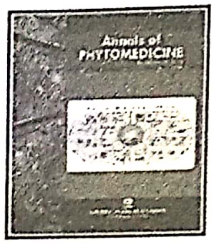
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Nutritional, antinutritional and phytomedicinal attributes of tree fodders and their impact on livestock health and productivity: A comprehensive review

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Abstract

Seasonal fodder scarcity, land degradation, and climate-induced variability increasingly constrain sustainable livestock production systems, particularly in tropical and semi-arid regions. Tree fodders, comprising leaves, pods, shoots, and twigs of woody perennials, offer a resilient alternative by providing year-round biomass, superior nutritional quality, and bioactive phytochemicals. This review synthesises current knowledge on the nutritional composition, phytomedicinal properties, and anti-nutritional factors (ANFs) of major tree fodder species used globally, with special emphasis on India. Tree fodders, especially leguminous species such as *Leucaena leucocephala*, *Moringa oleifera*, *Gliricidia sepium*, and *Sesbania grandiflora* are rich in crude protein (15-30% DM), minerals, vitamins, and metabolizable energy, making them effective supplements to low-quality roughages during lean seasons. Beyond nutrition, tree fodders contain phytochemicals-including tannins, saponins, flavonoids, and alkaloids-that exhibit antimicrobial, anthelmintic, antioxidant, anti-inflammatory, and immunomodulatory effects, positioning them as functional feeds within the food-feed-medicine continuum. However, excessive concentrations of ANFs such as condensed tannins, mimosine, oxalates, and phytates can impair intake, nutrient digestibility, mineral bioavailability, and animal health. The review highlights the dose-dependent duality of these compounds and discusses mitigation strategies, including processing, dietary dilution, supplementation, and species-specific feeding management. Key research gaps related to standardised ANF assessment, safe inclusion thresholds, long-term animal health impacts, and climate interactions are identified. Overall, strategic utilisation of tree fodders (15-40% of dietary dry matter) can enhance livestock productivity, health, and system resilience, supporting sustainable and climate-adaptive livestock production.

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