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USE OF MINIMAL PROCESSING TO SECURE VEGETABLE AVAILABILITY DURING WINTER MONTHS IN LADAKH REGION

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Abstract: Ladakh region is one of the driest and coldest inhabited places on the earth where availability of fresh vegetables in winter months is not possible. Minimal processing will play a vital role in the availability of vegetables during winter months in the region. Minimal processing means light processing so as to avoid spoilage of vegetables without altering its natural phenomenon. In this, some specific operations are performed to prevent the vegetable from fungal and bacterial attacks through cleaning, peeling, cutting, slicing, packaging and light processing of vegetables. Maintenance of quality and hygiene is of paramount importance during processing, packaging and storage. Minimal processing converts perishable vegetables into stable products with longer life. Physical, chemical and fermentation are the techniques of minimal processing.

Keywords: Conventional, Ladakh, Minimal, Vegetables

Introduction: Ladakh is the high altitude Trans Himalayan region of Jammu and Kashmir with special agro-climatic features. The region is one of the driest and coldest inhabited places on the earth. Extreme cold and aridity coupled with large seasonal as well as diurnal variation in temperature are limiting factors affecting agricultural productivity adversely. Winter temperature plummets to as low as 30 degree Celsius below freezing point. In summers, nonetheless, temperature can surge up to 39 degree Celsius. Raising crops in such a climatic setup is quite difficult and almost impossible during winters. During winter months Ladakh region remain cut from rest of the country for approximate eight months. In this situation maximum vegetables are lift through air, due to its bulky nature price is very high. In this situation minimal processing plays important role to provide vegetable during winter month at low price. Minimal processing means light processing so as to avoid spoilage of vegetables without altering its natural phenomenon. In this, some specific operations are performed to prevent the vegetable from fungal and bacterial attacks through cleaning, peeling, cutting, slicing, packaging and light processing of

vegetables ^[1]. Maintenance of quality and hygiene is of paramount importance during processing, packaging and storage.

Minimal processing converts perishable vegetables into stable products with longer life. Main purpose of minimal processing is to minimize the qualitative and quantitative deterioration of the produce after harvest. It is not merely to satisfy producers and processors by way of higher monetary return, but also with better taste and nutrition ^[2]. Minimal processing employs an integrated approach wherein the handling, processing, packaging and distribution of raw vegetables is properly managed with the application of appropriate food safety principles of Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Point (HACCP) ^[3]. A hurdle approach is often applied in order to enhance the microbial stability and sensory quality of minimally processed products. The basic principle behind this approach is that microorganisms are inhibited by combined preservative factors (referred to as hurdles). Low temperature storage, mild heat treatments, control of water activity, control of redox potential through appropriate packaging, the application of preservatives such as sorbate,

benzoate and ascorbic acid are commonly applied hurdles in the minimal processing of vegetables^[4]. Figure depicts an example of the hurdle concept as applied to a minimally

processed refrigerated product, wherein mild heat treatment, a chemical preservative, packaging and refrigerated conditions render the product storable.



Why Minimal Processing

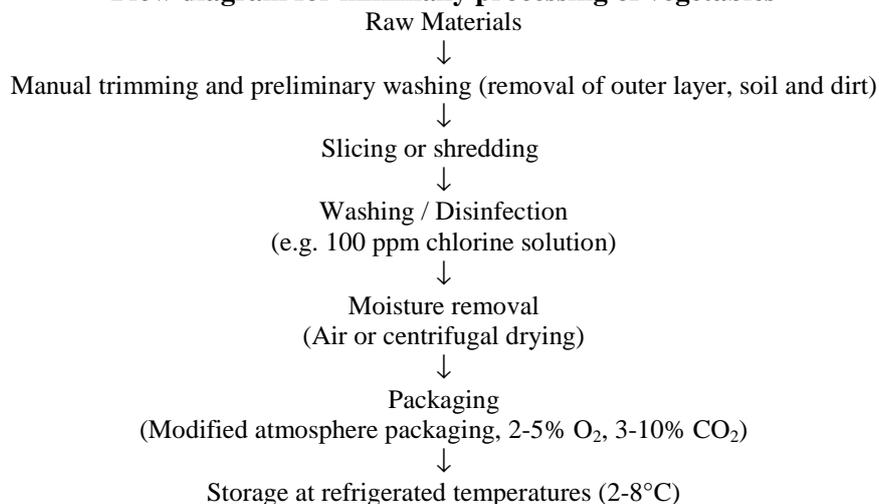
1. The present day nucleus families need ready to cook and ready to eat foods because of paucity of time.
2. Consumer is more health and quality conscious and averse to chemical preservatives
3. New methods of Minimal processing are being tried to suit the changing needs of the consumers.
4. Minimal processing can provide fresh and quality products through a hurdle approach.

How Minimal Processing is Different from Conventional Processing: Conventional processing methods extend the shelf life of vegetables longer than minimal processed produce. Minimal processing renders produce highly perishable, requiring chilled storage to ensure reasonable shelf life. No heat is applied to maintain fresh like characters. While, canning, dehydration and freezing are the examples of conventional processing.

General Principle of Minimally Processed Products

- Good quality raw materials (variety, cultivation, harvesting and storage conditions).
- Strict hygiene, recommended post-harvest practices, use of hazard analysis and critical control point principles is followed.
- Low temperature during processing.
- Thorough cleaning and washing before and after peeling.
- Good quality water for washing.
- Use of mild additives in washing water for disinfection for the prevention of browning.
- Gentle spin drying following washing.
- Gentle peeling, cutting and slicing.
- Correct packaging materials and packaging methods are employed.
- Optimum temperature and humidity during distribution and retailing.

Flow diagram for minimally processing of vegetables



Techniques of Minimal Processing

A. Physical

- Low Temperature storage/Freezing
- Thermal processing (Blanching, pasteurization, sterilization etc.
- Dehydration
- Irradiation
- Evaporation

B. Chemical

- Salt

- Sugar
- Acid
- Preservatives
- Eg. Potassium metabisulphite, Sodium benzoate, Sorbic acid and Methyl paraben etc.

C. Fermentation

- Lactic acid fermentation

List of Minimally Processed Vegetables

Ash gourd	Coriander leaves	Mint leaves
Beetroot	Cucumber	Okra
Beans	Curry leaves	Onion
Bitter gourd	Drumsticks	Ridge gourd
Carrot	Field beans	Snake gourd
Cabbage	Fenugreek leaves	Spinach leaves
Cauliflower	Green peas	Tomato
Cluster beans	Green chillies	Turnip
Coccinia	Knol-khol	Broccoli florets

Minimal Processed Vegetable Products

- Peeled and sliced potatoes
- Shredded lettuce and cabbage
- Washed and trimmed spinach
- Microwaveable fresh vegetable trays
- Vegetable snacks such as carrot and celery sticks
- Cauliflower
- Broccoli florets
- Bitter gourd sliced

Issues and Constraints in Processing

Operations: Due to increase in urbanization and access to world market through globalization, the demand for quality, storage and convenience and safety characteristics of vegetables has increased significantly. Meeting these criteria poses a major challenge for SMEs engaged in vegetable processing. Many of these enterprises are unable to comply with international standards of Good Manufacturing Practice (GMP), Hazard Analysis and Critical Control Point (HACCP) certification, quality assurance, labelling, packaging and environmental standards owing to a number of technical, infrastructural and institutional factors.

Conclusion: Change the family structure, market demand and need of the consumers has brought focus on minimal processed produce. Minimal

processing is a technique to provide ready to cook and ready to eat produce. Bulk reduction for better storage, easy transportation and packaging. Although the golden revolution in India has made milestones in production of vegetables, the post-harvest handling and processing was remained a neglected sector and it needs to be addressed. Moreover, there is need to develop indigenous technology based on area specific for diversification in processing sector to succeed in the rainbow revolution in Ladakh region.

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