**Text S1. Mathematical analysis of the stability of the normal orixate phyllotactic pattern in DC1**

In the present section, we considered the stability of normal orixate phyllotaxis, which has ideal periodic repetition of a sequence of divergence angles consisting of exactly , , , and .

Mathematical analysis was performed for the DC1 system, in which the radius of the shoot apical meristem is 1 and is the th leaf primordium located at with . The ’s inhibitory effect at on the SAM periphery is dependent solely on , the distance from . When the th primordium is arising, the inhibitory field strength at the position is calculated by summing the inhibitory effects from all existing primordia, as follows.

When the normal pattern of orixate phyllotaxis is stably maintained, the inhibitory field strength should give a minimum at . Hence, when setting , the following equation should be satisfied:

Because , we obtain:

where .

Thus,

where .

Regarding the arrangement of primordia, there are two geometrical situations; in situation 1, the divergence angle between the newly arising primordium, , and the last primordium, , is (), while it is () in situation 2 (Fig S1A).

(Situation 1)

Situation 1 is represented by setting as:

The application of this condition to Eq S5 yields:

Hence,

Because is a monotonically decreasing function, is always negative:

(Situation 2)

Situation 2 is represented by setting as:

The -derivative of can be calculated as in the case described for situation 1:

According to the distance dependency of the inhibitory effect assumed in DC1, . Using this assumption and noting that and , we obtain:

As increases monotonically with , , and then in both situations. This indicates that the total inhibitory field strength cannot satisfy Eq S2, which demonstrates that normal orixate phyllotaxis cannot be established in DC1.