

PASTORAL AND AGRO-PASTORAL SYSTEMS

CGIAR RESEARCH PROGRAM ON LIVESTOCK

Aims to increase the productivity of livestock agri-food systems in sustainable ways across the developing world.

Managing rangelands: promoting native shrub species

Ziziphus nummularia: a promising forage shrub for silvopasture in arid and semi-arid ecosystems.

Drylands cover approximately 40% of the world's land area, and support two billion people and 50% of the world's livestock. Native grasses provide fodder for animals only in post-monsoon months, from September to November. *Ziziphus nummularia* is one such important shrub species of arid and semi-arid tracts. Continuing to supply foliage over a long time, it plays a vital role in the economy of dryland peoples.

Benefits:

- Drought tolerant
- Salt tolerant
- Able to withstand extreme temperatures up to 50°C and tolerant to frost and diseases
- Thrives on sandy loam to rocky pediments
- Very edible



Scientific name:
Ziziphus nummularia
(Burm.f.) Wight & Arn

Common names:
Pala, wild jujube, Ramilak,
Kunar, Jhar and Karkandhu

Locations:
Thar Desert of western India &
southeastern Pakistan

Ziziphus nummularia (pala) is a multipurpose shrub, thorny, medium-sized straggling shrub, which grows to a height of 2-3 m if left uncut. It is always found in clusters of 2-5, given its propagation by root suckers. It is drought-hardy, thriving in areas receiving 125-850 mm rainfall. It is most commonly found in the dry, hot climatic conditions of Persia (Iran), Baluchistan, Arabia, Pakistan, and India at an altitude of 600 m. It is an important fodder crop, especially for livestock, as its leaves contain approximately 86-90% dry matter, 93.4% organic matter and 12.6% crude protein.



Z. nummularia plant (leaves, spines and fruits)



Drying of *Z. nummularia* in the field, Rajasthan State, India



Camel browsing *Z. nummularia* leaves

Silvopastoral management

Pala is an evergreen species, although it can shed some of its leaves during extremely dry seasons. Leaves fall in January-March, and are simultaneously replaced with new ones. The plant, as whole, is valued for soil conservation, growing naturally in cultivated fields and on wastelands. It coppices well due to its deep rooting system, with each plant producing 5-7 shoots in a good rainfall year. Between November and December plants remain almost ungrazed due to lack of foliage, and the volume of the shrubs again reduces (0.21-0.35 m³) during January and February under natural conditions. It flowers from the end of July to the middle of August, with fruits ready for harvesting in October. A mature plant yields about 1.0-1.5 kg fruit per bush in a 150-250 mm rainfall zone.

It grows naturally through root-suckers as well as by seeds. Under natural conditions, its germination is enhanced by seed needs treatments like scarification or mechanically cracking the seed coat to remove the hard woody seed coat. Young emergent plants need protection from browsing but the established plants have high regeneration capacity and can withstand fairly heavy browsing. In controlled conditions the germination takes about 1-3 months due to the hard seed coat.

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Nutritional composition

Leaf fodder yield varies according to the habitat and land use, with differing results for shrubs grown under sandy-loam soils, heavy (clay-loam) and gravelly soils, as well as cultivated and grazing lands. Leaves contain 85-92% dry matter, 90-93.4% organic matter, 11.5-14.5% crude protein and phosphorus (0.12-0.20%). The average palatability (dry matter intake) of pala has been found to be 2.05 kg/100 kg body weight in sheep and 1.36 kg/100 kg body weight in camel. Goats consume (3.3 kg/100 kg body weight). Though pala contains appreciable amounts of crude protein (approx. 12.8%), its digestible crude protein (DCP) value has been found to be only 3.6-6.0 g/100 g of dry feed, due to tannic acid and tryptic inhibitors. The protein content of pala could successfully be improved by treating it with formaldehyde, as formaldehyde protects the feed proteins from microbial degradation in the rumen and makes most of the protein available to the animal.

Effective Management

- The shrub is ready for grazing during the its second season in the 350-400 mm rainfall zone
- The shrub can be grazed year-round, except during November and December
- Harvesting of the bush in October gives a higher pala yield and better quality fodder

ICARDA's Rangeland Ecology and Management Unit

ICARDA's Rangeland Ecology and Management Unit aims to address the unsustainable use of resources induced by adverse effect of climate change and an increasing demand for food and feed in the dry areas. ICARDA programs promote the enhanced quality and productivity of crop, forage, livestock, and the improved management of water resources through close cooperation with farmers and national researchers.

