Chapter-4

ANTIVIRAL PROPERTIES OF FLAVONOIDS

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Abstract

Flavonoids are a diverse class of plant-derived polyphenolic compounds widely recognized for their antioxidant, anti-inflammatory, and anticancer properties. In recent years, they have gained substantial attention for their broad-spectrum antiviral potential against numerous RNA and DNA viruses. Found abundantly in fruits, vegetables, herbs, tea, and wine, flavonoids exert antiviral activity through both direct and indirect mechanisms, making them attractive candidates for complementary or alternative antiviral therapy, especially in the context of rising drug resistance and limitations of conventional treatments. These compounds act at multiple stages of the viral life cycle, including inhibition of viral attachment and entry, suppression of replication by targeting viral polymerases and proteases, interference with viral assembly and release, and modulation of host immune responses. Their ability to enhance interferon signaling, regulate cytokines, and reduce infection-induced oxidative stress further supports their antiviral efficacy.

Preclinical and in vitro studies have demonstrated significant antiviral activity of flavonoids such as quercetin, luteolin, baicalin, baicalein, EGCG, and hesperidin against viruses including SARS-CoV-2, Influenza, Dengue, HIV, HCV, and HSV. Several flavonoids also exhibit synergistic effects when combined with standard antiviral drugs, improving therapeutic outcomes and reducing drug toxicity. Structure–activity relationship analyses reveal that hydroxyl group patterns and the position of the flavonoid B-ring play crucial roles in antiviral binding interactions, as seen in molecular docking studies with Ebola virus proteins.

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