From waste to wellness: Validating Unani Medicine's holistic principles through the antimicrobial efficacy of fruit and vegetable discards

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Unani medicine is founded on the principle of holistic and efficient utilization of natural resources such as vegetables and fruits. Despite this historical wisdom, a systematic synthesis of modern scientific evidence validating the antimicrobial properties of these specific wastes in the context of Unani principles is lacking. This review aims to bridge that gap by exploring the antimicrobial potential of commonly discarded plant parts and correlating these findings with Unani medical system, thereby providing a scientific foundation for a traditional holistic approach. A systematic comprehensive review was conducted following PRISMA guidelines. Electronic databases (PubMed, Science Direct, Google Scholar) were searched for peer-reviewed articles published between 2012 and 2024 using keywords including "vegetable and fruit waste," "antimicrobial activity," "Unani medicine," and specific plant names. After screening, a total of 28 articles met the inclusion criteria, which encompassed studies on the phytochemical and pharmacological properties of plant waste parts. Data regarding extraction methods, phytochemicals, antimicrobial efficacy, and mechanisms of action were extracted and synthesized. The review conclusively demonstrated that discarded plant parts (e.g. potato (*Aaloo*), mango (*Aam*) peel, banana (*kela*) peel, bottle gourd (*kaddu*) peel, cauliflower (*Phool hobi*) stem) are rich sources of potent antimicrobial bioactive compounds, including polyphenols, flavonoids, alkaloids, and tannins. These compounds exhibited broad-spectrum activity against key food-borne pathogens (*Staphylococcus aureus, Escherichia coli, Salmonella typhi, Candida spp.*) through mechanisms such as cell wall damage, inhibition of protein synthesis, and disruption of microbial membranes. Crucially, these scientific findings show a strong correlation with Unani therapeutic concepts. The anti-putrefactive and astringent (*Daf-e-Ta'affun*, *Qabiz*) properties align with treating infectious diarrhoea and gastrointestinal infections. The ulcer-repellent and skin-strengthening (*Daf-e-Quruh*, *Muqawwi-e-Jild*) effects validate their use for topical applications against boils and wounds. This synthesis validates Unani medicine by showing that plant wastes possess strong antimicrobial properties, aligning with principles like *Taqliyul Akhlat* (purification of humors). Integrating traditional wisdom with modern science offers a sustainable approach to develop eco-friendly nutraceuticals and functional foods, turning waste into wellness. Future studies should standardize extracts and conduct *in vivo* trials for practical application.

Keywords: *Vegetable and fruit waste, Antimicrobial activity, Unani medicine, Bioactive compounds*