

Strategies for the Total Synthesis of Natural Products: Innovations, Challenges, and Perspectives

Kirti Sadhuroo Niralwad¹ and Ishwar Baburoo Ghorude²

Department of Chemistry, Nutan Mahavidhyalaya, Selu, Parbhani¹

Department of Environmental Science

Kohinoor Arts, Commerce & Science College, Khultabad, Chhatrapati Sambhajinager²

ghorade.ishwar@gmail.com

Abstract: *Natural products have long served as a wellspring of inspiration for synthetic chemists, driving innovation in organic synthesis and drug discovery. The total synthesis of these complex molecules represents a pinnacle of achievement in synthetic chemistry, requiring strategic planning, creative problem-solving, and mastery of diverse synthetic methodologies. This abstract provides a concise overview of strategies employed in the total synthesis of natural products, highlighting key concepts, innovative methodologies, and future directions in the field.*

Retrosynthetic analysis serves as the cornerstone of total synthesis, guiding chemists in the strategic disconnection of target molecules into readily accessible precursors. Innovative synthetic methodologies, including transition metal-catalyzed reactions, asymmetric transformations, and cascade reactions, have revolutionized the field, enabling the efficient construction of complex molecular architectures with high efficiency and selectivity. Despite these advancements, the synthesis of natural products remains a challenging endeavor, fraught with synthetic hurdles and unforeseen obstacles.

Looking ahead, the future of natural product synthesis is filled with promise and opportunity. The integration of computational tools, automation, and sustainability practices holds the potential to accelerate the discovery and optimization of synthetic routes to target molecules. Interdisciplinary collaborations between synthetic chemists, biologists, pharmacologists, and clinicians are essential for unlocking the therapeutic potential of natural products and developing new medicines to address unmet medical needs. Overall, the total synthesis of natural products continues to be a vibrant and dynamic field, driven by a combination of innovation, collaboration, and perseverance.

Keywords: Natural products, Total synthesis, Synthetic methodologies, Retrosynthetic analysis, Innovation & Drug discovery