

Breeding programs to improve survival time in laying hens

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Survival time in laying hens



Social interactions

Direct genetic effect (DGE)

Indirect genetic effect (IGE)

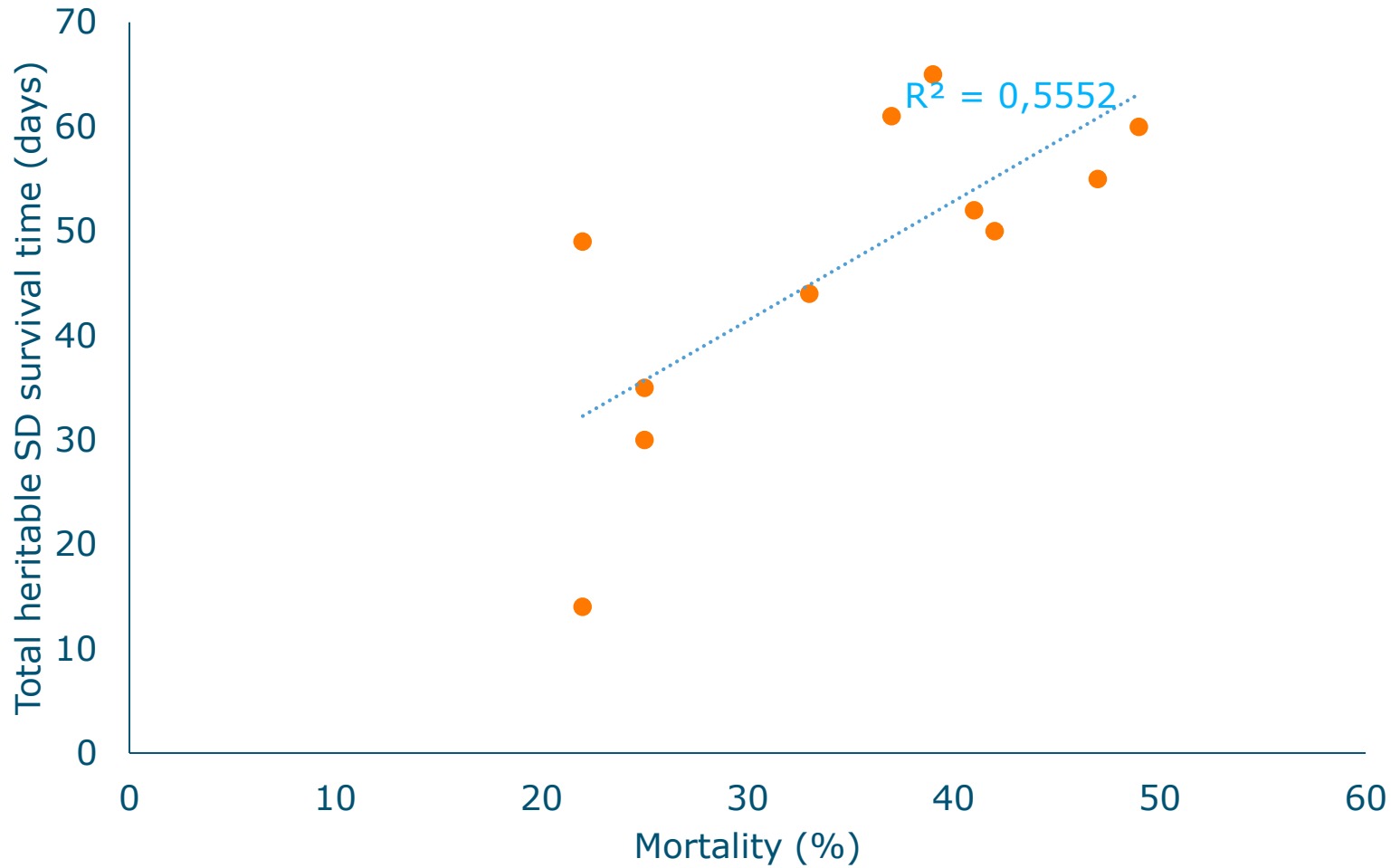
Previous studies

- IGE (actor effect): 36 – 87% of total heritable variation
- T^2 : 3 – 26%
 - Total heritable variance expressed relative to phenotypic variance: $T^2 = \frac{\sigma_{TBV}^2}{\sigma_P^2}$
- σ_{TBV} : 14 – 65 days

Both DGE and IGE are important
➤ **improve ΔG**

Selection experiment: < realized ΔG

Effect mortality



Aim

To improve **survival time (ST)** in laying hens by **genetic selection**

1. To compare response to selection in ST for two multi-trait crossbred breeding programs
 - Traditional recurrent testing (RT)
 - Genomic selection (GS)
2. To investigate the effect of level of mortality on
 - Total heritable standard deviation in ST
 - Response to selection for ST

Material & Method

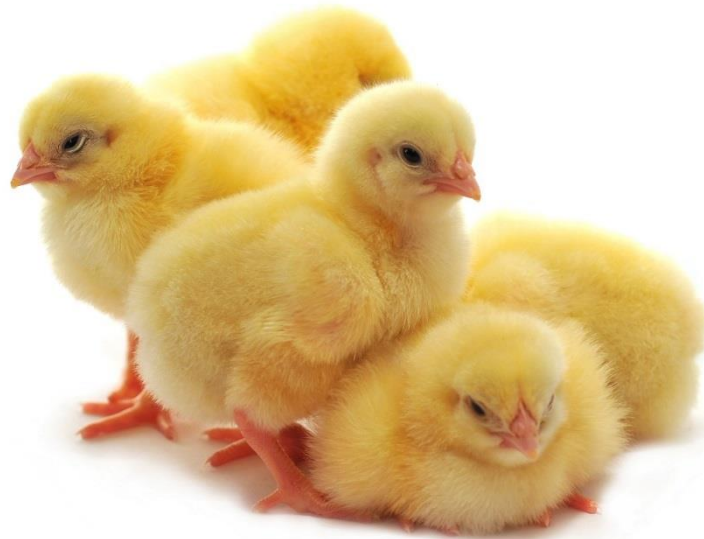
- Multi-trait: survival time (ST) & other traits (OT)
- Deterministic simulation
- SelAction: bivariate response curves



	ST	OT
T^2/h^2	0.17	0.30
r_g	0 or -0.3	

- Average mortality = 35%

1. Breeding programs



Breeding schemes ST

	RT		GS	
	Males	Females	Males	Females
Selection intensity	8%	8%	2%	8%
Information used	Progeny	Pedigree	Own	Own
Generation interval	99	55	33	33
Accuracy GS (ρ_{GS})				0.40

$$\rho_{gs} = \sqrt{\frac{r^2}{r^2 + \frac{M_e}{N_p}}}$$

Daetwyler et al., 2008

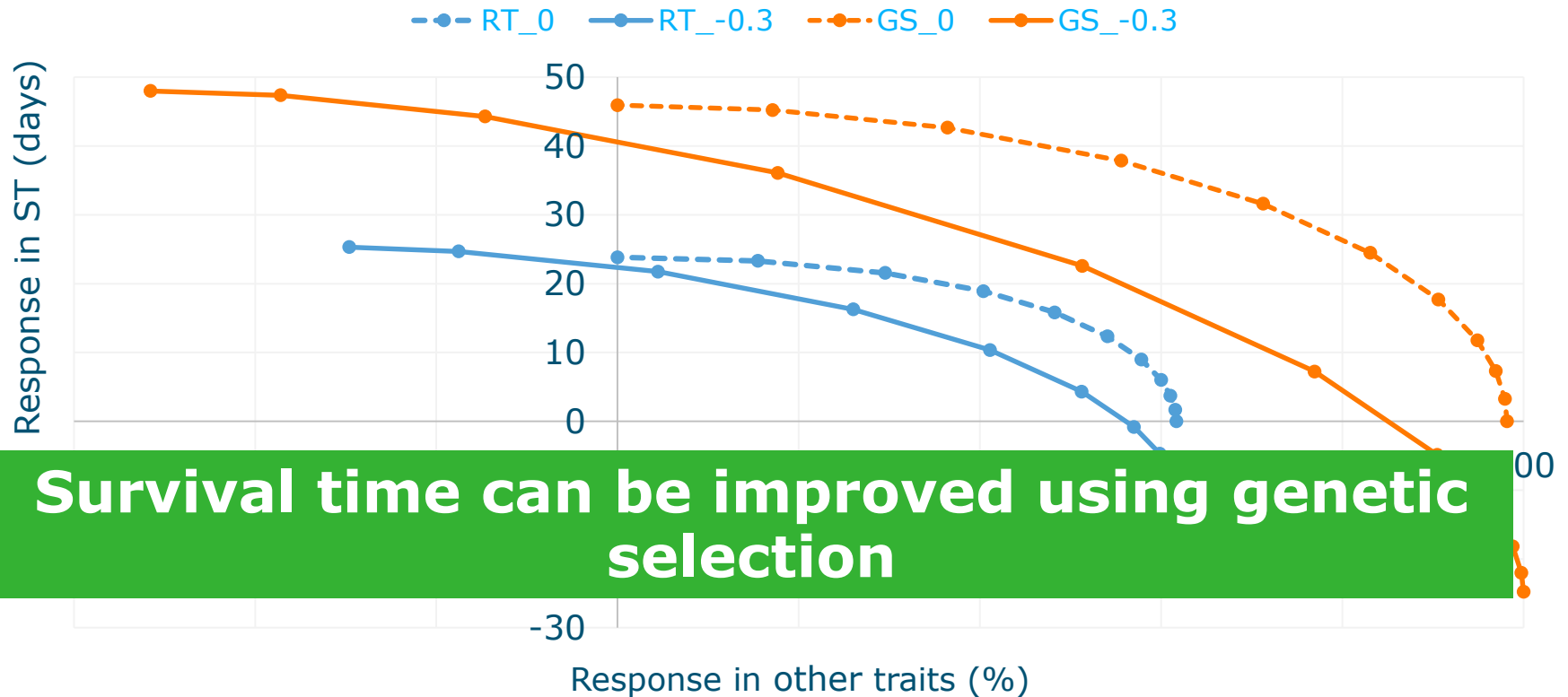
Breeding schemes OT

	RT		GS	
	Males	Females	Males	Females
Selection intensity	8%	8%	2%	8%
Information used	Progeny	Own, sibs	Own	Own
Generation interval	99	55	33	33
Accuracy GS (ρ_{GS})				0.48

$$\rho_{gs} = \sqrt{\frac{r^2}{r^2 + \frac{M_e}{N_p}}}$$

Daetwyler et al., 2008

Results RT & GS



Survival time can be improved using genetic selection

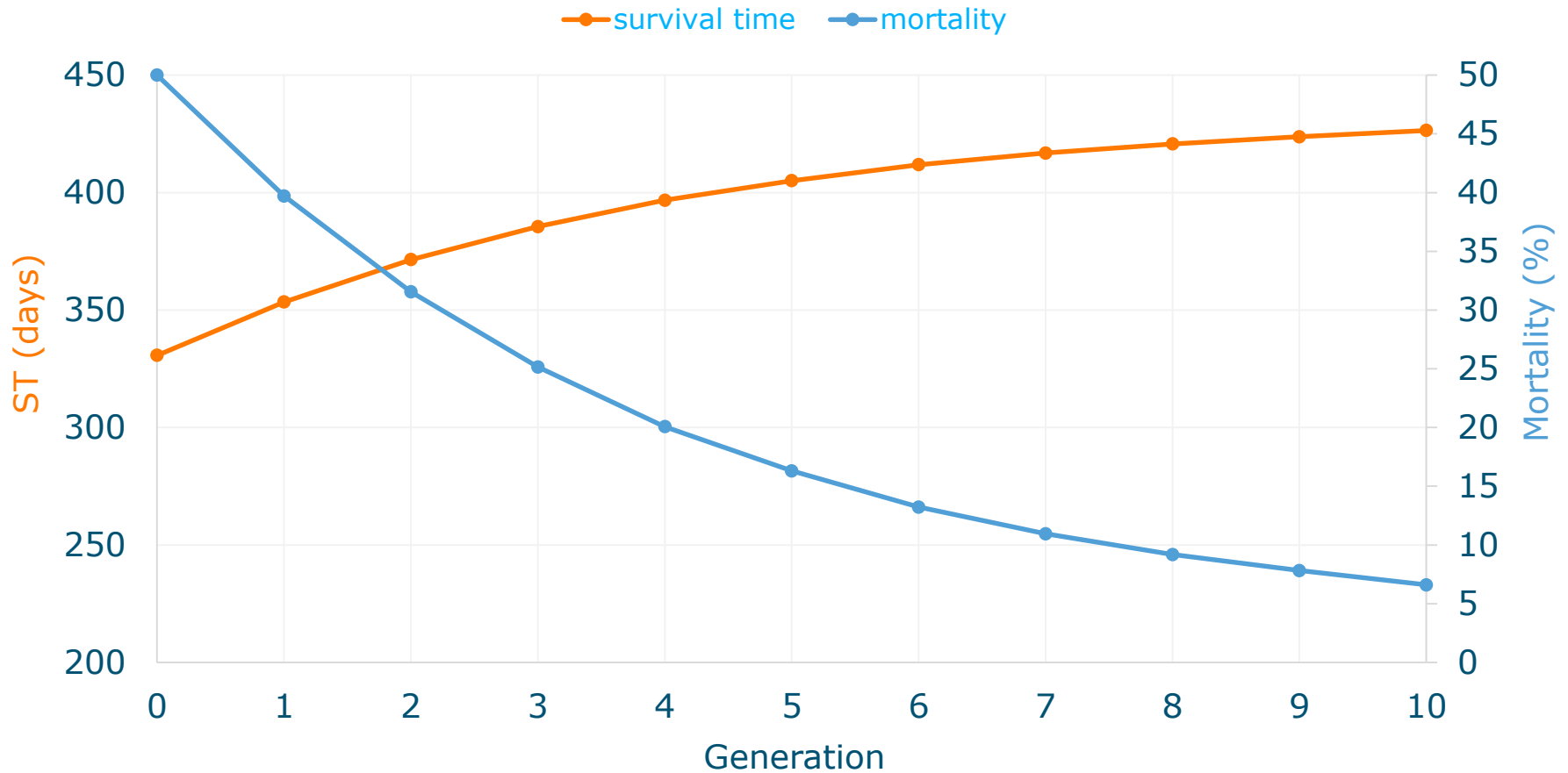
Effect mortality



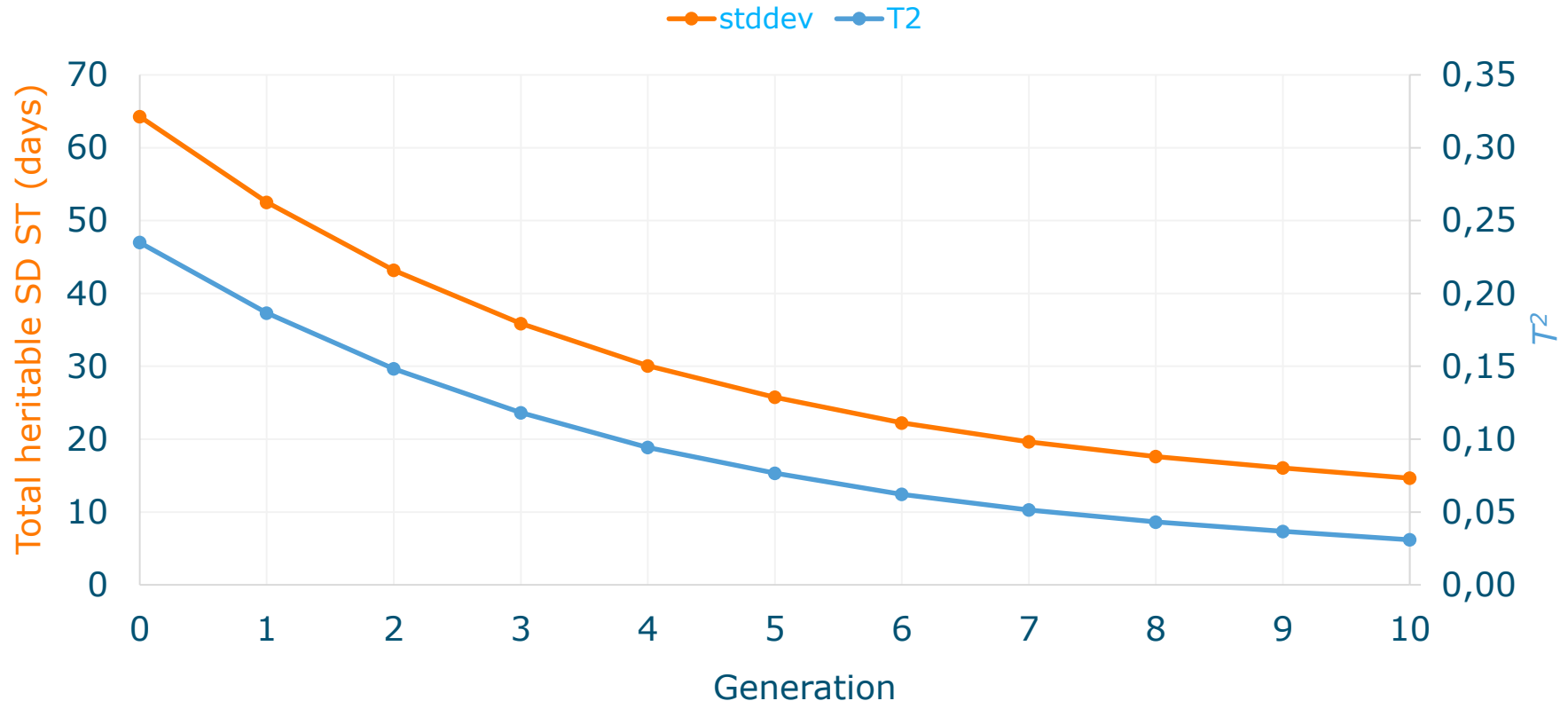
Method

- Selection for improved ST
- 10 generations
- Base generation: mortality = 50%, $\overline{ST} = 331$ days, $T^2 = 0.24$
- Each generation
 - Update ST and genetic parameters
 - Predict ΔG

Results – ST & mortality



Results – genetic parameters



In summary

- Survival time can be improved using genetic selection
- Depends on weight in a breeding goal
- GS improves response to selection
- Mortality has large impact on response to selection



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