



TRADITIONAL INDIGENOUS HERBAL TECHNOLOGIES FOR FOOD GRAIN PRESERVATION IN YAMKESHWAR BLOCK, UTTARAKHAND, INDIA

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ABSTRACT

The present study was conducted to document traditional grain storage practices and herbal-based preservation methods followed by rural households in Gaindakhal village and nearby areas of Yamkeshwar block, Uttarakhand. In rural and hilly regions, many families still depend on traditional knowledge for safe storage of food grains such as wheat, maize, mandua, jhangora and pulses. These methods are mainly based on locally available storage structures and plant-based materials. The study was carried out through field surveys, direct observation and personal interviews with villagers, farmers and women involved in grains storage activities. Different traditional storage structures such as Dablo, Kwakha, Tumri, metal bins, bamboo baskets and hanging storage methods were recorded during the survey. Traditional grain measuring units like Path and Man were also observed. The study also documented the use of herbal materials such as neem leaves, turmeric, wood ash, dried red chilli and mustard oil for protecting stored grains from insects and moisture damage. Neem leaves, ash and mustard oil were most commonly used by villagers. The findings indicate that these traditional methods are economical, environmentally friendly and effective for long-term grain storage. These practices help in reducing insect infestation without using harmful chemicals. The study highlights the importance of preserving indigenous knowledge related to traditional grain preservation for sustainable and safe storage practices in the future.

Keywords: Traditional grain storage, Herbal preservation methods, Indigenous knowledge, Food grains preservation, Sustainable practices.

INTRODUCTION

Food grains such as cereals, millets and pulses are the main sources of food for most Indian families. Crops like wheat, rice, maize and different types of millets, along with pulses such as gram, lentils, peas and pigeon pea are produced in large quantities and stored at the household level for daily use (Sundaramari et al., 2009). Proper storage of these grains becomes very important because, if grains are not stored properly, they can be damaged by insects, moisture and fungal growth. This not only reduces their quality but also leads to loss of food and income. Common storage pests such as rice weevils, pulse beetles and grain moths attack stored grains and reduce their nutritional value (Karthikeyan et al., 2005).

In many rural and hilly areas of India, especially Uttarakhand, farmers usually do not have modern storage facilities. Because of this, they depend on traditional methods that have been followed for generations. These methods include the use of locally available containers such as earthen pots, bamboo bins,

wooden boxes, metal containers and gunny bags (Negi & Salanki, 2015; Katagi & Malashetti, 2014). Along with these storage structures, farmers and villagers also use plant-based materials like neem leaves, neem oil, ash, eucalyptus leaves and mustard oil to protect grains from insects and moisture (Sharma et al., 2024; Prakash et al., 2016). Traditional grain storage practices are especially important for small farming families who store grains mainly for their own consumption. These practices are based on indigenous knowledge that has been developed over time and passed from one generation to another. These methods do not involve chemical pesticides; they are safe for people and do not harm the environment. The use of natural materials helps in maintaining grain quality and makes them suitable for long-term storage (Tripathi, 2013; Bisheko, 2023).

In Uttarakhand, particularly in the Kumaon and Garhwal regions, people follow different traditional practices for storing cereals, pulses and millets. Before storage, grains are usually cleaned and dried in sunlight

to remove moisture. After that, farmers mix natural materials such as neem leaves, ash or vegetable oils with grains to reduce insect attacks and maintain their quality during storage (Kandpal, 2025). Eco-friendly pest control methods using herbal materials are also commonly used, and they help in reducing storage losses (Kapkoti et al., 2025). Studies from areas like Pinder Basin and other Himalayan regions have also shown that people use traditional tools, storage systems and local knowledge according to their local conditions (Bisht et al., 2025; Pooja & Anil Pal, 2025; Mehta et al., 2013).

Traditional storage practices are also found in other parts of India. In Tamil Nadu, people use natural materials such as neem products, oils, salt, and sand are used to protect pulses from insect damage (Karthikeyan et al., 2005). In the Bundelkhand region of Uttar Pradesh, rural households continue to use traditional storage methods along with herbal treatments for safely storing grains and pulses (Dubey et al., 2014). Recent studies have also suggested that using both traditional and modern storage methods together can improve storage efficiency and reduce grain losses (Patel & Janardhana, 2025). Even today, many rural households continue to follow these traditional grain storage practices because they are simple, affordable and suitable for household needs. In the hilly regions like Uttarakhand, agriculture remains an important source of livelihood, and families mainly grow food grains such as cereals, pulses and millets for their own consumption. Despite the continued use of these traditional methods, there is limited documented information available on household level grain storage practices in many villages of the Yamkeshwar block. Therefore, the present study focuses on documenting and understanding the traditional grain storage methods followed by households in Gaindakhal village and nearby areas, Yamkeshwar block of Uttarakhand. The study aims to record different storage structures, materials and natural treatments used for preserving food grains. It also aims to highlight the importance of indigenous knowledge and promote eco-friendly and low-cost storage practices.

MATERIALS AND METHODS

Study Area

The present study was conducted in Gaindakhal village and nearby villages of Yamkeshwar block (fig. 1) in the Pauri Garhwal district of Uttarakhand, India. The nearby villages included Gaind, Silwani, Sindhai

and Dandoli. The study area is located in the foothills of the Himalayan region and has both hilly and partly plain land. The average altitude of the area is approximately 372 meters above sea level and it is located around 30.12°N latitude and 78.25°E longitude. The climate of the area is subtropical, with cold winters and moderate summers. Most of the rainfall occurs during the monsoon season, which is important for agriculture. Agriculture is the main occupation of the local people. Farmers grow crops like wheat, barley, maize, mandua, jhangora and different types of pulses, mainly for their household consumption. Due to the limited access to modern storage facilities, people in this region still depend on traditional grain storage methods and plant-based materials to protect grains from insects and moisture.

Selection of Study Area

The study area was selected because traditional grain storage practices are still commonly used by rural households in Gaindakhal village and nearby villages of the Yamkeshwar block. Another important reason is that elderly villagers and farmers in this region still have valuable traditional knowledge about grain storage and preservation, which has been passed from one generation to another. Rural women also play an important role in storing grains at the household level. Because of these reasons, this area was suitable for documenting indigenous knowledge related to traditional grain storage structures and herbal preservation.

Data Collection

The data for the present study were collected through field surveys conducted from November 2025 to February 2026. A total of 8 households were selected from the study area. Two to three field visits were made to the selected villages. Personal interviews and informal discussions were conducted with farmers, elderly villagers and women involved in grain storage activities.

A structured questionnaire was used to record details regarding the types of food grains stored, storage structures used, duration of storage and plant-based materials used for protecting grains from insects and moisture. Photographs of traditional grain storage structures and preservation materials were also taken during the field visits for documentation.

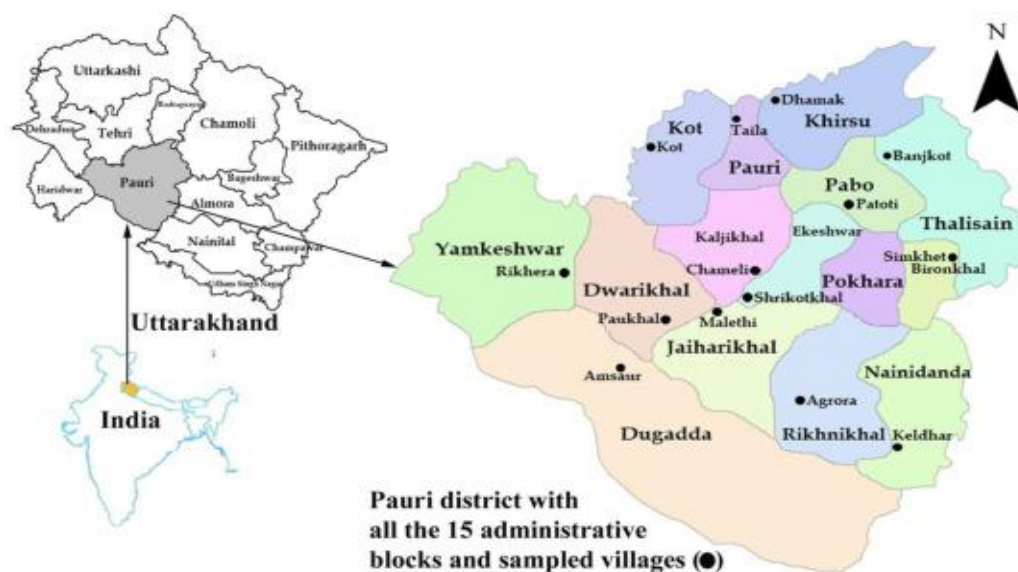


Fig. 1: Map of Study Area

Traditional Storage Structures

During the field survey, different types of traditional grain storage structures used by rural households were directly observed in the study area. These included Dablo, Kwakha, Tumri, metal (tin) containers, hanging methods for storing maize cobs, baskets made from bamboo and bhimal fibers, grain measurement devices and supi. Information about their use, materials used for making them and their role in protecting grains from insects and moisture was collected through observation and discussion with villagers. Direct observation helped in understanding the practical use and importance of these traditional storage structures in daily life.

Documentation of Herbal Preservation Methods

During the survey, it was observed that rural households use different plant-based materials to protect stored grains from insects and moisture. Commonly used materials included neem leaves, turmeric powder, ash, dried red chilli and mustard oil. Information about how these materials are used and their purpose was collected through interaction with villagers. These traditional methods show how local people use natural resources effectively for safe grain storage without using chemical preservatives.

RESULTS

The present study documented various traditional grain storage structures and herbal-based grain preservation practices followed by rural households of Gaidnkhal village and adjoining areas of Yamkeshwar Block, Uttarakhand. Data collected through field observations, household surveys, and interactions with local villagers revealed that traditional storage systems continue to play an important role in ensuring food security at the household level. These methods are inexpensive, environmentally sustainable, and effective in protecting grains from moisture, insects, and rodents during long-term storage.

Traditional Grain Storage Structures

Dablo (Bamboo Bin)

Dablo was found to be one of the most widely used traditional grain storage structures in the study area. It is a cylindrical bin constructed from woven bamboo strips and coated externally with a mixture of mud and cow dung, which enhances its strength and provides protection against insect infestation (Plate 1a). Farmers commonly use Dablo for storing wheat, maize, barley, mandua (*Eleusine coracana*), and jhangora (*Echinochloa frumentacea*) for a period of approximately 6–12 months. The structure permits limited air circulation while preventing excess

moisture accumulation, thereby maintaining grain quality during storage.

Kwakha (Maloo Creeper Basket)

Kwakha is a traditional basket prepared from the stems of the Maloo creeper (*Bauhinia vahlii*), which grows abundantly in nearby forest areas. It is primarily used for temporary storage of grains before their transfer to permanent storage structures (Plate 1c). The basket is commonly utilized for storing maize and pulses for short durations. Its open and ventilated structure facilitates air circulation and helps reduce grain moisture. Besides grain storage, Maloo leaves are extensively used for preparing traditional leaf plates (pattal), indicating their multipurpose importance in rural livelihoods.

Tumri (Dried Bottle Gourd Container)

Tumri, prepared from the dried shell of bottle gourd (*Lagenaria siceraria*), serves as a natural container for storing small quantities of seeds and pulses (Plate 1b). It is commonly used for the storage of mustard, jakhiya, fenugreek (methi), lentils, and other seeds. Villagers reported that grains and seeds can be safely preserved in Tumri containers for approximately 3–6 months. The

closed structure of the container minimizes insect entry and provides protection against storage pests.

Hanging Storage Method

A traditional hanging storage method was frequently observed in the study area, particularly for maize cobs (Plate 1, l). Maize is suspended from the ceilings or walls inside houses, usually near kitchen areas. The warmth generated from cooking activities and the continuous air circulation around the hanging cobs help prevent insect infestation and rodent damage. According to local farmers, maize stored through this method remains protected for approximately 4–6 months.

Metal Bins

Although traditional structures are still prevalent, metal bins made of iron or steel have increasingly been adopted for grain storage (Plate 1d). These bins are mainly used for wheat, rice, and pulses and provide superior protection against moisture, rodents, and insect pests. Farmers reported that properly dried grains can be safely stored in metal bins for up to one year without significant deterioration in quality.

Table 1: Use of Traditional Storage Structures in Study Area (n=8)

S.No.	Storage Structures	House	Percentage	Use	Duration
1.	Dablo	6	75%	Wheat, maize storage	6-12 months
2.	Metal Bin	5	62.5%	Long-term storage	Up to 1 year
3.	Hanging method	5	62.5%	Maize, millet storage	4-6 months
4.	Tumri	4	50%	Seeds storage	3-6 months
5.	Kwakha	3	37.5%	Temporary storage	Short-term

Traditional Grain Measurement Devices

Traditional measuring units continue to be used by villagers for grain storage, exchange, and household consumption (Plate 1e–f).

Path is a small wooden or metal container used for measuring relatively small quantities of grain. It is commonly employed for daily household requirements and for estimating seed quantities required for sowing.

Man is a larger traditional measuring unit used for storing and estimating larger quantities of grain, particularly during harvesting and storage operations.

Although metric units such as kilograms have become common, these traditional measurement systems remain an integral part of local agricultural practices.

Bamboo and Bhimal Baskets

Baskets woven from bamboo and Bhimal (*Grewia optiva*) fibers are extensively used for transporting harvested grains from fields to homes and for temporary storage during post-harvest handling. These baskets are lightweight, durable, and locally available. They are commonly used for wheat, maize, mandua, and pulses during harvesting, drying, and storage operations. Additionally, bamboo *Supi* is traditionally used for winnowing and cleaning grains before storage.



Herbal Materials Used for Grain Preservation

The survey revealed that villagers employ several plant-based materials and natural substances to protect stored grains from insect infestation, fungal growth, and moisture damage. These preservation methods are cost-effective, locally available, and environmentally friendly.

Neem Leaves (*Azadirachta indica*)

Dried neem leaves were identified as the most commonly used botanical preservative in the study area (Plate 2, k). Farmers mix dried neem leaves with grains while filling storage containers. The insect-repellent properties of neem help protect stored grains from pests and maintain grain quality for approximately 6–12 months.

Turmeric Powder (*Curcuma longa*)

Turmeric powder is applied in small quantities to stored grains as a natural preservative. Villagers reported that turmeric effectively reduces insect infestation and fungal contamination due to its antimicrobial properties, thereby enhancing the storage life of grains.

Dried Red Chilli (*Capsicum annuum*)

Whole dried red chillies are commonly placed inside grain storage containers. The strong pungent odor of chilli acts as a natural insect repellent and helps prevent pest infestation during storage.

Wood Ash (Raakh/Rangur)

Wood ash is traditionally used as a protective layer around stored grains (Plate 2, m). Farmers reported that ash absorbs excess moisture and creates an unfavorable environment for insect pests and fungal growth. Due to its easy availability and low cost, it remains one of the most popular grain preservation materials.

Mustard Oil (*Brassica juncea*)

Mustard oil (Sarso ka Tel) is applied as a thin coating on grains before storage (Plate 2, j). The oil forms a protective layer on the grain surface, restricting insect attack and reducing fungal infection. Farmers particularly use this method for storing pulses and seeds intended for household consumption.

Table 2: Use of Herbal Materials for Grain Preservation (n=8) :-

S.No.	Material	House	%	Function	Source
1.	Neem leaves	7	87.5%	Insect repellent	Local trees
2.	Wood Ash	6	75%	Moisture control	Household waste
3.	Dry Red Chilli	5	62.5%	Insect repellent	Household
4.	Mustard Oil	5	62.5%	Protective layer	Local
5.	Turmeric	3	37.5%	Antimicrobial	Household

DISCUSSION

The present study revealed that rural households of Gaindkhal village and nearby areas of Yamkeshwar Block, Uttarakhand, continue to rely on traditional grain storage structures and herbal-based preservation methods for the safe storage of food grains and pulses. The storage practices documented during the study included the use of traditional containers such as bamboo bins (Dablo), earthen pots (Matti ki Kuthli), metal containers, and wooden storage structures. In addition, locally available plant materials such as neem leaves, turmeric powder, mustard oil, ash, and walnut

leaves were commonly used to protect stored grains from insect infestation and spoilage. These findings are consistent with earlier studies conducted in Uttarakhand. Negi and Salanki (2015) reported that farmers in the Kumaon region continue to use traditional storage structures such as earthen pots, bamboo bins, wooden boxes, and metal containers due to their affordability, accessibility, and effectiveness. Their study also documented the use of natural materials including neem leaves, ash, and mustard oil for grain protection, which closely resembles the practices observed in the present investigation.



PLATE: 1 a.Dablo, b.Tumri, c. Kwakha, d. Metal bin, e. Path, f. Man, (Photos captured by Shivani)



PLATE: 2 l. g. Bamboo supi, h. Bhimal basket, i. Bamboo basket, j. Mustard oil coating in pulses, k. Dry neem leaves in wheat, l. Hanging maize cobs, m. Wood Ash in maize, ((Photos captured by Shivani)

Proper preparation of grains before storage was another important aspect documented in the study. Farmers commonly practiced sun drying and cleaning of grains before storage to reduce moisture content and prevent fungal growth. Similar observations were reported by Kandpal (2025), who documented traditional cereal and millet storage practices in the Kumaon region and highlighted the importance of drying and cleaning grains before storage. The use of neem leaves and cow dung as protective materials reported in that study further supports the findings of the present research.

The continued dependence of local communities on indigenous knowledge systems observed during the present study agrees with the findings of Mehta et al. (2013), who reported that rural households in Uttarakhand largely depend on traditional knowledge and herbal methods rather than chemical treatments for grain preservation. Likewise, Pooja and Anil Pal (2025) emphasized that traditional agricultural and storage practices in the Pinder Basin are based on generations of local experience and are well adapted to the environmental conditions of the Himalayan region.

The findings also correspond with studies conducted outside Uttarakhand. Basfore et al. (2025) documented indigenous grain storage structures in Meghalaya that were prepared from locally available materials and played an important role in ensuring household food security. Similar observations in the present study suggest that traditional storage systems remain relevant across different regions of India due to their sustainability and low cost.

The use of eco-friendly and plant-based materials for pest management observed in the present study is supported by several earlier investigations. Kapkoti et al. (2025) reported that herbal materials are widely used in Uttarakhand for the management of pests in stored pulses. Similarly, Sharma et al. (2024) and Tripathi (2013) found that neem seed powder, turmeric, eucalyptus leaves, and vegetable oils serve as effective alternatives to synthetic pesticides for protecting stored grains. The use of mustard oil, neem leaves, and turmeric powder documented during the present study further validates these findings. Studies conducted in other parts of India have also highlighted the effectiveness of traditional grain preservation methods. Prakash et al. (2015) reported that oil coating and plant-based materials are commonly used for improving seed longevity and reducing insect damage during storage. Karthikeyan et al. (2005) documented the use of neem leaves, neem

oil, coconut oil, salt, and sand for pulse storage in Tamil Nadu, while Reddy (2006) described several indigenous pulse storage techniques in Andhra Pradesh that were economical and effective in reducing storage losses. Similar use of locally available materials was observed among households in the present study.

Traditional storage structures documented in the current investigation also resemble those reported by Katagi and Malashetti (2014), who described the use of bamboo bins, earthen pots, and underground storage systems in different parts of India. These structures, when combined with botanical protectants, were found to reduce post-harvest losses and maintain grain quality. Comparable benefits were reported by respondents during the present study, who considered traditional storage methods effective for long-term preservation of grains.

The importance of indigenous grain storage systems in ensuring household food security has been highlighted by several researchers. Bisheko (2023) reported that traditional storage practices in Assam contribute significantly to safe grain preservation and food security. Likewise, Bisht et al. (2025) observed that indigenous agricultural practices influence post-harvest handling and storage systems in Uttarakhand. The findings of the present study further support the role of traditional storage knowledge in maintaining grain quality and reducing storage losses in rural households.

Overall, the present study confirms that traditional grain storage structures and herbal preservation methods remain an integral part of household grain management in rural Uttarakhand. These practices are affordable, environmentally sustainable, and based on locally available resources. Although modernization has introduced improved storage technologies, indigenous methods continue to be preferred by many households due to their low cost and cultural acceptance. However, scientific documentation of these practices at the household level remains limited, particularly in the Himalayan region. Therefore, further studies are needed to evaluate their effectiveness scientifically and to promote the conservation of this valuable traditional knowledge for future generations.

CONCLUSION

The present study shows that traditional grain storage methods are still important in rural areas of Yamkeshwar block, Uttarakhand. Local people continue to use traditional storage structures, measuring units and herbal materials for protecting



food grains at the household level. These methods are simple, low-cost and based on local knowledge passed from one generation to another. The study found that traditional storage structures such as Dablo, Kwakha, Tumri and metal bins are still commonly used for safe storage of grains. Traditional measuring units like Man and Path are also still used in many households for measuring grains during storage and daily use. Baskets made from bamboo and bhimal fibers are useful for carrying, drying and temporary storage of grains. Plant-based materials such as neem leaves, red chilli, ash and mustard oil are commonly used to protect grains from insects and moisture damage. These traditional methods are considered safer because they use natural materials instead of harmful chemicals. They are eco-friendly and suitable for rural households. Therefore, it is important to preserve and promote this indigenous knowledge so that these traditional and sustainable grain preservation practices can continue to be valuable for future generations.

REFERENCES

- Basfore R, Gurung A, Sharma L, Kumar R, Bhutia KD, Rana M, Upadhyay S, Bag N, Lamichaney A (2025). Indigenous knowledge to ensure food security: Revisiting grain storage practices in Meghalaya, India. *Journal of Food Legumes* 38(3):447–454. <https://pub.isprid.in/index.php/jfl/article/view/1877>
- Bisheko MJ (2023). Traditional grain storage methods: An exploration of their contribution to the sustainability of Indian agriculture. *Journal of Food Security* 9(2):21–28. [10.1080/23311932.2023.2276559](https://doi.org/10.1080/23311932.2023.2276559)
- Bisht AS, Verma R, Tewari R, Bhatt S, Hemdan A, Gedela S, Sharma R (2025). Indigenous traditional knowledge for rice cultivation in Uttarakhand. *Journal of Mountain Research* 21(1):21–30. [10.51220/jmr.v20-i1.3](https://doi.org/10.51220/jmr.v20-i1.3)
- Dubey SK, Umasah, Saxena H (2014). Indigenous pulse storage methods in Bundelkhand region of Uttar Pradesh. *Current Advances in Agricultural Sciences* 6:161–164.
- Kandpal A (2025). Preservation methods of traditional cereals and millets applied as stable food in Kumaon. *Indian Journal of Agricultural Research* 10:101–107.
- Kapkoti R, Kumari D, Gauna N, Bisht N (2025). Traditional and eco-friendly pest management techniques for pulse storage. *Indian Journal of Entomology* 88(3):830–834. <https://doi.org/10.55446/IJE.2025.3149>
- Karthikeyan C, Veeragavathatham D, Karpagam D, Firdouse Ayisha S (2005). Indigenous storage practices in pulses of Tamil Nadu. *Journal of Agricultural Extension* 8(1):55–61.
- Katagi A, Malashetti RI (2014). Use of plant products for safe and economic storage of food grains. *International Advance Research Journal of Crop Improvement* 5(1):53–56.
- Mehta PS, Negi KS, Ojha SN, Rayal A, Verma SK (2013). Herbal-based traditional practices used by the Bhotias and Gangwals of the Central Himalayan Region, Uttarakhand, India. *Journal of Environmental Nanotechnology* 2(1):83–96.
- Negi T, Salanki D (2015). Traditional grain storage structures and practices followed by farm families of Kumaon region. *Indian Research Journal of Extension Education* 15:137–141.
- Patel M, Janardhana A (2025). A unique way of food preservation through traditional and modern methodologies. *Indian Journal of Applied and Pure Biology* 40(1):286–297.
- Pooja, Pal A (2025). Local wisdom in agriculture: Tools, practices and storage structures in the Pinder Basin, Uttarakhand. *International Journal of Applied Social Science* 12(7):581–589. <https://dois.org/doi/10.202568617695/IJASS/12.7&8/588-596>
- Prakash BG, Raghavendra KV, Gowthami R, Shashank R (2016). Indigenous practices for eco-friendly storage of food grains and seeds. *Advanced Plants & Agriculture Research* 3(4):101–107. [10.15406/apar.2016.03.00101](https://doi.org/10.15406/apar.2016.03.00101)
- Reddy BS (2006). Indigenous technical knowledge on pulses storage and processing practices in Andhra Pradesh. *Indian Journal of Traditional Knowledge* 5(1):87–94.
- Sharma HH, Sonawal S, Dutta SK, Bora M, Goswami A, Talukdar N (2024). Exploring various natural and organic approaches for storage and preservation of food grains. *Journal of Agriculture Studies* 7(5):265–270. [10.33545/2618060X.2024.v7.i5d.689](https://doi.org/10.33545/2618060X.2024.v7.i5d.689)
- Sundaramari M, Ganesh S, Kannan GS, Seethalakshmi M, Gopalsamy K (2009). Indigenous grain storage structure of Tamil Nadu. *Indian Journal of Traditional Knowledge* 10(2):380–383.
- Tripathi P (2013). Traditional grain storage and measurement devices in Uttarakhand. *Journal of Rural Development Studies*.