

Tumba: An Underutilised Medicinal Vegetable of Dryland Ecosystems

***Tumba (Citrullus colocynthis)* is an underutilised medicinal vegetable species indigenous to arid and semi-arid ecosystems. The crop exhibits remarkable tolerance to drought and extreme temperatures and is capable of growing in marginal soils with low fertility. Traditionally, it has been widely used in ayurvedic and indigenous medicinal systems due to the presence of diverse bioactive compounds. Its extracts possess antidiabetic, laxative, anti-inflammatory and antimicrobial properties. Owing to its resilience and therapeutic potential, the cultivation and utilisation of this species may contribute to sustainable agriculture, value addition in medicinal plant resources, and improved livelihood opportunities in dryland regions.**

Keywords: Cultivation, Economic potential, Tumba, Underutilised medicinal vegetable

TUMBA (*Citrullus colocynthis*), a member of the family Cucurbitaceae, is a hardy wild herbaceous vine widely adapted to arid and desert environments. In India, it is commonly known as Bitter cucumber, Wild gourd, *Tumba* and *Indrayan*. The species is believed to have originated in the tropical regions of Asia and Africa and is now widely distributed across the Mediterranean and North African regions. It was the progenitor of present cultivated watermelon. In India, the plant commonly occurs in wild habitats, particularly in sandy areas of Punjab, north western regions, southern India and along the Coromandel Coast. It is naturally adapted to desert ecosystems such as those found in Arabia, the Sahara and parts of South Asia including India and Pakistan.

Composition and uses: India is recognised as an important centre of diversity for many wild medicinal plants. In traditional medical systems such as Ayurveda, Siddha

and Unani, a large number of therapeutic preparations are derived from plant species, a practice that has been followed since ancient times and continues to be widely used and commercially exploited today. The different plant parts including roots, fruits, seeds and leaves are valued for their medicinal and nutraceutical properties. The plant holds an important place in traditional medicine and can be propagated both vegetatively and through seeds, particularly during the summer season. In addition to these nutrients, fruits and seeds contain several essential bioactive compounds such as alkaloids, essential oils, flavonoids, cucurbitacins (A, B, C, D, E, K and L) and colocynthosides (A and B) and minerals, which contribute to their dietary significance.

Furthermore, seed oil is considered valuable due to the presence of beneficial fatty acids and bioactive constituents. The powder prepared from the dried fruits and seeds are also used in traditional medicine for various therapeutic purposes. Because of these nutritional and pharmacological properties, it has significant potential for use in functional foods, nutraceuticals and herbal formulations.



Vining habit of *tumba* plant

Table 1. Nutritional profile of *Tumba*

Particulars	Flesh contents/ 100 g	Seeds contents/ 100 g
Moisture %	85–90	3–6
Protein %	2–4	13–26
Carbohydrates %	7–10	20–30
Ash %	–	2.4
Fat %	0.5–1	14–24



Mature fruits of *Tumba*



Fruit flesh with mature seeds

Botany: Botanically, it is an important herbaceous vine adapted to arid and semi-arid environments. The plant is usually perennial in nature and develops long creeping or trailing vines that may reach up to about 3 m in length. The stems bear rough, angular tendrils covered with coarse hairs, which help the plant spread over the ground. The leaves are alternately arranged, deeply lobed, and typically measure 5–10 cm in length, with petioles attached to the vine. The plant produces monoecious flowers, meaning that separate male and female flowers occur on the same plant. The flowers are pale yellow in colour and possess a five-lobed corolla and a five-parted calyx, which are characteristic features of cucurbitaceous crops. Each plant can produce approximately 15–30 globose fruits. The fruits are about 5–7.5 cm in diameter, pepo-type with a smooth outer surface. They are green when immature and gradually turn yellow at maturity and ripening.



Drying of mature fruits



Naturally dried fruits

Anticancer activity: The anticancer potential is due to the presence of diverse bioactive compounds. Extracts prepared from the seeds using solvents such as methanol, chloroform and hexane have been evaluated against different cancer cell lines, including hepatic (HepG2), prostate (DU145), cervical (HeLa) and lung (A549). The most extracts exhibit inhibitory effects on cancer cell proliferation, although the chloroform extract showed comparatively lower activity. Among the extracts, the hexane seed extract demonstrate the strongest antiproliferative effect, particularly against the DU145 prostate cancer cell line.

Anti-inflammatory and immunomodulatory properties:

gastritis and psoriasis, often through increased levels of inflammatory mediators including TNF- α , COX-2 and IL-6. By modulating these inflammatory pathways, it helps alleviate inflammation and improve overall health.

Antimicrobial activity: It possesses notable antimicrobial properties against a wide range of microorganisms, including bacteria, fungi, and viruses. The presence of bioactive compounds enables the plant extracts to inhibit the growth of pathogenic microbes. Considering the increasing global challenge of antimicrobial resistance, it may serve as a valuable source for developing alternative therapeutic agents. The silver nanoparticles derived from aqueous extract exhibited antibacterial, antiviral, fungicidal and larvicidal properties.

Antioxidant Properties: It contains several antioxidant compounds capable of neutralising free radicals and reducing oxidative stress in biological systems. These antioxidants help protect cells from oxidative damage, which is often associated with the development of chronic diseases such as cardiovascular disorders, cancer, and neurodegenerative conditions. Therefore, the antioxidant potential contributes to its therapeutic importance in promoting overall health.

Cardioprotective benefits: The nutritional composition of its fruits may contribute to cardiovascular health. Potassium present in the fruits plays a key role in maintaining normal blood pressure, while dietary fibre helps reduce cholesterol levels. Calcium also supports proper muscle and cardiac function. Regular consumption of such nutrient-rich plant products may help lower the risk of cardiovascular disorders such as hypertension and coronary artery disease. by decreasing C-reactive protein (CRP), alanine aminotransferase (ALT), ALP, AST, and lactate dehydrogenase (LDH) levels.

Antidiabetic Potential: It has promising antidiabetic activity in various experimental studies. Bioactive constituents present in the fruit and seed extracts help regulate blood glucose levels and improve insulin sensitivity. These compounds influence glucose metabolism and support better glycaemic control. It may serve as a

potential natural supplement for managing diabetes and improving metabolic health. It has more blood sugar-lowering potential (58%) than ethanol (36%) and chloroform extract (34%).

Cultivation practices

Soil and climate: It is a typical xerophytic plant adapted to arid and semi-arid climates. It grows well in areas with a mean annual temperature of about 23–27 °C and annual rainfall ranging from 25–37 cm. The plant can be found up to 1500 m above sea level and thrives in sandy or sandy-loam soils with a pH range of 5.0–7.8, including sub-desert soils and coastal sandy habitats.

Field preparation: Sandy soils does not require but field should be free from weeds/grasses at the time of sowing.

Seed selection and treatments: There is no specific superior variety of *tumba*, mostly farmers grow desert local cultivars. After selection of healthy and disease-free seeds they are dipped in 5% NACL solution, for quick germination.

Sowing: Early sowing is done at the onset of monsoon and late sowing up to mid-August. The treated seeds may be sown in two ways;

- Drilled in the field by opening the furrows
- **Pit sowing:** (best method for high yield) 2,3 seeds are sown in each pit which are 120 cm × 120 cm distance. Before seed sowing filled 2 t/ha FYM and 5 kg/ha BHC dust to reduce soil borne problem and enhances seeding growth. The seed should be thinned at 10-15 days after germination to maintain proper plant spacing.

Manure and fertilizers: 2 t/ha FYM is incorporated in field before sowing. Crops are grown under rainfed condition, application of 80 kg/ha nitrogen should be done as top dressing while phosphorus and potassium are not necessary.

Weeding and intercultural operations: These practices are done in early stages when plant attains 20–30 cm height

and another 45 days after sowing for better growth of vine.

Plant protection: Basically tumba is not affected by any serious diseases or pests, at vegetative stage tumba beetles attacks have been noticed, for controlling beetles damage spray 0.2% carbaryl at 10–15 days interval.

Harvesting and yield: The mature yellow fruits are picked dried and threshed for seed purpose whereas the green fruits are fed to animals. It yields 120-150 q/ha dried fruits and 450 kg/ha seed.

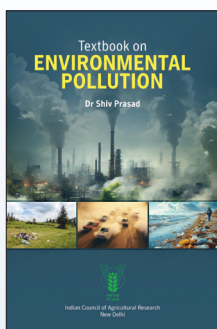
SUMMARY

Tumba is a drought- and heat-tolerant cucurbit well suited to arid and semi-arid regions because of its low water and input requirements. Its seeds and fruits possess nutritional, medicinal and industrial importance with potential applications in nutraceutical, pharmaceutical and biofuel industries. Cultivation on marginal lands can enhance farmer, income and support climate-resilient dryland agriculture. In addition to its economic value, it serves as an important genetic resource for improving biotic and abiotic stress tolerance in cucurbit crops. Future research should emphasise phytochemical characterisation, genetic improvement and development of safe therapeutic products. Value addition through seed oil, powders and nutraceutical formulations along with improved cultivation and commercialisation strategies, can further enhance its economic viability and livelihood opportunities in arid regions.

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