

Abstract

Photosynthesis is a complex of complete biochemical processes which are working in photosynthetic structures, in our case in the leaf of higher plant.

Leaf is the main photosynthetic organ of the higher plant which is excellently adapted to its photosynthetic function. Leaf used to be thin (short transport pathways) and used to have a big leaf area which enables to catch as much as possible of incoming irradiance. Light is falling to leaf epidermis. Epidermal cells do not contain chloroplasts and they represent a system of lenses which concentrate the light to the leaf mesophyll so that a light gradient appears. The cells of the palisade parenchyma are columnar and prolonged and the intercellular spaces enable the light going deeper into the leaf mesophyll. On the surface of the palisade parenchyma cells light is scattered and reflected and thus a significant proportion of down-welling light is sent back and will be absorbed for photosynthesis. The cells of spongy parenchyma have a very irregular shape and that amplifies multiple photon scattering.

Important substrate for photosynthesis is a quantity of CO₂. CO₂ is in surrounding atmosphere and enters the leaf mainly through stomata what is the first barrier limiting CO₂ flux into the leaf if the stomata are half-open or closed. Further on, CO₂ diffuses to surface of mesophyll cells via intercellular spaces, where it dilutes in water present in cell walls. Following transport of CO₂ continues in the liquid phase. The transport of CO₂ in the liquid phase is slower than in the gas phase but the diffusion pathway from the cell wall to the photosynthesising centers in the chloroplasts is short. Stomata are representing the highest resistance to CO₂ on its pathway from the atmosphere into the chloroplasts. Stomata are also the place of exchange of water vapour into the atmosphere during transpiration process. Openness of stomatal aperture has to be set in such a manner that sufficient CO₂ supply would be available for photosynthesis in the leaf and simultaneously the leaf should not lose too much water in a form of water vapour during transpiration in regard to actual environmental conditions. Regulation of stomata is unique adaptation to photosynthetic processes.