$$\frac{da}{dt} = 1 - a - m - K_1 m^2 a$$

$$\frac{dm}{dt} = K_1 m^2 a + K_2 m^n (a+m-1)$$

Fixed point : $\dot{a} = 0$ and $\dot{m} = 0$

$\dot{a} = 0 \implies K_1 m^2 a = 1 - a - m$ — (*)

Putting this in $\dot{m} = 0$,

$$(1-a-m) = K_2 m^n (1-a-m)$$

$$(1-a-m)\left[1 - K_2 m^n\right] = 0$$

$\implies$ Either $\underline{a+m=1}$ or $\underline{m = \frac{1}{K_2^{1/n}}}$

$K_1 m^2 a = 0$ (from *)

$\Rightarrow m = 0$ or $a = 0$

Then we have $\boxed{(0,1)}$ or $\boxed{(1,0)}$

$K_1 m^2 a = 1 - a - m$

$a(K_1 m^2 + 1) = 1 - m$

$\implies a = \frac{1-m}{1+K_1 m^2}$

$$a = \frac{1 - \frac{1}{K_2^{1/n}}}{1 + \frac{K_1}{K_2^{2/n}}}$$

$$a = \frac{K_2^{2/n} - K_2^{1/n}}{K_2^{2/n} + K_1}$$

$$\therefore \boxed{\left(\frac{K_2^{2/n} - K_2^{1/n}}{K_2^{2/n} + K_1}, \frac{1}{K_2^{1/n}}\right)}$$

$$f(a,m) = 1 - a - m - K_1 m^2 a$$

$$g(a,m) = K_1 m^2 a + K_2 m^n (a+m-1)$$

$$\frac{\partial f}{\partial a} = -1 - K_1 m^2 \qquad \frac{\partial f}{\partial m} = -1 - 2K_1 m a$$

$$\frac{\partial g}{\partial a} = K_1 m^2 + K_2 m^n \qquad \frac{\partial g}{\partial m} = 2K_1 m a + n a K_2 m^{n-1} + (n+1) K_2 m^n - n K_2 m^{n-1}$$

At $(a,m) = (0,1)$:

$$J = \begin{pmatrix} -1-K_1 & -1 \\ K_1+K_2 & K_2 \end{pmatrix}$$

$$\tau = K_2 - K_1 - 1$$

$$\Delta = -K_2(K_1+1) + K_1 + K_2 = -K_1 K_2 + K_1 = K_1(1-K_2)$$

If $K_2 > 1$, Saddle point (usual case)

If $K_2 < 1$, $\Delta > 0$ $\tau < 0$

$$\begin{aligned} \tau^2 - 4\Delta &= (K_2 - K_1 - 1)^2 + 4K_1(K_2 - 1) \\ &= K_2^2 + K_1^2 + 1 + 2K_1K_2 - 2K_1 - 2K_2 \\ &= (K_1+K_2)^2 + 1 - 2(K_1+K_2) \\ &= (K_1 + K_2 - 1)^2 \geq 0 \end{aligned}$$

$\therefore$ if $K_2 < 1$ and $K_1 + K_2 \neq 1$, stable node.

" and $K_1 + K_2 = 1$, star or degenerate node.

At $(a,m) = (1,0)$:

$$J = \begin{pmatrix} -1 & -1 \\ 0 & 0 \end{pmatrix} \qquad \tau = -1, \quad \Delta = 0$$

$\lambda = 0 : \begin{pmatrix} 1 \\ -1 \end{pmatrix}$

$\lambda = -1 : \begin{pmatrix} 1 \\ 0 \end{pmatrix}$

$\Rightarrow$ **Non-Isolated Fixed Point**

At $(a,m) = \left( \dfrac{k_2^{2/n} - k_2^{1/n}}{k_2^{2/n} + k_1}, \dfrac{1}{k_2^{1/n}} \right)$

$$-1 - k_1 k_2^{-2/n} \qquad \frac{\partial f}{\partial a}$$

$$-1 - \frac{2 k_1 \left(-1 + k_2^{\frac{1}{n}}\right)}{k_1 + k_2^{2/n}} \qquad \frac{\partial f}{\partial m}$$

$$k_1 k_2^{-2/n} + k_2 \left(k_2^{-1/n}\right)^n \qquad \frac{\partial g}{\partial a}$$

$$k_2 \left(k_2^{-1/n}\right)^n - \frac{k_1 \left(-1 + k_2^{\frac{1}{n}}\right) \left(-2 + n k_2 \left(k_2^{-1/n}\right)^n\right)}{k_1 + k_2^{2/n}} \qquad \frac{\partial g}{\partial m}$$

$$\tau = \frac{\partial f}{\partial a} + \frac{\partial g}{\partial m}$$

$$\Delta = \frac{\partial f}{\partial a} \cdot \frac{\partial g}{\partial m} - \frac{\partial f}{\partial m} \cdot \frac{\partial g}{\partial a}$$

$$-1 + k_2 \left(k_2^{-1/n}\right)^n + k_1 \left( -k_2^{-2/n} - \frac{\left(-1 + k_2^{\frac{1}{n}}\right) \left(-2 + n k_2 \left(k_2^{-1/n}\right)^n\right)}{k_1 + k_2^{2/n}} \right) \qquad \tau$$

$$\Delta$$

$$\frac{k_1 k_2^{-2/n} \left( k_1 \left( 1 + k_2 \left(k_2^{-1/n}\right)^n \left( -1 - n + n k_2^{\frac{1}{n}} \right) \right) + k_2^{2/n} \left( 3 - (3+n) k_2 \left(k_2^{-1/n}\right)^n + k_2^{\frac{1}{n}} \left( -2 + (2+n) k_2 \left(k_2^{-1/n}\right)^n \right) \right) \right)}{k_1 + k_2^{2/n}}$$

Clearly, this expression is too complicated for us to make any general comment.