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Supplementary material: Describing 3D leaf shapes

Extending the leaf shape model to describe a non-planar shape can be done by following the same methodology, merely adding a description of the z-coordinate independently. As an example, a leaf with a rippled leaf margin and horizontal leaf midrib can be described by adding a sinusoid function to describe the evolution of the z coordinates of the leaf edges (**Fig. S.1**):

$$0 \le j \le 1 \qquad z_j = z_A \sin\left[\pi\left(z_f\left(j + z_{ph}\right)\right)\right] \qquad \text{(Eq. S.1)}$$

Where z_A is the sinusoid amplitude, z_f the number of half waves and z_{ph} the phase with $z_f \in \mathbb{N}$ and $z_{ph} \in \left(0, \frac{1}{z_f}\right)$ to guarantee a z coordinate of 0 at both the leaf start and the leaf tip.

In the case of a curved midrib, an additional equation will be needed to describe the progression of it's the midrib height (**Fig. S.2**). This can be done by a simple second degree polynomial.

$$0 \le j \le 1 \qquad m = a \cdot j^2 + b \cdot j \qquad \text{(Eq. S.2)}$$

Which simply extends the description of z_j to:

$$0 \le j \le 1 \qquad z_j = z_A \sin\left[\pi\left(z_f\left(j + z_{ph}\right)\right)\right] + m \qquad \text{or} \qquad \text{(Eq. S.3)}$$

$$z_j = z_A \sin\left[\pi\left(z_f\left(j + z_{ph}\right)\right)\right] + a \cdot j^2 + b \cdot j$$

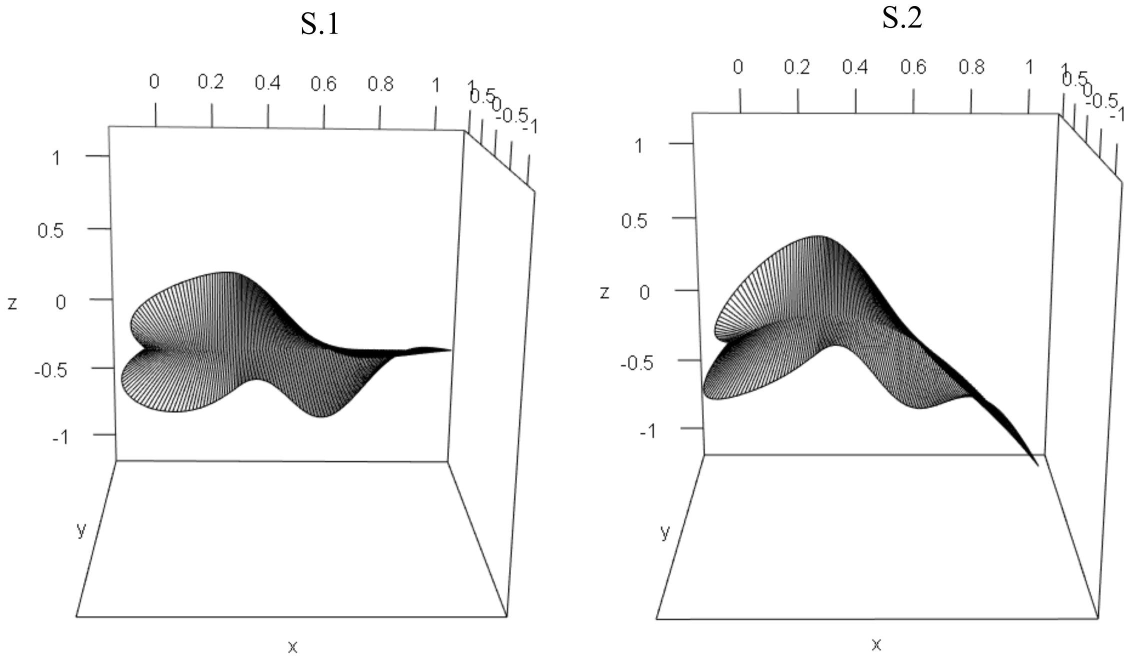

Fig. S (S.1) 3D leaf shape generated with the addition of a simple sinusoid function representing the evolution of the z coordinate. (S.2) is extended further by the inclusion of a second degree polynomial describing the height of the leaf midrib