Optimality and universal scaling for osmotically driven translocation of sugars in plants

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— The growth of plants depends on efficient translocation of sugars. The current belief is that this takes place predominantly through osmotically driven flow, passively generated by differences in sugar concentrations (the so-called Münch mechanism). We show that optimization of translocation speed predicts a universal scaling between the width of the conduits (phloem cells), the length of the plant and the length of the “loading zones” (the leaves). This unexpected scaling is verified by data from plants over several orders of magnitude in size, from small green plants to large trees.

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