75:25
  - ✓ 50:50
  - ✓ 25:75
  - ✓ 0:100

- Phenotyping criteria

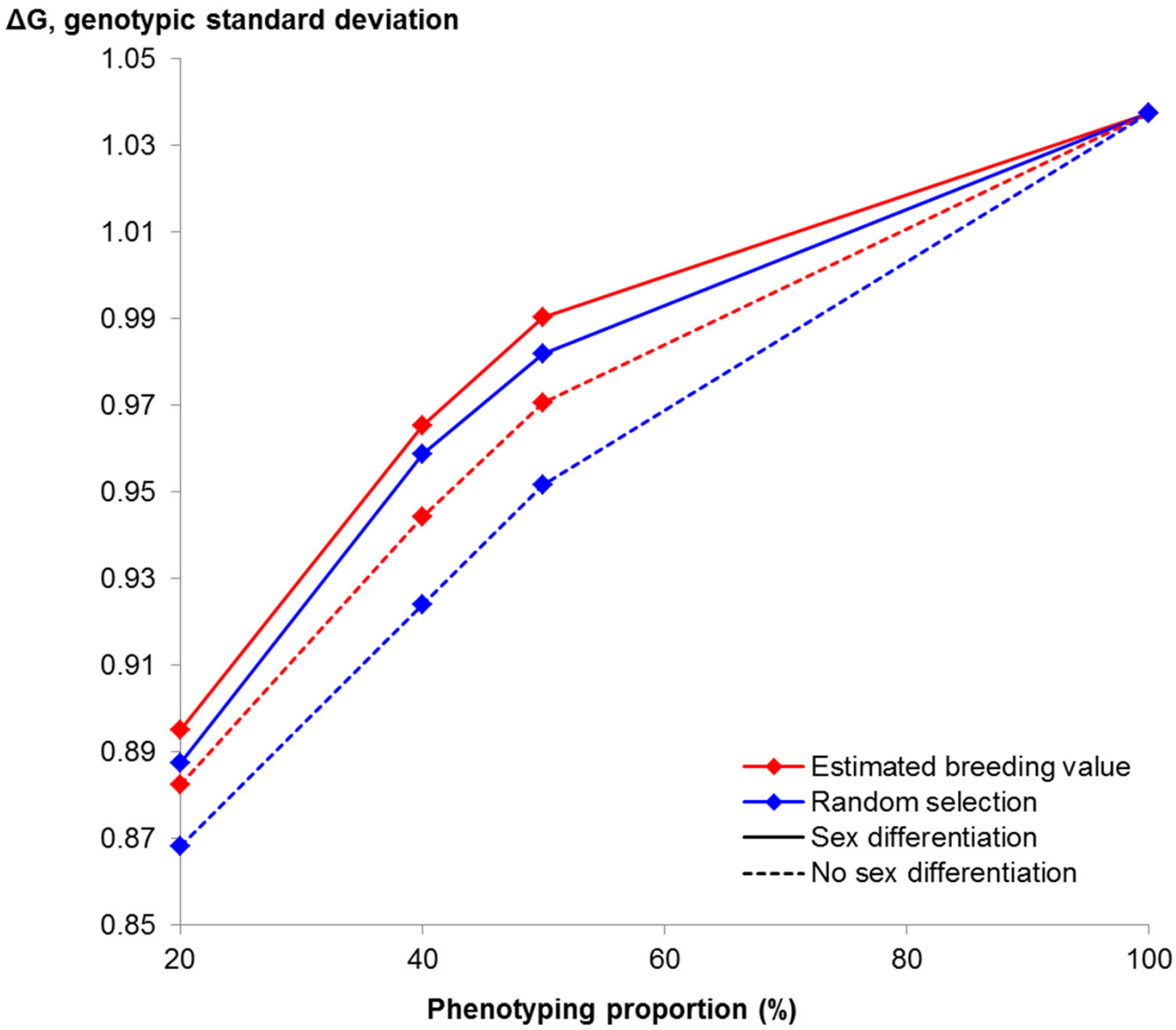


- Breeding scheme
  - Population structure
    - ✓Boars = 10
    - ✓Sows = 100
    - ✓Litter size = 5
  - Implementation
    - ✓12 discrete generations
    - ✓8-12 - Implementation of genomic selection and phenotyping criteria
  - Breeding objective - Single trait selection with h^2 =0.4

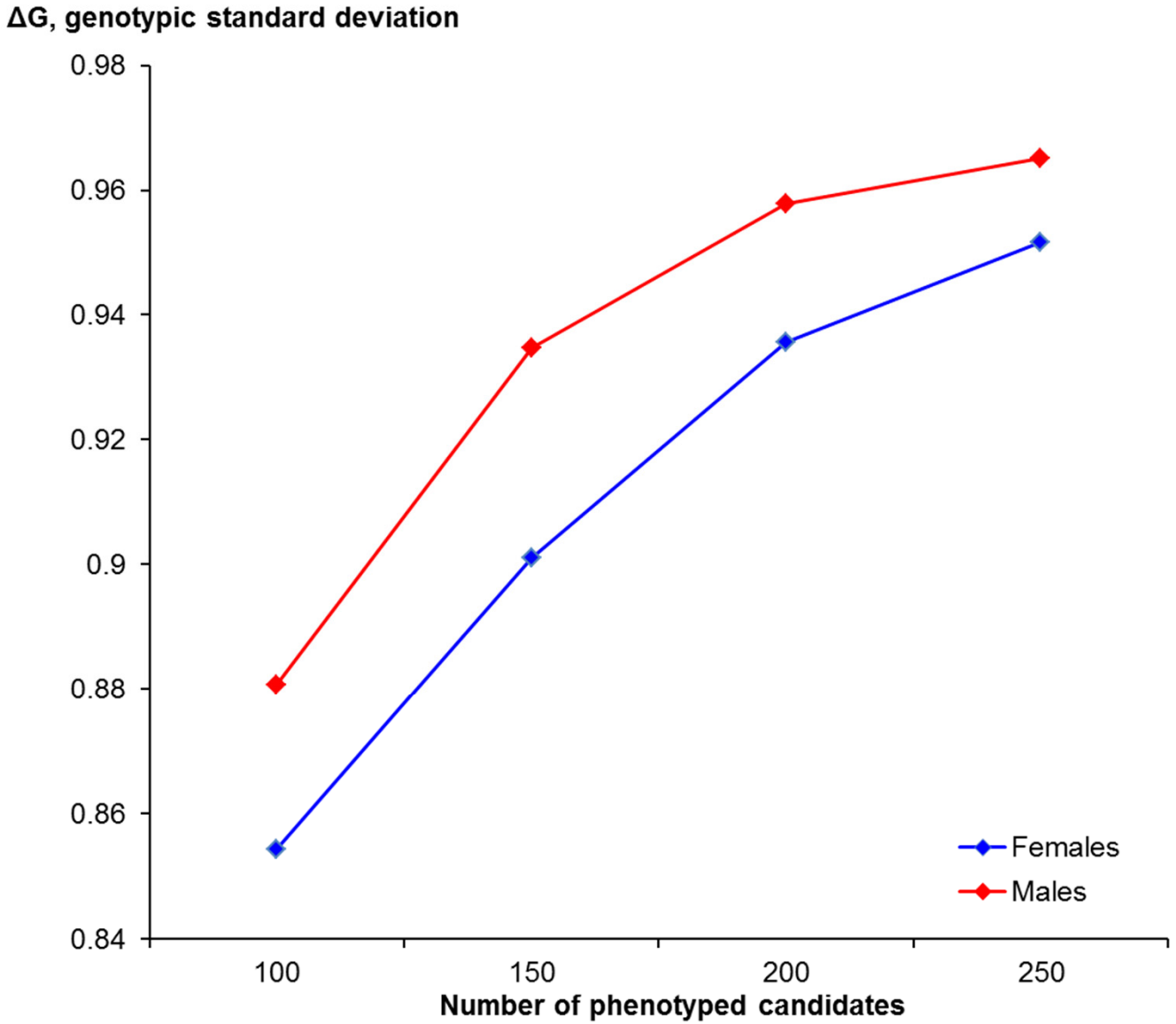
➢ Simulated genome

- ✓ Genetic architecture of the founder population– represent LD in the Danish pigs
- ✓ Genome = 18 chromosomes of 167 cM each
- ✓ 60,000 markers and 8,000 QTLs
- ✓ Haplotypes sampled to initiate breeding schemes

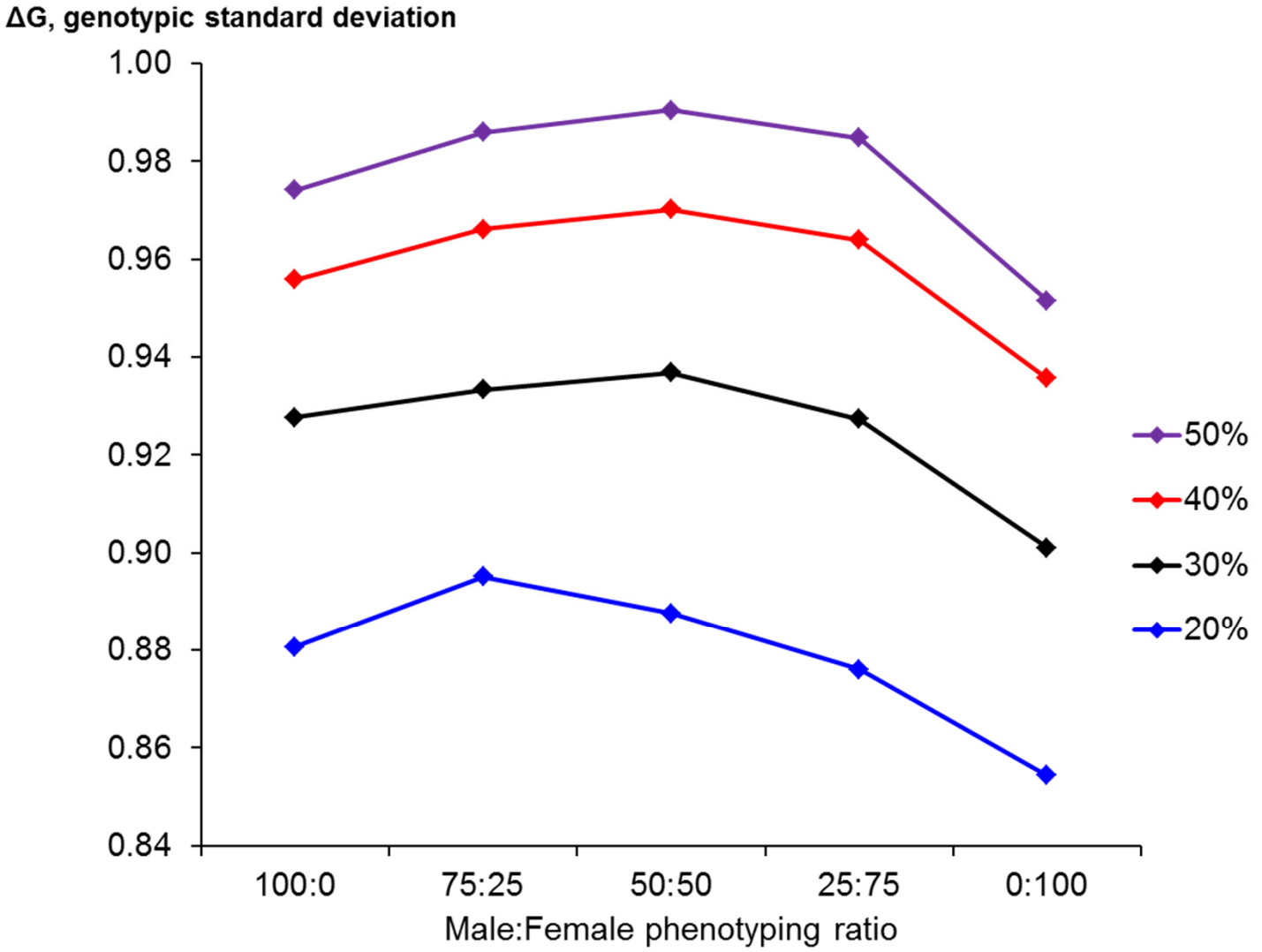
Genetic gain



Genetic gain for Males and Females



Genetic gain for Male:Female ratio



Conclusions

- Considering sex ratio among the phenotyping candidates is beneficial
- Phenotyping sex with high selection intensity is beneficial at low proportions
- Less intensively selected sex should also be considered at high phenotyping proportions