

CHAYA BASED PALLETS FEED: WESTE TO WEALTH FOR GOAT

Ramesh Chandra^{1*}, Ujjwal¹, Deepak Kumar¹, Deepa Kumari²

¹LPM Division, ICAR-National Dairy Research Institute, Karnal, 132001

²KVK, ICAR--National Dairy Research Institute, Karnal, 132001

*Corresponding author email: drchandraicar@yahoo.co.in



ABSTRACT

Goat is the backbone of small and marginal farmers in India. India consists of large goat population, but goat farming faces poor nutrition and high disease incidence and seasonal fodder scarcity, which reduces productivity and profitability. Feeding accounts for nearly 70% of the total production cost, making it the most significant economic constraints for farmers. There is a need to adopt cheaper and nutritious feed. In this context, the use of unconventional and locally available fodder like Chaya has gathered attention due to their rich nutritional profile, including high protein content, essential amino acids, minerals, vitamins, and antioxidant properties.

KEYWORDS: Chaya, concentrate, goat, growth, feed, milk, nutrition

INTRODUCTION

Goat farming plays a pivotal role in the livelihood of small and marginal farmers in India, offering a dependable source of income, milk, meat, and manure. Providing the livestock keepers, a cheap source of quality fodder will benefit both the producers as well as consumers. Feed is a crucial component of the ruminant livestock production system, directly influencing growth, productivity, reproduction, and health. The availability of high-quality and sustainable feed remains a significant challenge, particularly in predominantly tropical country like India. The allocation of land for cultivating green fodder crops is limited, accounting for only about 4.9 per cent (9.13 million hectares) of the country's gross cropped area. Moreover, this area has remained stagnant for the last 25–30 years. As a result, the need for alternative feed sources that are cost-effective, easily accessible, highly nutritious, and environmentally sustainable has become a priority. Feeding Chaya (*Cnidioscolus aconitifolius*) to goats offers benefits like high protein, minerals (Ca, K), and essential amino acids, improving growth, weight gain, and nutrient digestibility, potentially as a partial protein source replacement, while its bioactive compounds may offer antioxidant effects and help balance rumen pH, leading to better feed efficiency and milk and meat

quality in goats, but processing (drying/pelleting) might be needed to manage anti-nutritional factors.

Traditionally, shrubs and trees are used as feedstuff to supply livestock with energy, protein, and other nutrients (Papachristou and Papanastasis, 1994). Some of the most common trees and shrubs used in the diets have been shown to improve body growth (Aggarwal et al., 2026) and milk production Totakul et al., 2022). The use of tree leaves in animal feeding has been practiced for a long time. Fodder tree leaves are of particular importance because they contain a high level of CP, therefore, they are typically used for feeding buffaloes, dairy cattle, and goats. However, the potential use of an ingredient is commonly determined not only by its CP content but also by the rumen degradability, palatability, and the associative effects with other feeds in the rations (Smith 1992). Moreover, previous studies reported that feed supplement as a fodder tree mixture could enhance ruminal degradation of nutrients, volatile fatty acids (VFA), and microbial growth in the ruminants (Waghorn 2008).

ORIGIN AND DISTRIBUTION OF CHAYA

The Euphorbeaceae family includes the Chaya (*Cnidoscolus aconitifolius*), which is indigenous to Mesoamerica (Central America). The Indian Grassland and Fodder Research Institute in Jhansi was the site of its introduction in India in 2006. It is also known as "tree spinach" and is prized by the indigenous people of the Yucatan peninsula, parts of Honduras, south-east Mexico, Belize, and the Maya region of Guatemala (Martin and Ruberte, 1978).

Recently Indian families from foreign countries have spread the cultivated Chaya varieties in India. Now it is widely available in Kerala. Kerala Ponics was the first company to provide farmers with authoritative information about these Mexican Chaya leaves. With alternate palmate lobed leaves, the Chaya is a deciduous, evergreen shrub that can withstand drought and reach a height of six meters. Additionally, it resists insects and disease. The succulent leaves are 30 cm in length. The plant has spread all over the world because of its tremendous productivity and simplicity of growing. Chaya may be grown all year round and grows swiftly.

NUTRITIONAL BENEFITS

- *Rich in Protein & Minerals:* Chaya leaves are high in crude protein (around 29%), calcium, and potassium, comparable to soybean meal or alfalfa.
- *Essential Amino Acids:* Contains vital amino acids like lysine, leucine, and phenylalanine.
- *Vitamins:* A good source of essential vitamins, contributing to overall health.

PERFORMANCE & HEALTH BENEFITS FOR GOATS

- *Improved Growth:* Studies show improved body weight gain and growth performance in goats supplemented with Chaya.
- *Enhanced Digestibility:* Increases the digestibility of dry matter, crude protein, and fiber.
- *Better Rumen Function:* Balances rumen pH and promotes propionic acid production, reducing methane.
- *Potential Milk Improvement:* Can enhance milk yield and improve milk composition in dairy goats.
- *Cost-Effective Protein:* Can replace a significant portion (up to 75%) of expensive conventional concentrate feeds, making it a cheaper alternative.
- *Sustainable Fodder:* Its high yield, drought tolerance, and pest resistance make it a valuable, sustainable feed source.

CULTIVATION AND PROPAGATION

Chaya is an easy to grow spinach variety in India. Well-draining soil is suitable for growing tree spinach.

- *Planting Cuttings:* Stem cuttings of 6" to 12" long hardwood cuttings with 2-4 nodes are used as cultivars. Dig a pit of size 50 x 50 x 50 (cm) for planting the rooted stem cutting. Fill the pit with a mixture of soil and compost or green manure. When transplanting the cutting starts (rooted cane), fill the soil firmly around it and mulch well. After allowing the ends to dry for a few days to prevent rotting, plant them upright or at an angle, burying at least 1-2 nodes in the soil.
- *Soil and Climate:* Chaya prefers well-draining soil and can grow in either full sun or partial shade. It requires minimal water once established, but should be irrigated during prolonged dry spells.
- *Spacing:* For commercial fodder production, space cuttings about 1 meter apart, with rows 1 to 2 meters apart.

VARIETIES OF CHAYA

While specific localized Indian cultivars of Chaya do not have prominent registered commercial names, four main varieties of *Cnidoscolus aconitifolius* are used globally and thrive in tropical climates like Haryana and other parts of India.

- *Chaya mansa*: The most common variety used for fodder and edible leaves. It has deeply lobed leaves and is essentially spineless, making harvesting and feeding much easier.
- *Estrella*: Known for broad, deeply lobed leaves. It is a sterile variety that does not produce seeds, so it must be propagated exclusively through stem cuttings.
- *Redonda*: Features more rounded, less deeply lobed leaves. It is known for high leaf biomass production in a short period.
- *Picuda*: Characterized by highly pointed leaf edges. Unlike Chayamansa and Estrella, Picuda produces seeds but can sometimes have mild urticating (stinging) hairs.

HARVESTING FOR FODDER

Pruning: Chaya is a rapid grower. Prune the plant using coppicing or pollarding styles (cutting branches or the main trunk back) to encourage dense, bushy regrowth of young, tender leaves.

Frequency: Plants are robust and can tolerate harvesting up to 60% of their foliage without dying.

YIELD

The plant establishes quickly and responds well to regular pruning. You can perform the first harvest about 90 days after planting, with subsequent cuts every 40 to 50 days. Chaya (*Cnidoscolus aconitifolius*), often called Mayan spinach, is a high-yield, drought-tolerant perennial shrub. On average, Chaya fodder yields an annual fresh biomass of 30 to 60 metric tons per hectare.

FEEDING

Chaya is an incredibly nutritious, protein-rich fodder plant, but its raw leaves and succulent stems contain toxic hydrocyanic glucosides. To feed it safely to goat, you must process it first. Follow these specific preparation methods based on requirement of animal. It can be used in the form of meal or in pellets form.

PREPARATION OF CHAYA MEAL

- *Chaya Leaf Meal (CLM)*: Harvest young branches and leaves, chop them into small particles, and sun-dry them for 2 to 3 days. Grind the dried leaves into a powder and mix it into commercial feeds. Chaya meal is high in protein, making it an excellent supplement. However, do not feed it as the sole diet. Start by introducing small amounts (e.g., mixing 4% to 10% into their total daily concentrate mix). Some research indicates that up to 10-20% of their daily diet can safely be composed of Chaya leaf pellets or meal. Mix the meal thoroughly with standard concentrate feed, grain, or molasses to

make it highly palatable.

- *Inclusion Rate:* Incorporate the dried Chaya Leaf Meal at about 7.5% to 15% of the total feed mixture (or roughly 150g per kg of feed) to replace more expensive protein sources
- *Preparation of Pellets:* Preparing pellets from Chaya leaf meal involves drying, grinding, and compacting the leaves—usually with binding agents like molasses and cassava starch. This process enhances the shelf life, palatability, and nutrient density of Chaya, which is rich in crude protein, essential amino acids, and minerals.

MIX THE INGREDIENTS

To make firm, nutritious feed pellets, the Chaya meal needs binding agents and other nutrient sources

- *Base Mix:* Combine Chaya meal (approx. 50-90% of the mix) with concentrate mixtures like maize, soya, or wheat bran, dal chunni, salt and mineral mixture.
- *Binders:* Add 5-8% molasses to help bind the leaf meal together under pressure.
- *Moisture:* Add water (about 800 ml per 5 kg of the dry mixture) until the material is slightly damp but not mushy. It should hold its shape when squeezed.

PELLETIZE

- *Machine:* Run the mixed blend through a standard commercial or farm-scale flat-die pellet mill (e.g., 3HP to 100 kg/hr capacity).
- *Action:* The pressure and heat generated by the pelletizer will naturally melt the plant starches and lignin, binding the meal into solid, shiny pellets.

STORAGE

- *Final Drying:* Spread the freshly made, warm pellets out to air-dry and cool completely.
- *Storage:* Store the dried pellets in airtight plastic bins or moisture-proof feed bags to prevent spoilage.

COMPOSITION OF INGREDIENTS FOR PREPARATION OF PELLETS WITH CHAYA LEAVES

- Dry Chaya leaves:4
- Maize:8
- Dal chunni: 35

- Wheat bran: 11
- Mustard Cake: 35
- Molasses: 8
- Mineral Mixture: 2
- Salt: 1
- Total: 100

NUTRITIONAL COMPOSITION OF CHAYA LEAVES PELLETS

- Dry matter: 92.59 ± 0.60
- Organic matter: 90.35 ± 0.44
- Crude protein: 19.22 ± 0.23
- Ether extract: 4.49 ± 0.18
- Total ash: 9.65 ± 0.12
- Nutrient Detergent Fibre: 30.74 ± 0.38
- Acid Detergent Fibre: 19.63 ± 0.29
- Hemicellulose: 11.06 ± 0.28

HANDLING TIPS

- When harvesting, always wear gloves or use plastic bags on your hands to protect your skin from the plant's stinging, irritant hairs.
- Boiling the leaves for 5 to 15 minutes neutralizes the toxins completely and removes the stinging hairs, making them safe for any use.
- Preparing Chaya leaf meal for goats requires careful drying or boiling to remove naturally occurring toxic cyanogenic glycosides. To prepare it safely, harvest the leaves, chop them finely to 2-3 mm, and sun-dry them for 2 to 3 days until brittle. Grind the dried leaves into a meal and mix it in small amounts (up to 10-20%) with their regular feed.

CONCLUSION

Chaya tree is a multipurpose crop foliage boasts a high crude protein content and a favourable amino acid profile, outperforming many conventional leguminous feeds. It is also rich in calcium, potassium, and omega-3 fatty acids. Chaya contains flavonoids and tannins that actively manipulate rumen fermentation.



Preparation of Chaya Leaf Meal Pellets for Goats

This helps reduce calculated methane emissions while balancing rumen pH. Replacing up to 25% to 35% of expensive concentrate mixtures with Chaya meal supports growth, milk yield, and meat production while significantly lowering overall feed costs.

REFERENCES

- Aggarwal, U., Bhupender, Rahul Singh Yadav, R. S., Maheshbhai, T. T., Chandrika, P., Pushpa, Chandra, R and Misra, A. K. (2026). Effect of Moringa and Chaya Mixed Pellet Supplementation on Growth and Nutrient Utilization of Barbari Kids. *Indian Journal of Animal Research* 10.18805/IJAR.B-5765
- Martin, F. W. and Ruberte, R. (1978). Vegetables for the hot, humid tropics. Part-III. Chaya, *Cnidoscolus chayamansa*. *Science and Education Administration, USDA, New Orleans, Louisiana*. pp.11
- Papachristou T. G, and Papanastasis, V. P. (1994). Forage value of Mediterranean deciduous woody fodder species and its implication to management of silvo-pastoral systems for goats. *Agroforestry System* 27:269-82. <https://doi.org/10.1007/BF00705061>
- Smith O B. (1992). Fodder trees and shrubs in range and farming systems in tropical humid Africa. In: Legume trees and other fodder trees as protein sources for livestock. Rome, Italy: FAO; FAO Animal Production and Health Paper 102.
- Totakul, P., Viennasay, B., Sommmmai, S., Matra, M., Infascelli, F. and Wanapat, M. (2022). Chaya (*Cnidoscolus aconitifolius*, Mill. Johnston) pellet supplementation improved rumen fermentation, milk yield and milk composition of lactating dairy cows. *Livestock Science* 262:104974
- Waghorn, G. (2008). Beneficial and detrimental effects of dietary condensed tannins for sustainable sheep and goat production —Progress and challenges. *Animal Feed Science Technology* 147:116-39. <https://doi.org/10.1016/j.anifeedsci.2007.09.013>

How to cite:

Chandra, R., Ujjwal, Kumar, D. and Kumari, D. (2026). Chaya based pellets feed: Waste to wealth for goat. Leaves and Dew Publication, New Delhi 110059. *Agri Journal World* 6 (2): 37-43.

*****XXXXX*****