

BIO-341-01-0901: 3-Pt Testcross Exercise (100 Points, Due 31Mar09)

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Sent: Thursday, March 26, 2009 3:48 PM

To: Lin, Peter

3-Point Testcross Exercise (100 Points, Due 31 Mar 09)

Analytical Approaches to Solving Genetics Problems: Pp 158; Q6.2 Chinese primrose (use new data table provided in class)

Provide answers (in correct gene order) to the following:

- a) Parental Phenotypes & Genotypes
- b) Subject Phenotypes & Genotypes
- c) Tester Phenotypes & Genotypes
- d) % Recombinant in SCO I (please define)
- e) % Recombinant in SCO II (please define)
- f) Interference (I)

Post your answers in Blackboard Genetics-341 Discussion Board under "3-Pt Testcross Exercise" Forum.

Analytical Approaches to Solving Genetics Problems

Pp. 158 Q6.2: New Testcross Progeny Data Table

(Use for 3-Pt Testcross Exercise, 100 Points; Due 31Mar09)

| Phenotype | Number of Progeny |
|----------------------------|--------------------------|
| Slate, green, short | 977 |
| Slate, red, short | 85 |
| Blue, red, short | 27 |
| Slate, red, long | 402 |
| Slate, green, long | 27 |
| Blue, green, long | 93 |
| Blue, green, short | 427 |
| Blue, red, long | 960 |
| Total: | 3,000 |

Key 26 Mar 09.
3-pt Testcross Exercise

Analytical Approaches to Solving Genetics Problems

Pp. 158 Q6.2: New Testcross Progeny Data Table

(Use for 3-Pt Testcross Exercise, 100 Points; Due 31Mar09)

| Phenotype | Number of Progeny |
|--------------------------------|-------------------|
| Slate, green, short <i>sRL</i> | 977 |
| Slate, red, short <i>srL</i> | 85 |
| Blue, red, short <i>SrL</i> | 27 |
| Slate, red, long <i>srl</i> | 402 |
| Slate, green, long <i>sRL</i> | 27 |
| Blue, green, long <i>SRL</i> | 93 |
| Blue, green, short <i>SRL</i> | 427 |
| Blue, red, long <i>Srl</i> | 960 |
| Total: | 3,000 |

Key:

| | |
|-----------|-----------|
| slate (s) | Blue (S) |
| long (l) | Short (L) |
| red (r) | Green (R) |

① Gene order Determination

Most abundant } 977 Slate, Green, Short *sRL*
 960 Blue, red, long *Srl* } Parental

27 Blue, red, Short *SrL*
 27 slate, Green, long *sRL* } DCO

least abundant

l change position
 ⇒ l in middle

s-l-r

or

r-l-s

② Rewrite in correct gene order

Parental
genotype phenotype
determination

977 slate, short, Green SLR
~~Blue, red, long Sr~~ } Parental
 960 Blue, long, red SLr
 27 Blue, short, red SLr } DCO
 27 slate, long, Green, SLR }

Impley True Breeding Parental Genotypes are:
 Phenotype are:

P ♀ $\frac{SLR}{SLR}$ x $\frac{SLr}{SLr}$ ♂ (a)

slate, short, Green, Blue, long, red

3-pt Testcross

F₁ Subject $\frac{SLR}{SLr}$ x $\frac{SLr}{SLr}$ Tester (b)
 Blue, short, Green slate, long, red (c)

Subject & Tester
 phenotype + genotype Determination

③

SCO_I(l-l) Determination

~~s l r~~ → s l r slate, long, red 402
s l r SLR Blue, Short, Green 427

(d) % Recon SCO(l-l)

$$= \frac{SCO(l-l) + DCO}{\text{total}} \times 100\%$$

$$= \frac{[402 + 427] + [27 + 27]}{3000} \times 100\% = \frac{883}{3000} \times 100\% \\ = 29.43\% \\ (0.2943)$$

SCO_{II}(l-r) Determination

~~s l r~~ → s l r slate, Short, red 85
s l r SLR Blue, long, Green 93

(e) % Recon SCO(l-r)

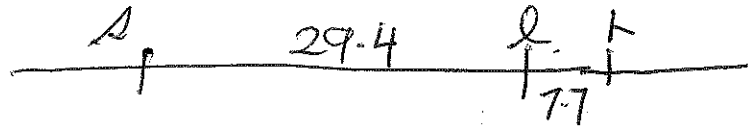
$$= \frac{SCO(l-r) + DCO}{\text{total}} \times 100\%$$

$$= \frac{[85 + 93] + [27 + 27]}{3000} \times 100\% = \frac{232}{3000} \times 100\% \\ = 7.73\% \\ (0.0773)$$

Interference Determination

(4)

Gene map



$$\text{Interference (I)} = 1 - \text{Coef. Coincidence (C)}$$

$$I = 1 - C$$

Observed

$$C = \frac{\text{Obs DCO}}{\text{Exp DCO}}$$

Expected

$$\text{Obs DCO} = \frac{27+27}{3000} = 0.018$$

$$\begin{aligned} \text{Exp DCO} &= [\text{SCO}_I] \times [\text{SCO}_{II}] \\ &= 0.294 \times 0.077 \\ &= 0.023 \end{aligned}$$

$$C = \frac{\text{Obs DCO}}{\text{Exp DCO}} = \frac{0.018}{0.023} = 0.783$$

$$I = 1 - C$$

(f) $I = 1 - 0.783 = 0.217$

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Provide answers (in correct gene order) to the following:

- a) Parental Phenotypes & Genotypes P SLR/SLR slate, short, green, Slr/slR Blue, long, red.
- b) Subject Phenotypes & Genotypes F_1 SLR/slR Blue, short, green [Triply heterozygous]
- c) Tester Phenotypes & Genotypes slr/slR slate, long, red [Triply homo recessive]
- d) % Recombinant in SCO I (please define) SCO (A-B) : 29.4%
- e) % Recombinant in SCO II (please define) SCO (B-C) : 7.7%
- f) Interference (I) $I = 1 - 0.78 = 0.22$

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