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Sommario/riassunto	<p>One of the distinguishing features of plants is the presence of membrane-bound organelles called plastids. Starting from proplastids (undifferentiated plastids) they readily develop into specialised types, which are involved in a range of cellular functions such as photosynthesis, nitrogen assimilation, biosynthesis of sucrose, starch, chlorophyll, carotenoids, fatty acids, amino acids, and secondary metabolites as well as a number of metabolic reactions. The central role of plastids in many aspects of plant cell biology means an in-depth understanding is key for a holistic view of plant physiology. Despite the vast amount of research, the molecular details of many aspects of plastid biology remains limited. Plastids possess their own high-copy number genome known as the plastome. Manipulation of the plastid genome has been developed as an alternative way to developing transgenic plants for various biotechnological applications. High-copy number of the plastome, site-specific integration of transgenes through homologous recombination, and potential to express proteins at high levels (>70% of total soluble proteins has been reported in some cases) are some of the technologies being developed. Additionally, plastids are inherited maternally, providing a natural gene containment system, and do not follow Mendelian laws of inheritance, allowing each individual member of the progeny of a transplastomic line to uniformly express transgene(s). Both algal and higher plant chloroplast transformation has been demonstrated, and with the ability</p>

to be propagated either in bioreactors or in the field, both systems are well suited for scale up of production. The manipulation of chloroplast genes is also essential for many approaches that attempt to increase biomass accumulation or re-routing metabolic pathways for biofortification, food and fuel production. This includes metabolic engineering for lipid production, adapting the light harvesting apparatus to improve solar conversion efficiencies and engineering means of suppressing photorespiration in crop species, which range from the introduction of artificial carbon concentrating mechanisms, or those pre-existing elsewhere in nature, to bypassing ribulose biphosphate carboxylase/oxygenase entirely. The purpose of this eBook is to provide a compilation of the latest research on various aspects of plastid biology including basic biology, biopharming, metabolic engineering, bio-fortification, stress physiology, and biofuel production. One of the distinguishing features of plants is the presence of membrane-bound organelles called plastids. Starting from proplastids (undifferentiated plastids) they readily develop into specialised types, which are involved in a range of cellular functions such as photosynthesis, nitrogen assimilation, biosynthesis of sucrose, starch, chlorophyll, carotenoids, fatty acids, amino acids, and secondary metabolites as well as a number of metabolic reactions. The central role of plastids in many aspects of plant cell biology means an in-depth understanding is key for a holistic view of plant physiology. Despite the vast amount of research, the molecular details of many aspects of plastid biology remains limited. Plastids possess their own high-copy number genome known as the plastome. Manipulation of the plastid genome has been developed as an alternative way to developing transgenic plants for various biotechnological applications. High-copy number of the plastome, site-specific integration of transgenes through homologous recombination, and potential to express proteins at high levels (>70% of total soluble proteins has been reported in some cases) are some of the technologies being developed. Additionally, plastids are inherited maternally, providing a natural gene containment system, and do not follow Mendelian laws of inheritance, allowing each individual member of the progeny of a transplastomic line to uniformly express transgene(s). Both algal and higher plant chloroplast transformation has been demonstrated, and with the ability to be propagated either in bioreactors or in the field, both systems are well suited for scale up of production. The manipulation of chloroplast genes is also essential for many approaches that attempt to increase biomass accumulation or re-routing metabolic pathways for biofortification, food and fuel production. This includes metabolic engineering for lipid production, adapting the light harvesting apparatus to improve solar conversion efficiencies and engineering means of suppressing photorespiration in crop species, which range from the introduction of artificial carbon concentrating mechanisms, or those pre-existing elsewhere in nature, to bypassing ribulose biphosphate carboxylase/oxygenase entirely. The purpose of this eBook is to provide a compilation of the latest research on various aspects of plastid biology including basic biology, biopharming, metabolic engineering, bio-fortification, stress physiology, and biofuel production.
