J. Biodivers. Conservation 9(2): 198-205 ISSN: 2457-0761 (online)
2025 http://www.aprfjournal.in

Review Article

Tupistra nutans Wall. ex Lindl. (Asparagaceae): Theoretical survey on Himalayan Nakima plant

Karma Lama[1], Arun Kumar Mishra[2] and Emdad Hossain[1*]

[1]Department of Pharmaceutical Technology, Jadavpur University, Kolkata 700032, West Bengal, India
[2]SOS School of Pharmacy, IFTM University, Moradabad 244102, Uttar Pradesh, India
*Email-Id: emdad@rediffmail.com; ORCID: https://orcid.org/0000-0001-9110-6449

DOI: https://doi.org/10.5281/zenodo.15644965

Article Details: Received: 2025-04-12 | Accepted: 2025-06-10 | Available online: 2025-06-12

Licensed under a Creative Commons Attribution 4.0 International License

Abstract: *Tupistra nutans*, commonly referred to as 'Nakima,' belongs to the Asparagaceae family and holds significant ethnobotanical importance due to its diverse medicinal and nutritional applications. Various parts of this plant have been utilized by local communities in the hilly regions to treat a broad range of ailments. Recent research has identified its rich phytochemical profile, including bioactive compounds like flavonoids, saponins, terpenoids, and alkaloids, which enhance its pharmacological potential. These secondary metabolites contribute to diseases treatment. Some of the major pharmaceutical properties of the plant include anti-diabetic, anticancer, antimicrobial, and anti-inflammatory effects. Its inflorescence is consumed as a vegetable and is available in the local market from October to November. This review highlights the morphology, habitat, phytoconstituents, and traditional and pharmacological uses of this plant species. This knowledge can be applied in future studies to promote the safe and scientifically validated use of traditional Indian medicinal plants and to identify new potential compounds for the development of herbal formulations.

Keywords: Pharmacological potential, secondary metabolite, traditional uses

Introduction

Since ancient times, humans have sought natural remedies to address various ailments (Hossain, 2013). The use of therapeutic plants began instinctively, much like the behaviour observed in animals (Petrovska, 2012). Among natural remedies, plants remain the most valuable source of bioactive compounds for extensive research. It is estimated that 80-90% of the global population relies on traditional remedies containing medicinal plant substances (Samantaray and Pradhan, 2024). Despite the advancements in modern pharmaceuticals, medicinal herbs continue to be widely favoured as alternative treatments due to their affordability, efficacy and alignment with historical, cultural and

religious practices (Yazan and Armania, 2014; Nayak and Kumar, 2023). Plants also play a significant role in managing chronic diseases, with a long-standing history of therapeutic applications. According to estimates by the International Union for Conservation of Nature and the World Wildlife Fund, approximately 50,000 to 80,000 flowering plant species are utilized for medicinal purposes (Chen et al., 2016). This enduring reliance on medicinal plants highlights their importance as a cornerstone of traditional medicine and a valuable resource for drug discovery. *Tupistra nutans* Wall. ex Lindl., commonly known as "Nakima" is a traditional medicinal plant belonging to the family Asparagaceae. It is predominantly found in the Eastern Himalayan region of India and is also widely distributed across other Asian countries including Nepal, Bhutan, Bangladesh, India, Thailand, China, Myanmar Vietnam and Laos (Chung et al., 2019; Roy and Singh, 2019). Traditionally, *Tupistra nutans* has been used to treat a variety of ailments, including high blood pressure, obesity, and blood sugar issues. It is also recognized for its pain-relieving, cytotoxic, anti-inflammatory, anti-cancer, and antibacterial properties (Baruah et al., 2022; Khatoon et al., 2018). In the Eastern Himalayan region, local communities commonly use a powdered root decoction to relieve body pain and combat weakness (Linh et al., 2022; Rai 2020). The inflorescence of *T. nutans* is often consumed as a vegetable either in the form of a curry or a pickle, also valued for its high fibre content and nutritional benefits (Roy and Singh, 2019). Moreover, the plant has gained popularity as a vegetative crop due to its ease of cultivation. During the month of October and November, the flower buds or inflorescence are harvested and sold alongside other vegetables in local markets (Chettri et al., 2020). This versatile plant holds significant potential as both a medicinal and nutritional resource, making it an essential part of the region's traditional practices and agricultural economy. This study aims to explore the botanical details, traditional uses, pharmacological properties, and phytochemical composition of *Tupistra nutan* for its future utilization in medicinal applications.

Morphology

Tupistra nutans is a perennial, evergreen, bushy herb belonging to the family Asparagaceae, with an average height of 1.8 meters (Figure 1). Native to the Eastern Himalayas, it is characterized by its unusual rhizome structure (Chettri et al., 2020). The plant has long, strap-like leaves around 1-2 meters in length resembling those of *Aspidistra* (Gurung et al., 2018). The cylindrical stem of *Tupistra nutans*, with a diameter ranging from 1.5 to 1.7 cm, supports a green, erect peduncle that is slightly arched at the distal end and typically 3 to 4 times longer than the spike. This peduncle emerges from the axillary, apical portion of the stem. The plant produces fleshy, clustered flowers that are an attractive yellowish-green with a purple tint, and feature a purplish-white stigma. The fruit of *T. nutans* is globe-shaped, containing a single, rigid seed (Figure 2). Propagation occurs primarily through suckers, making cultivation relatively easy. The plant's distinctive morphology and propagation method enhance its ecological and agricultural significance (Baruah et al., 2024).

Geographical distribution

Tupistra nutans is found across several Asian countries, including India, Bangladesh, Korea, Bhutan, Thailand, China, Myanmar, Nepal, Vietnam, and Laos. In India, it is primarily located in the northeastern

hilly regions, particularly in Sikkim, Meghalaya, and the eastern Himalayan areas of Darjeeling and Kalimpong.

Figure 1: Whole plant of *Tupistra nutans*

The plant thrives at higher altitudes, typically ranging from 3,000 to 7,000 feet above sea level (Chung et al., 2019; Khatoon et al., 2018; Roy and Singh, 2019). *T. nutans* thrives in cool, moist environments and is commonly found in damp, shaded forest areas. In recent years, the plant has gained recognition as an agricultural crop, leading to a significant expansion in its cultivation. Its inflorescence is harvested between September and mid-November and is readily available in local markets (Bhutia et al., 2024).

Figure 2: Fruiting plant of *T. nutans*

Ethnomedicinal and traditional uses

Tupistra nutans has several traditional uses and is widely utilized by local communities in Sikkim and Kalimpong to treat various ailments. The root and flower decoction are especially effective in managing diabetes. Additionally, dried flowers from the inflorescence are used to treat food poisoning. The plant is also known to help reduce elevated blood pressure. Furthermore, it is valued as a remedy for obesity, with powdered root and flower decoctions commonly used for this purpose (Rai, 2020). It is used for stomach-ache, high blood pressure, fever for major traditional healers of Sikkim and lesser for food poison, pneumonia and headache. The inflorescence of *T. nutans* is consumed as a vegetable or pickle by locals in Kalimpong, Darjeeling, and Sikkim (Bhujel et al., 2018). A powdered decoction of the inflorescence is used to relieve body aches, while tribal communities in Kalimpong also use it as a remedy for mild fever. In addition to its medicinal benefits, the plant is valued as a nutritional resource. It is rich in essential nutrients, including sodium (Na), potassium (K), calcium (Ca), iron (Fe), and magnesium (Mg) (Khatoon et al., 2018).

Phytochemical composition

Qualitative analysis of *T. nutans* has identified various secondary metabolites, including alkaloids, flavonoids, saponins, steroids, glycosides, coumarins, anthraquinones, anthocyanins, and phenols, across all parts of the plant, such as the roots, leaves, and inflorescence. However, certain phytochemicals, like tannins, were only detected in the root and leaf extracts, while vitamin C and terpenoids were found exclusively in the inflorescence. Additionally, several compounds present in hydro-methanolic extracts of different parts of *T. nutans*, including 9,12-octadecadienoyl chloride, phthalic acid, neophytadiene, myo-inositol, stearic acid, γ-tocopherol, stigmasterol, diosgenin, β-sitosterol, piperidine, pearlide, α-santalol, citronellol, γ-sitosterol, salicylic acid, linoleic acid, and palmitic acid, were identified through GC-MS analysis (Roy et al., 2023; Figure 3). Biologically active flavonoids, such as quercetin, and phenolic compounds, including p-coumaric acid, were found in the plant (Chettri et al., 2020).

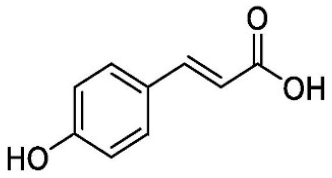
Pharmacological activities

Anti-diabetic activity: Numerous investigations have revealed that the plant extract can effectively block α glycosidase. The studies suggested that the phytochemical present in the plant specifically the phenolic compounds play a very important role in inhibiting α-glucosidase (Chettri et al., 2020).

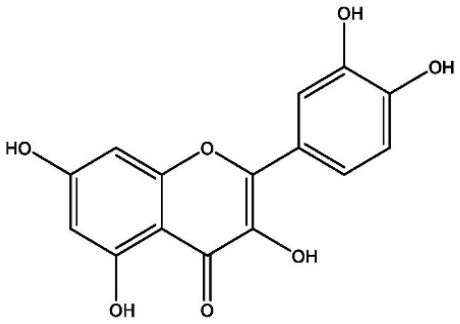
Anti-microbial activity: The root extract of the *Tupistra nutans* has shown to possess a wide range of antimicrobial property. The study was performed using various pathogenic microorganisms. The study to determine the antimicrobial potential of *T. nutans* was done using microdilution method and Disk diffusion method. Confocal microscopy was used to examine the inhibition of the microdilution method. The study also suggested that the p-coumaric acid which is a phenolic compound present in *T. nutans* was responsible for the antimicrobial activity (Chung et al., 2019; Chettri et al., 2020).

Anti-inflammatory activity: The anti-inflammatory property of *Tupistra nutans* was evaluated using the HRBC membrane protection test, which indicated that the methanolic extract of its flowers may prevent HRBC hemolysis. The Karl-Pearson correlation test for hemolysis inhibition revealed that the effect of the plant extract was dose-dependent (Brahma et al., 2020). Among all *Tupistra* species, *T. nutans* stands out due to its high phenolic content, which contributes to its strong antioxidative activity (Linh et al., 2022).

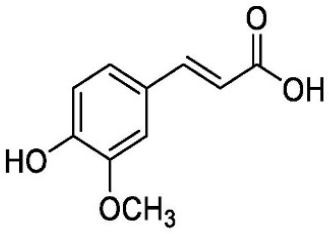
Anticancer Activity: The high concentration of ascorbic acid and the abundant presence of p-Coumaric acid in the inflorescence of the plant contribute to its strong anti-carcinogenic activity through free radical and reactive oxygen species scavenging effects (Chettri et al., 2020). The hydro-methanolic extract of the plant was investigated for anti-hepatocellular carcinoma activity and found to induce significantly greater cell death in HepG2 cells compared to non-cancer cells, likely due to elevated ROS production (Roy et al., 2023).



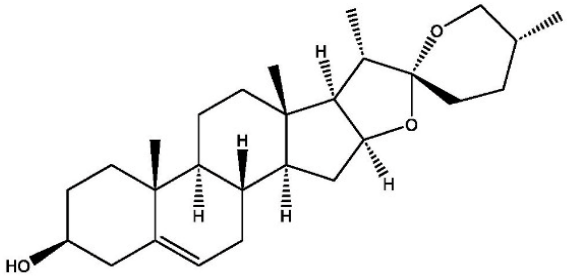
P-coumaric acid



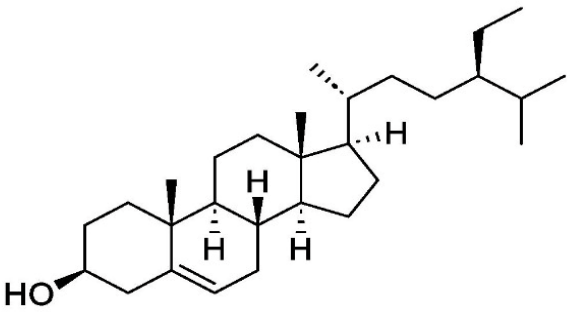
Quercetin



Ferulic acid



Diosgenin



β- sitosterol

Figure 3: Some isolated compounds from *T. nutans* (Source: PubChem)

Future utilization

Given its versatile traditional uses in various parts of Sikkim, India, and across the world, alongside its established pharmacological properties, *Tupistra nutans* holds great potential for future applications:

- **Phytopharmaceuticals**: The active compounds in *T. nutans* could be utilized to develop herbal supplements, topical ointments, or even pharmaceutical drugs, offering fewer side effects compared to synthetic alternatives.
- **Herbal Medicine Industry**: As global demand for herbal and natural medicines continues to grow, *T. nutans* could become a commercially viable product in the herbal medicine market.
- **Functional Foods**: The nutritional benefits of *T. nutans* can also be incorporated into functional foods, where its medicinal properties enhance its value as a food source.

Conclusion

Tupistra nutans, also known as Himalayan Nakima, is a plant of great cultural and medicinal importance. With its wide range of traditional uses and promising pharmacological properties, it has the potential to become a valuable resource for future medical applications. Further research is needed to isolate the active compounds responsible for its traditional uses and to explore its potential in modern pharmaceuticals and the nutrition industry. Additionally, efforts should be made to ensure the conservation and sustainable utilization of this valuable plant. As interest in natural remedies and sustainable agriculture grows, *Tupistra nutans* could play a crucial role in both preserving traditional knowledge and contributing to the development of new therapeutic approaches.

References

Baruah K, Kaushik K and Tare K. (2022). Local vegetables of Sikkim and their medicinal values. Agriculture & Food. 4(7):463-465.

Baruah K, Kaushik K, Tare K, Chetia S, Subba R and Tamang D. (2024). A Review on the distribution, economic importance and nutritional value of underutilized plants in Sikkim's agricultural scenario. Journal of Scientific Research and Reports. 30(5): 376-384.

Bhujel D, Chhetri G and Rai YK. (2018). Wild edible plants used by ethnic communities in Kalimpong district of West Bengal, India. NeBIO. 09(04): 314-326.

Bhutia TL, Dutta SK, Devi EL, Das SK and Kumar A. (2024). *Tupistra clarkei:* Medicinally rich-lesser-known vegetable of Sikkim Himalayas. Food and Scientific Reports. 04(06): 46-51.

Brahma M, Gurung J and Singh B. (2020). An investigation of traditional uses and anti-inflammatory property of *Clematis buchananiana De Candolle* and *Tupistra nutans* Wall. ex Lindl., native ethnomedicinal plants from Sikkim, India. Indian Journal of Traditional Knowledge. 19(4): 719-727.

Chen SL, Yu H, Luo HM, Wu Q, Li CF and Steinmetz A. (2016). Conservation and sustainable use of medicinal plants: problems, progress and prospects. Chinese Medicine. 11: 1-10.

Chettri U, Kumari S, Sharma D, Chettri B, Chettri S. (2020). A review on potential anti-microbial and therapeutic properties of Himalayan plant *Tupistra nutans* (Nakima). International Journal of Pharmaceutical Sciences Review and Research. 64(1):109-113.

Chung IM, Chelliah R, Oh DH, Kim SH, Yu CY and Ghimire BK. (2019*). Tupistra nutans* Wall. root extract, rich in phenolics, inhibits microbial growth and α-glucosidase activity while demonstrating strong antioxidant potential. Brazilian Journal of Botany. 42: 383-397.

Gurung R, Upadhyay S, Maddarsu V R, Manivannan S and Gurung T. (2018). Determination of multi-elemental profile of Nakima (*Tupistra nutans*). Journal of Pharmacognosy and Phytochemistry. 7(6): 2137-2140.

Hossain E, Mandal SC and Gupta JK. (2013). Pharmacognostical Evaluation of *Bombax malabaricum* Leaves. International Journal of Pharmaceutical Sciences and Research. 4(11): 4245-4252.

Khatoon U, Sharma L, Manivannan S and Muddarsu V. (2018). Proximate analysis, elemental profiling and antioxidant activities of *Tupistra nutans* wall grown in Sikkim Hills, India. Journal of Pharmacognosy and Phytochemistry. 7(2): 3630-3633.

Linh NTT, Ha NM and Son NT. (2022). Genus *Tupistra*: A comprehensive review of phytochemistry and pharmacological activity. Natural Product Communications. 17(1):1-20.

Nayak S and Kumar S. (2023). Medicinal plants used by tribals of Odisha. State Medicinal Plants Board, Odisha & Ambika Prasad Research Foundation, Odisha, India.

Petrovska BB. (2012). Historical review of medicinal plants' usage. Pharmacognosy Reviews. 6(11): 1-5.

Rai S, Roy U and Sarkar RK. (2020). Nakima *(Tupistra nutans* Wall*)* – An indigenous underutilised vegetable crop grown in hills of West Bengal. Readers Shelf. 17(03): 4-6.

Roy AC, Prasad A, Singh S, Priya K and Ghosh I. (2023). Comparative bioactivity analysis of hydro-methanolic extracts of root, leaf, and inflorescence of *Tupistra nutans* Wall. ex Lindl: An in vitro study on antioxidant and anti-hepatocellular carcinoma activity. Biocatalysis and Agricultural Biotechnology. 52: 102819.

Roy DK and Singh B K. (2019). Notes on taxonomic recognition and recollection of *Tupistra nutans* (Asparagaceae). Bulletin of Arunachal Forest Research. 34(1&2): 25-28.

Samantaray A and Pradhan D. (2024). *Tupistra chinensis* a traditional Chinese plant suppresses tumor growth and metastasis in vitro against ER positive and triple negative breast cancer. Pharmacological Research-Modern Chinese Medicine. 10 :100368.

Yazan S and Armania N. (2014). Dillenia species: A review of the traditional uses, active constituents and pharmacological properties from pre-clinical studies. Pharmaceutical Biology. 52(7):890-897.