

Thornless Cactus (*Opuntia ficus-indica*)

A source of green fodder for semi-arid and arid regions



Planting of Cladode



Tissue culture opuntia saplings



Year old fodder cactus plants



Cladodes ready for harvesting



Chopping



Feeding

An Alternate Fodder Crop for Water Deficit Areas



**National Dairy Development Board
Anand**

Introduction

Thornless cactus (*Opuntia ficus-indica*) commonly known as fodder cactus or prickly pear is one of the most important plants of *Cactaceae* family. It can be used both as a vegetable and valuable forage resource in arid / semi-arid areas. These areas are characterized with high water deficit, low and erratic rainfall, frequent drought along with long & dry spells and poor soil. Therefore, animal husbandry has come to the fore-front as a source of livelihood in such areas. In India, arid zone alone occupies about 19 per cent of total geographical area and supports 34 percent of the total livestock population. Generally, such areas have a significant deficit of feed & fodder resources and their adequate supply in terms of quality & quantity for livestock is a major challenge. Further, production and feeding of green fodder to livestock beyond rainy season is even more challenging. Fodder cactus originated in the deserts of Central and North America, cultivated as perennial crop for green fodder production in many arid and semi-arid areas of the world. It has potential to produce a large quantity of palatable and nutritious green fodder for the livestock. The entire plant can be used for green fodder consisting of 1-1.5 cm thick fleshy mass called cladode (oval stems).

Physiology

Thornless cactus has higher water use efficiency (WUE) and rain use efficiency (RUE) than any conventional fodder crop because it is CAM (Crassulacean Acid Metabolism) plant. The CAM plants are native to arid and semi-arid regions and characterized by nocturnal stomatal opening so that net CO₂ uptake and water loss occurs during the cooler part of 24 –hour cycle, leading high WUE & RUE.

Nutrient Composition

Cactus fodder is rich in vitamin A and water soluble carbohydrates. Forage quality is comparable with several other cultivated fodder crops. It is highly digestible with 70 per cent dry matter digestibility. The average chemical composition of cactus cladode is given below:

Chemical composition (dry matter basis)	
Dry Matter (%)	10 -11
Crude protein (%)	11.81
Ether Extract (%)	1.18
Fibre (%)	8.12
Acid Insoluble Ash (%)	2.55
Calcium (%)	6.05
Phosphorus (%)	0.30
Magnesium (%)	3.15
Potassium (%)	1.82
Sodium (%)	0.05
Copper (mg/kg)	6.13
Zinc (mg/kg)	24.37
Manganese (mg/kg)	98.17
Iron (mg/kg)	257.54
Carotenoid	29 µg/100 gm
Ascorbic acid	13 mg / 100 gm

Propagation

Cactus is successfully multiplied by vegetative propagation using oval stems known as cladodes or paddles. For planting in large area, it can be propagated by using saplings raised through tissue culture.

Package of practices for cultivation

- Rainy or post rainy seasons (Mid-June to Mid-July and Mid-October to Mid-November) are ideal for cactus planting in arid and semi-arid climate.
- Cactus thrives best on sandy and sandy loam soils. However, well drained heavy soils and gravelly or stony lands especially at foot hill slopes are also suitable.
- Recommended available accessions/cultivars of thornless cactus in India are No. 1270, No. 1271 and Texas 1308.
- Field should be well prepared with a chisel plough before planting up to depth of 60-80 cm in order to ensure good drainage. Apply well decomposed farm yard manure @ 15 ton/ha in field 20 days before planting of cactus.
- One week before planting, use disc plough, cultivator and harrow ploughs to get fine tilth in upper 30 cm soil layer and make soil free from weeds. At last ploughing, mix *Trichoderma viridae* bio-fungicide @ 1.5 kg/ha in soil to control root decaying fungal diseases.
- Use 90 kg nitrogen, 40 kg phosphorus, 30 kg potash and 10 kg Zinc sulphate per ha. Well mix 30 kg nitrogen and rest of fertilizers in soil before planting. As top dressing, apply 20 kg nitrogen in equal doses to plants at four months intervals during the year.
- Sowing has to be done at row to row distance of 100 cm and plant to plant of 40 cm. One foot high ridges (north-south direction) are formed in field for plantation of cladodes/sapling to avoid water stagnation.
- One year old cladodes or 7-8 month old saplings raised through tissue culture are suitable for planting.
- Fresh seed cladodes are treated with copper based fungicide like copper oxychloride (50% WP) or copper hydroxide (77% WP) @ 5 gram per litre of water to control bacterial and fungal plant diseases. These fungicides may also be applied to thornless cactus plants if root decay, wilting and rotting symptoms appears during growing periods particularly during rainy season.
- After fungicide treatment cladodes are kept under the shade for 2 weeks before planting for better establishment.
- Cladodes are planted keeping one third portion below the soil and two-thirds portion above the soil surface. Press the soil well near the surface for firm establishment of cladodes or saplings in soil.
- Irrigate the cladodes and saplings immediately after planting. Control irrigations through drip coupled with mulching enhances the water use efficiency (WUE) and biomass production.
- Give light irrigation to crop as per need and soil moisture availability. Drain excess water from the fields.

Harvesting /Pruning

Take first harvest manually when plant attain one meter height. In first two years, remove inner cladodes and those oriented downward, horizontally or close to ground. Use clean tools for cutting cladodes from plants. Take regular harvest at the interval of 5 to 6 months. Well managed crop gives green fodder yield of 40-50 MT/ hectare/ year.

Feeding of Thornless Cactus

- For animal feeding only large size, fleshy and 6 months old cladodes are cut from plants. **Please note that whole plant is not to be uprooted.** At a time, up to 1/3rd of total cladodes on plant may be harvested for feeding. Subsequent harvesting is done after 6 months.
- Before feeding, cladodes / paddles should be chopped in small pieces of 2-3 inches size by chopper or chaff cutter.
- After chopping, mix small pieces with some dry fodder like wheat, bajra or sorghum straw for feeding. 10-15 kg chopped thornless cactus may be fed to animals per day.

Other benefits of fodder cactus

- It is an excellent source of water too for livestock as it contains 90 per cent water.
- It has high water use efficiency (WUE) i.e. to produce 1 kg dry matter; it needs 267 kg of water against 400 kg required for pearl millet, a prominent drought tolerant cereal crop.
- Due to high rain use efficiency (RUE), it can produce 40 kg dry matter /mm/ year of rainfall against 25 kg in pearl millet.
- It also provides food to human beings.
- Thornless cactus is also suitable for saline soils, check soil erosion, combat desertification and reclaim degraded land.
- It has high potential to capture carbon both above and below the soil.



Fungicide treatment



Treated Cladodes



Regenerated cladodes



Thornless cactus cultivation with drip irrigation and plastic mulching

For more information please contact: Animal Nutrition Group, Anand 388001, Gujarat