Trichome patterning model

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Contents

1 Model network

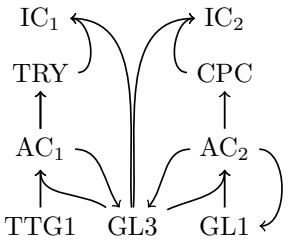

Figure 1: Schematic of the model. AC1 = TTG1-GL3, AC2 = GL1-GL3, IC1 = TRY-GL3, IC2 = CPC-GL3

2 The model equations

$$\partial_t[TTG1]_j = k_1 - [TTG1]_j(k_2 + k_3[GL3]_j) + k_2k_4\hat{L}[TTG1]_j \tag{1}$$

$$\partial_t[GL1]_j = k_5 + k_6[AC2]_j - [GL1]_j(k_7 + k_8[GL3]_j) \tag{2}$$

$$\partial_t[GL3]_j = k_9 + \frac{k_{10}k_{11}[AC1]_j^2}{k_{11} + [AC1]_j^2} + \frac{k_{12}k_{13}[AC2]_j^2}{k_{13} + [AC2]_j^2} - [GL3]_j(k_{14} + k_3[TTG1]_j + k_8[GL1]_j + k_{15}[TRY]_j + k_{16}[CPC]_j) \tag{3}$$

$$\partial_t[TRY]_j = k_{17}[AC1]_j^2 - [TRY]_j(k_{18} + k_{15}[GL3]_j) + k_{18}k_{19}\hat{L}[TRY]_j \tag{4}$$

$$\partial_t[CPC]_j = k_{20}[AC2]_j^2 - [CPC]_j(k_{21} + k_{16}[GL3]_j) + k_{21}k_{22}\hat{L}[CPC]_j \tag{5}$$

$$\partial_t[AC1]_j = k_3[GL3]_j[TTG1]_j - k_{23}[AC1]_j \tag{6}$$

$$\partial_t[AC2]_j = k_8[GL3]_j[GL1]_j - k_{24}[AC2]_j \tag{7}$$

Transport of variable χ between cell j at coordinates (x, y), where $1 \leq x \leq N_x$ and $1 \leq y \leq N_y$, and its neighbour on a hexagonal grid is modelled by the coupling equation:

$$\hat{L}[\chi]_{x,y} = [\chi]_{y-1,x} + [\chi]_{y+1,x} + [\chi]_{y,x-1} + [\chi]_{y,x+1} + [\chi]_{y+1,x-1} + [\chi]_{y-1,x+1} - 6[\chi]_{y,x}. \tag{8}$$

3 Parameter description

Table 1: Parameters and their descriptions

Parameter name	Description	Example value
k_1	TTG1 basal production	0.5982
k_2	TTG1 degradation	0.1405
k_3	TTG1-GL3 binding	2.1971
k_4	TTG1 diffusion	1.1245
k_5	GL1 basal production	0.2916
k_6	GL1 activation by AC2	2.3028
k_7	GL1 degradation	0.3466
k_8	GL1-GL3 binding	1.7822
k_9	GL3 basal production	0.3976
k_{10}	GL3 activation by AC1	9.9829
k_{11}	Saturation of GL3 activation by AC1	1.3647
k_{12}	GL3 activation by AC2	1.2590
k_{13}	Saturation of GL3 activation by AC2	7.8041
k_{14}	GL3 degradation	2.6202
k_{15}	TRY-GL3 binding	1.5731
k_{16}	CPC-GL3 binding	5.2625
k_{17}	TRY activation by AC1	4.8758
k_{18}	TRY degradation	0.3196
k_{19}	TRY diffusion	0.1465
k_{20}	CPC activation by AC2	2.1453
k_{21}	CPC degradation	0.5396
k_{22}	CPC diffusion	56.0520
k_{23}	AC1 degradation	0.5131
k_{24}	AC2 degradation	0.8396