Tricks of the trade - the unique specialized metabolism in opium poppy

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Benzylisoquinoline alkaloid biosynthesis in opium poppy has been the subject of elegant scientific enquiry for more than a half-century. These efforts have recently culminated in the isolation of genes encoding all known pathway enzymes involved in the formation of the narcotic analgesic morphine, the cough suppressant and potential anticancer drug noscapine, and the antimicrobial agent sanguinarine. Investigations into the biochemistry and physiology of alkaloid metabolism in opium poppy has revealed several unique features contributing to the efficacy of the plant as a factory for high-value metabolite production. The perceived availability of the required catalytic components has prompted well-publicized efforts to reconstitute benzylisoquinoline alkaloid pathways in yeast and bacteria, although yields from initial efforts are inferior to the impressive metabolic capacity of the plant. The discovery of new biochemical machinery and the drafting of accurate metabolic blueprints in opium poppy are essential to realize the goal of efficiently engineering benzylisoquinoline alkaloid production in microorganisms. Recent progress will be discussed.