15. $\dfrac{\partial u}{\partial t} = a\dfrac{\partial^2 u}{\partial x^2} + u^{1+kn} f\bigl(u^n w^m\bigr), \qquad \dfrac{\partial w}{\partial t} = b\dfrac{\partial^2 w}{\partial x^2} + w^{1-km} g\bigl(u^n w^m\bigr).$

Self-similar solution:

$$u = (C_1 t + C_2)^{-\frac{1}{kn}} y(\xi), \qquad w = (C_1 t + C_2)^{\frac{1}{km}} z(\xi), \qquad \xi = \frac{x + C_3}{\sqrt{C_1 t + C_2}},$$

where C_1, C_2, and C_3 are arbitrary constants, and the functions $y = y(\xi)$ and $z = z(\xi)$ are determined by the system of ordinary differential equations

$$a y''_{\xi\xi} + \frac{1}{2} C_1 \xi y'_\xi + \frac{C_1}{kn} y + y^{1+kn} f\bigl(y^n z^m\bigr) = 0,$$
$$b z''_{\xi\xi} + \frac{1}{2} C_1 \xi z'_\xi - \frac{C_1}{km} z + z^{1-km} g\bigl(y^n z^m\bigr) = 0.$$

Reference

Polyanin, A. D., Exact solutions of nonlinear systems of reaction-diffusion equations and mathematical biology equations, *Theor. Found. Chem. Eng.,* Vol. 37, No. 6, 2004.

