

Traditional methods for storage of vegetables in cold arid region of Ladakh, India

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Received 05.05.2009; revised 08.02.2010

The indigenous knowledge of the people in Ladakh for storage of selected vegetables is unique. Vegetable cultivation in Ladakh during winter is not practiced due to sub-zero temperature. To meet the vegetable needs during winter, tribal people in the region has gained wisdom in storage of selected crops like cabbage, potato, onion, radish and carrot, which comply well with the ecological and socioeconomic conditions of the region. Cabbage is stored in basement of house, tuber and root crops in underground pits and onion by hanging from the ceiling of the storehouse. Under sub-zero temperature, vegetables are stored in good conditions for 5-6 months. With the advancement of technology the cumbersome traditional method is undergoing changes and declining. However, the traditional method is time tested, zero-energy based and still being preferred due to low cost. This paper describes the ancient traditional method of vegetable storage still being practiced in Ladakh.

Keywords: Ladakh, Storage, Vegetable, Winter

IPC Int. Cl.⁸: B65G, A01F 25/00

People in cold desert of Ladakh practiced a number of indigenous techniques for the management, storage and use of bioresources. The isolation of the region plays an important role in the sustenance of such knowledge base. In the event of modernization, the people are gradually moving away from tradition¹. The indigenous knowledge of vegetable storage for off-season consumption is unique, and still being practiced in some part of the region. Therefore, documentation of the indigenous knowledge from cultural view point and possible future use is compiled here based on personal knowledge, observations and discussions.

Vegetable find important place in the *Ladakhi* menu. Area measuring 310 ha is under vegetable cultivation producing 7,544 tons of fresh vegetables annually in Leh district². Due to sub-zero temperature during winter months, vegetable cultivation is possible only from April to October, and harvesting is done from July to October. Storage of vegetables produced during the summer season is must for its consumption during winter months. The region remains isolated from rest parts of the country from November to May every year due to heavy snowfall. Getting fresh vegetables from outside the region is

beyond the reach of the people due to high air cargo charges of Rs 130/kg. Therefore, the only means of getting vegetables during winter months is by storing the locally produced surplus vegetables for off-season consumption. Traditionally, few vegetables are being grown in the region and the indigenous knowledge of selected vegetable storage has been matured and refined over time as new situations are confronted. Vegetables stored for the winter months form a major source of income for vegetable growers. Women folk sell stored vegetable on foot path in the local market (Fig. 1).

Study site

Ladakh region is situated in trans-Himalaya and comprises of Leh and Kargil district. Leh district is situated between 32°N to 36°N latitude and 75°E to 80°E longitude at an altitude ranging from 2900 - 5900 m above mean sea level. Area measuring 45,110 km² having 116 villages is divided into 9 blocks³. The present study has been conducted in places adjoining Leh township where vegetable growing form a main source of income.

Methodology

Survey of Leh market for availability of locally produced vegetables throughout the year was done.

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Sixty elderly and experienced villagers from 12 villages adjoining Leh township in Leh district were selected on account of their rich experiences in vegetable growing and storage. Rapport building process has been established by communicating with the villagers in local dialect. Data pertaining to the study were collected by combination of discussion with the villagers and on-spot observation of the method practiced by the villagers.

Results

Extensive surveys, on-spot observations and discussions with elderly and experienced farmers have shown that the following 3 methods of vegetable storage are most common in the region (Table 1).

Sadong

A cone shaped pit locally known as *Sadong* is constructed at ground level in a well drained location. The size of the pit varies from 150-180 cm depth, 90-120 cm surface diameter and 150-180 cm basal diameter. The pit is made in October ending soon after crop harvesting. Vegetables, viz. potato, carrot, radish and turnip free from cuts, cracks, bruises, or other insect or mechanical injury are placed in the pit and covered with gunny bag. The pit is filled upto 30 cm from ground level and covered with soil. When, vegetables are to be consumed within two to three months, 30 cm gap is maintained between the piled vegetable and the ground surface. It is then covered with long wooden sticks and covered with gunny bags followed by 45 cm thick soil layer above the ground. When, the weather is warm in late autumn or early spring, the above ground soil layer is reduced to 30 cm. Separate pits are made for storage of potato, carrot, radish and turnip. Storing few vegetables together in the same pit is not uncommon in case the total quantity requirement of a household is not large.

Table 1—Types of storage structures and shelf life of stored vegetables

Storage types	Vegetables	Storage life
<i>Sadong</i> (Under Ground Pit)	Potato	5 months
	Carrot	5 months
	Radish	5 months
	Turnip	2 months
<i>Tsothbang</i> (Vegetable Cellar)	Potato	6 months
	Carrot	6 months
	Radish	6 months
	Turnip	2 months
	Cabbage	6 months
<i>Charches</i> (Hanging)	Onion	8 months

During winter months, the pit is dug from the surface to remove required quantity of vegetables for consumption (Figs. 2 & 3). The gunny bag and soil is placed back to avoid freezing of the produce. Repeated opening of the pit is generally avoided as it increases the chances of mechanical injury and deep freezing. Under these conditions, vegetables can be stored in good conditions for upto 5 months. At the end of the winter months the remaining vegetables are removed from the pit and pit is filled with soil to carry routine agricultural activities. This method, therefore, uses the same field for storage during winter and vegetable cultivation in summer.

Tsothbang

The *tsothbang* is a rectangular structure with a small outdoor entrance and a ventilator used for storage of cabbage and root crops. Generally its dimensions are $12 \times 10 \times 6 \text{ m}^3$ (L \times W \times H). The selection of location is based on that it prevents light entrance in the structure during storage period. The structure is made either in the basement of the house or as separate outdoor underground or semi-underground structure. If the structure is made at basement of the house, opening is generally made from the kitchen using staircase. Humidity inside the structure is maintained by sprinkling water every 15 to 20 days interval. Temperature is maintained by opening or closing the ventilator. The ventilator is close tightly from November to February when the outdoor temperature is sub-zero. Depending on the outside temperature, the ventilator is opened during day time in October and March onwards. For storage in *tsothbang* cabbage is harvested along with roots and set them side by side with their roots in 15 cm soil layer spreaded on the floor (Figs. 4 & 5). Root crops are heaped at a corner of the structure and covered with 7.5-10 cm thick soil layer. This method is good for keeping vegetables for 5-6 months.

Charches

This method involves storage of fresh onion by hanging them from ceiling. The onion crop is harvested when the bulb is matured and leaves are green. For storage in *charches*, the bunch of onion is tied together in the form of knot with the help of green leaves. Long sticks strong enough to bear the load of the onion bunches are hanged parallelly on the ceiling of an unheated storehouse using rope hooks. Bunches of onions are carefully hanged on the sticks (Fig. 6). Utmost care is taken to keep the onion



Figs. (1-6)—1, Women folk sell stored vegetables on foot path in local market; 2, *Sadong*: Underground pit for vegetable storage; 3, Digging of *sadong* to remove stored vegetable; 4, *Tsothbang*: Underground structure for vegetable storage; 5, Cabbage stored in *tsothbang* and 6, *Charches*: Onion storage by hanging from ceiling.

untouched after hanging. Repeated hand touching and hard pressing spoils the bulbs. As per requirement the bulbs are plugged from one end without disturbing the entire lot. The method is effective for storage of onion upto 8 months from October to May.

Discussion and conclusion

Storage of fresh root crops, potato, onion and cabbage using traditional methods is an important activity in Ladakh region. Due to sub-zero temperature and cut off from the rest part of India during winter months, the people have mastered the art of storing selected vegetables. These storage methods do not involve electric power supply and are entirely based on the use of local natural resources. The shelf life of stored vegetable is comparable with energy intensive modern methods of storage. The stored vegetables serve as important source of nutritive food during the snow covered period in the region. It helps to break monotonous consumption of dried vegetables. Despite the modernising activity in the region, the traditional method of vegetable storage is still playing an important role in the life of *Ladakhi* people. Defence Institute of High Altitude Research, DRDO, Leh-Ladakh has conducted extensive surveys to document these methods of vegetable storage practiced since ages. Results have revealed that *Sadong*, *Tsothbang* and *Charches* are the three most common methods of vegetable storage in the region.

These methods can be helpful in developing low cost innovative methods of preservations to minimize the post harvest losses and increased the availability of vegetables during winter months. Based on the observations of the traditional method, researchers can further improve the zero-energy storage of vegetables in cold deserts to further extend the shelf life and quality of vegetables. Newly introduced vegetables in the region can also be attempted for zero-energy based long term storage using the traditional methods.

Acknowledgement

The authors would like to thank the elderly and experienced villagers of Leh block for sharing knowledge and information on the subject. Authors are especially thankful to Sebi (Thiksey), Boto (Skara), Karpotok (Skara) and Onpo (Sankar) families for permission to take samples and data during various stages of vegetable storage in their houses.

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