special chloroplasts (called iridoplasts) located in epidermal cells, which contain periodically arranged thylakoid stacks spanning the entire chloroplast (Lee, 1986, 1997).

Structural colouration due to interference phenomena was further reported for fruits of species of the genus *Elaeocarpus* (Lee, 1991). In these fruits, interference originates from a three-dimensional lattice formed by extracellular polysaccharide strands of about 80 nm thickness but are still located inside the upper epidermal cell wall. More recently, Lee *et al.* (2000) discovered structural colouration in fruits of *Delarbrea michieana* (Araliaceae). Generally, fruit colouration is thought to attract animal ingestion and consequent seed dispersal. A specific advantage of structural colouration may be greater stability and longevity resulting in longer-lasting appeal to animals compared with normal pigment colouration, which fades faster with fruit decomposition.

6.5 Concluding remarks

We have summarised the many factors contributing to the optical behaviour of plant surfaces. Most of the individual aspects of surface optics have been characterised for specific plant species or plant groups in which they appear of particular importance. A general pattern of the relative significance of the various optical features, however, is not yet apparent. Moreover, published data sets are often limited to a certain aspect of surface optics; thus, not only the relative significance of electronic absorption of radiation and of non-absorptive optical properties is often not defined but also the relative contributions of surface domains (e.g. epicuticular wax, cuticle or cell vacuole) to the total surface optical characteristics are not evaluated.

Obviously, despite the immense success of research during recent decades, our general understanding of plant surface optics is still fragmentary. To obtain a more holistic comprehension, future research on surface optics requires investigations at different levels of complexity by combining analytical methods to identify optically active molecules, spectrometric characterisation of surface optics and microscopic evaluation of structures and distribution of absorbing compounds. Little is known about the forces that have driven the evolution of so many different kinds of optical features. Analyses of energy costs for syntheses of various optical elements in different species in comparison with the advantages conferred by specific optical features, together with studies clarifying the emergence of optical traits during evolution, will help to further advance our understanding of the role and function of the many forms of plant surface optics. Understanding the role of plant surface optics also requires consideration of other possible functions, e.g. their potential signalling role which can influence plant–animal interactions.

Acknowledgements

We thank Dr. Robert J. Porra and Ms. Wilma Kreßmann for their help in preparing the manuscript.