TRADITIONAL AND INDIGENOUS METHODS OF FOOD PRESERVATION

By

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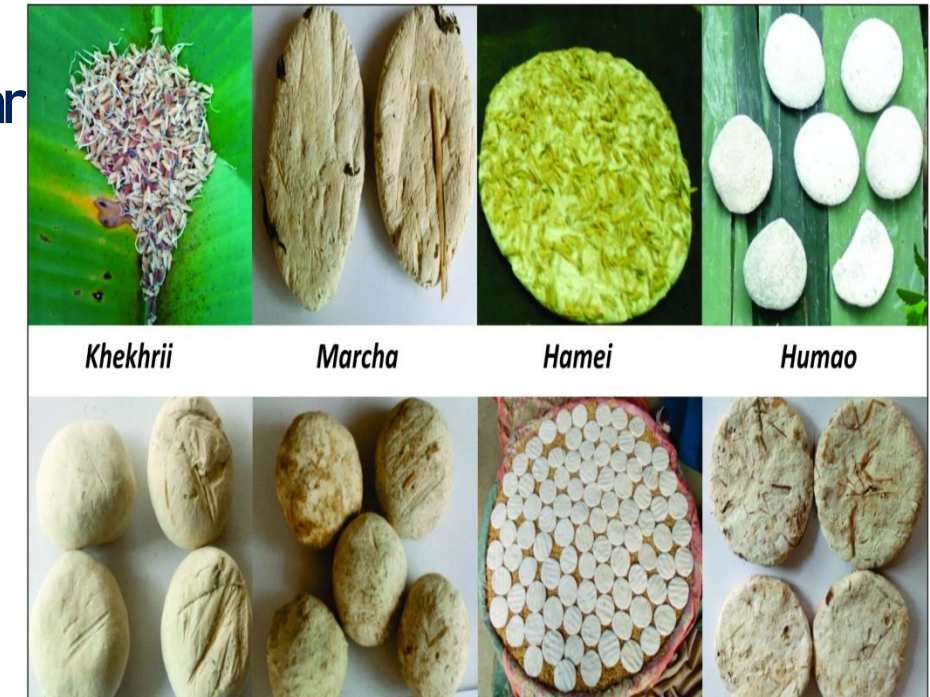


- Traditional methods means the technologies based upon the custom, opinion or belief handed down to posterity. For example, the wine making process is a traditional method of food preservation.
- Indigenous methods mean the technologies that are native or belonging naturally to a place. For example, gundruk making is the native process of Nepal.
- Indigenous foods of our country are divided into two categories:

1. Fermented foods and
2. Non fermented foods

Fermented and non-fermented foods

Fermented indigenous foods	Non-fermented indigenous foods
a) Gundruk b) Sinki c) Jand/rakshi/tungba d) Kinema e) Bamboo shoot (tama or mesu) f) Pickles g) Curd/dahi h) Maseura (partially fermented) i) Yak cheese	a) Bhakka b) Dried fruits and vegetables products c) Dried meats d) Dried fish e) Cheura (flaked rice) f) Murahi(puffed rice) g) Chhoyela, kachila and sekuwa h) Chhurpi i) Sel-roti

Table 1. Nepalese indigenous foods based on main raw material used

Raw material	Indigenous foods
Cereals	*Anarasa, Bhakka, Bhusba, Chakumar, Chatamari, Chyakhla, Chiura, Dabbe (Dabbiya), Dhido, Dhik(u)ri, Golphuki, Hakuwa, Hyan-tho (n) , Jand, Jhilinga (Khiuni), Kaliroti, Kasar, Khajuri, Khapsa, Khatte, Laba, Lunghakcha, Malpuri, Murai (Bhuja), Perukiya, Phiniroti, Selroti, Silaura, Sinkamari, Sirimla, Syabji, Tilauri (Phulauri), Yamari*
Pseudo cereals	*Chyang, Jand, Khareng, Papanda, Penagolya, Raksi, Sigolya, Tongba,*
Pulses and legumes	*Adauri, Bara, Bari, Furaula, Kinema, Kwati, Maseura, Phando, Sattu*
Rice-pulse	*Baqiya, Dal-puri, Lakhamari, Puri*
Vegetables	*Achar, Arikanchan (Aarkanchan, Aarkoch), Bid(r)ia, dried Sisnu,* dried vegetables, *Gundruk, Kalipapro, Kumbharauri, Lattepapro, Sinamani, Sinki , Titaudo*
Fruits	*Achar, Amat, Chuk, Khalpi, Mada, Nimki, Titaura*
Oilseeds	*Bara, Chiuri gheu,* Mustard oil, *Pina pani, Philinge-achar*
Milk	*Churpi, Dahi, Dhaukho, Durkha, Galeue, Gheu, Gundpak, Ju Ju Dhou, Mohi, Nauni-gheu, Pustakari, Sollar*
Meat	*Choyala, Kachila, Momo, Sargyangma, Sukuti, Womyuk*
Fish	fish cake, *Sidra, Sukuti-macha*
Sugar	*Chaaku, Sakhar*
Miscellaneous	*Khamir mana, Manapu, Mahuwa raksi, Murcha, Tama*

Gundruk

- Gundruk, a non-salted and fermented leafy vegetable product, has been one of the major appetisers for the Nepalese people since a long time ago. Gundruk making seems to have been evolved as a means of preserving vegetables when they are plentiful during peak harvest season.
- Gundruk is also a kind of preserved vegetable by fermentation. Usually, mustard vegetables(Brassica juncea), rapeseed vegetables(Brassica campestris), cauliflower leaves and flower(Brassica oleracea) and radish vegetables, are fermented for about one week and the product is called Gundruk.
- It has good nutritive and other food values. It is a major source of supplying minerals and vitamins during off seasons when green vegetables are not available.
- The quality attributes to Gundruk basically depends upon the typical Gundruk flavour and acidic taste., "More the acidic taste , better is the product"

Microorganisms involved during fermentation

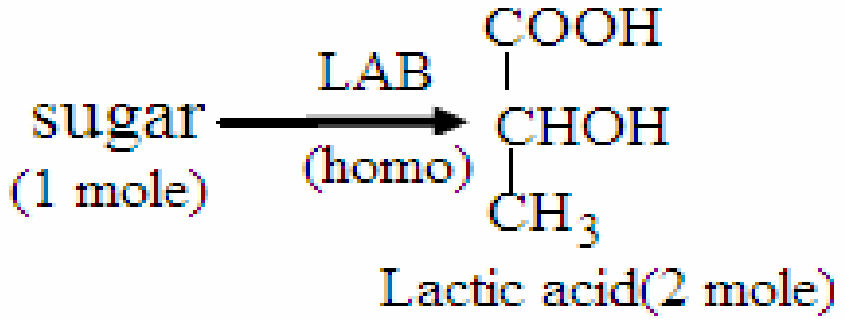
- Fresh vegetables contains a numerous and varied micro flora including many potential spoilage microorganisms and an extremely small population of lactic acid bacteria (homolactics and heterolactics).
- The homolactics forms lactic acid and the heterolactics forms acetic acid, CO2 and ethanol in addition to lactate which imparts typical and desirable flavor. Natural or spontaneous fermentation of vegetables is therefore a result of certain action of these microorganisms.
- Quality of the product mainly depends on the balanced production of lactic acid (50%) and acetic acid (35%), which is highly desirable to maintain stability in the production.
- Gundruk fermentation is primarily initiated by heterolactic *Lactobacillus cellobiosus* and homofermentative *Pediococcus pentosaceus* and subsequently completed by the more acid producing homolactic *Lactobacillus plantarum.*
- Acidity of gundruk as lactic acid 0.48% and moisture content 5.3%. The production of organic acid not only contributes to the desired taste and flavor of the final product but also makes the substrate unfavorable for proliferation of spoilage and other undesirable microorganisms.
- The acid makes the substrate more suitable for growth of microorganisms that improve the properties of the food. Gundruk is spoiled by mold because it tolerates salt, and others.

Lactic acid bacteria (LAB) and their role:

- In vegetables one or more species of lactic acid bacteria plays and important role. Lactic acid bacteria are a group of gram +ve, anaerobic, salt tolerant, non spore forming bacteria. Their optimum temperature range is 18 to 22 ^{0}C.
- LAB can be classified into two categories based upon the metabolites they form during fermentation, as:

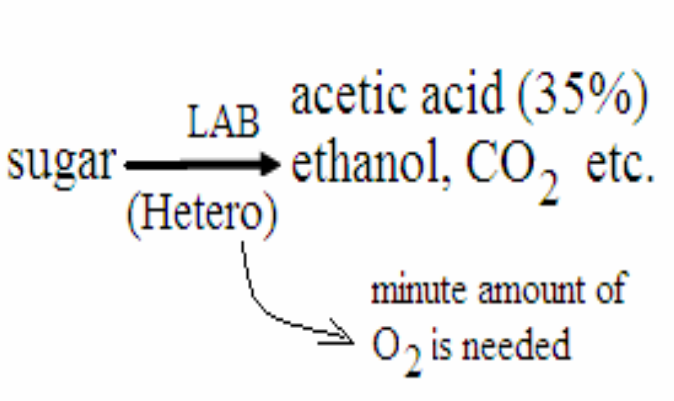
1. **Homolactic flora** (homolactics)

They form only lactic acid. Some of the *Lactobacillus sp.*as *L. plantarum, Pediococcus sp. As P. cerevisae, Streptococcus sp.* belongs to this group



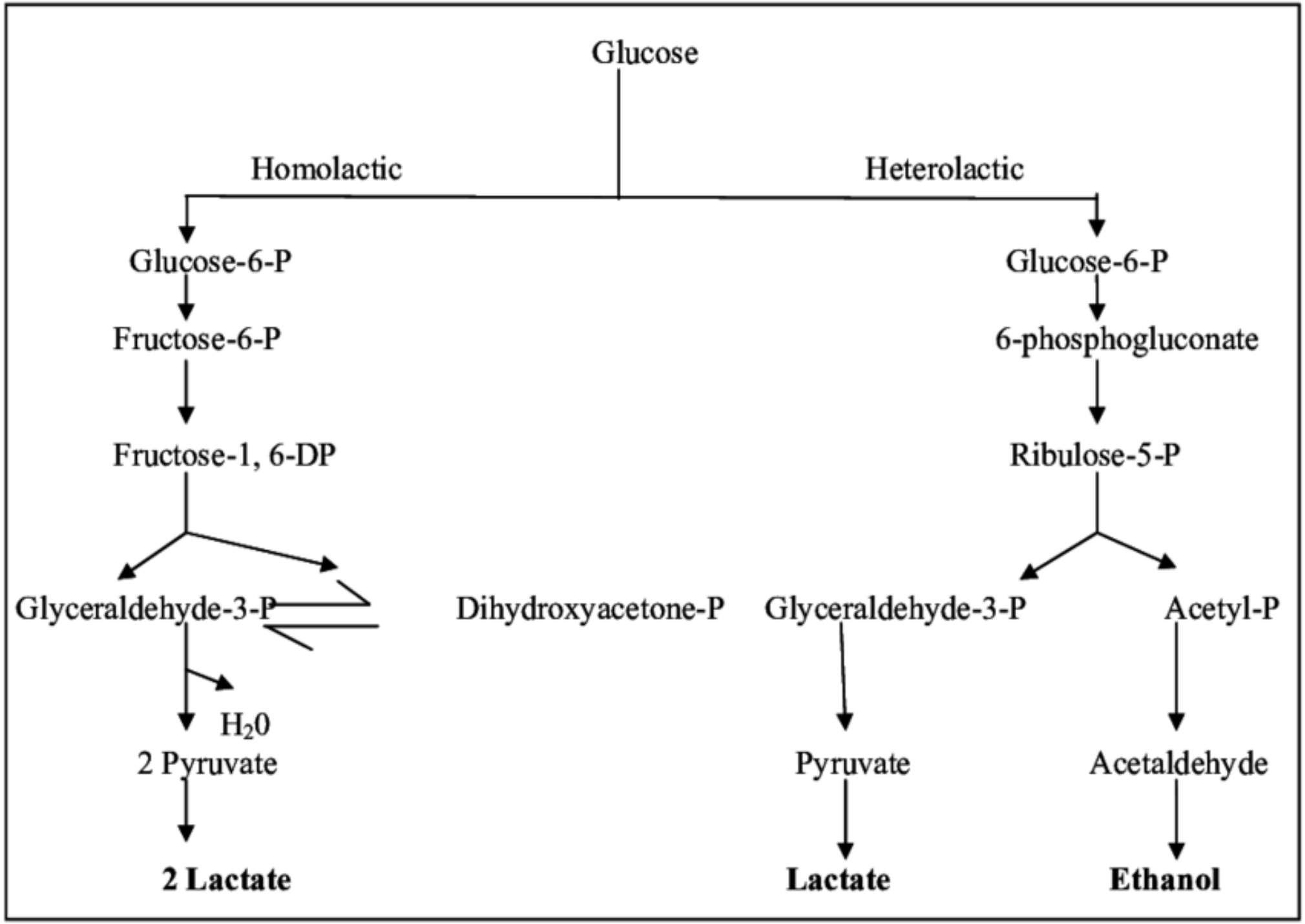
2. **Heterolactic flora** (heterolactics)

In addition to lactic acid they forms acetic acid,CO2, ethanol etc. Some of the *Lactobacillus sp.* as *L. brevis, Leuconostoc sp.* as *L. mesenteroids etc* belongs to this group.



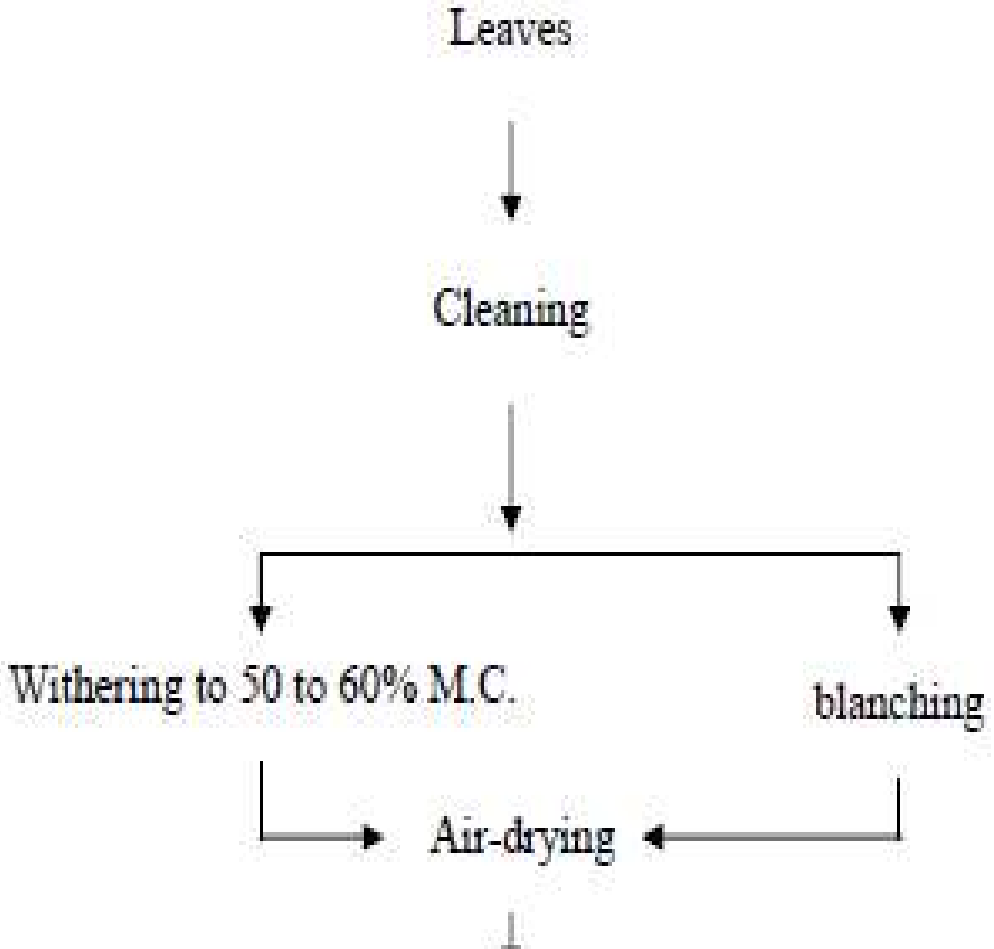
(Raw material)

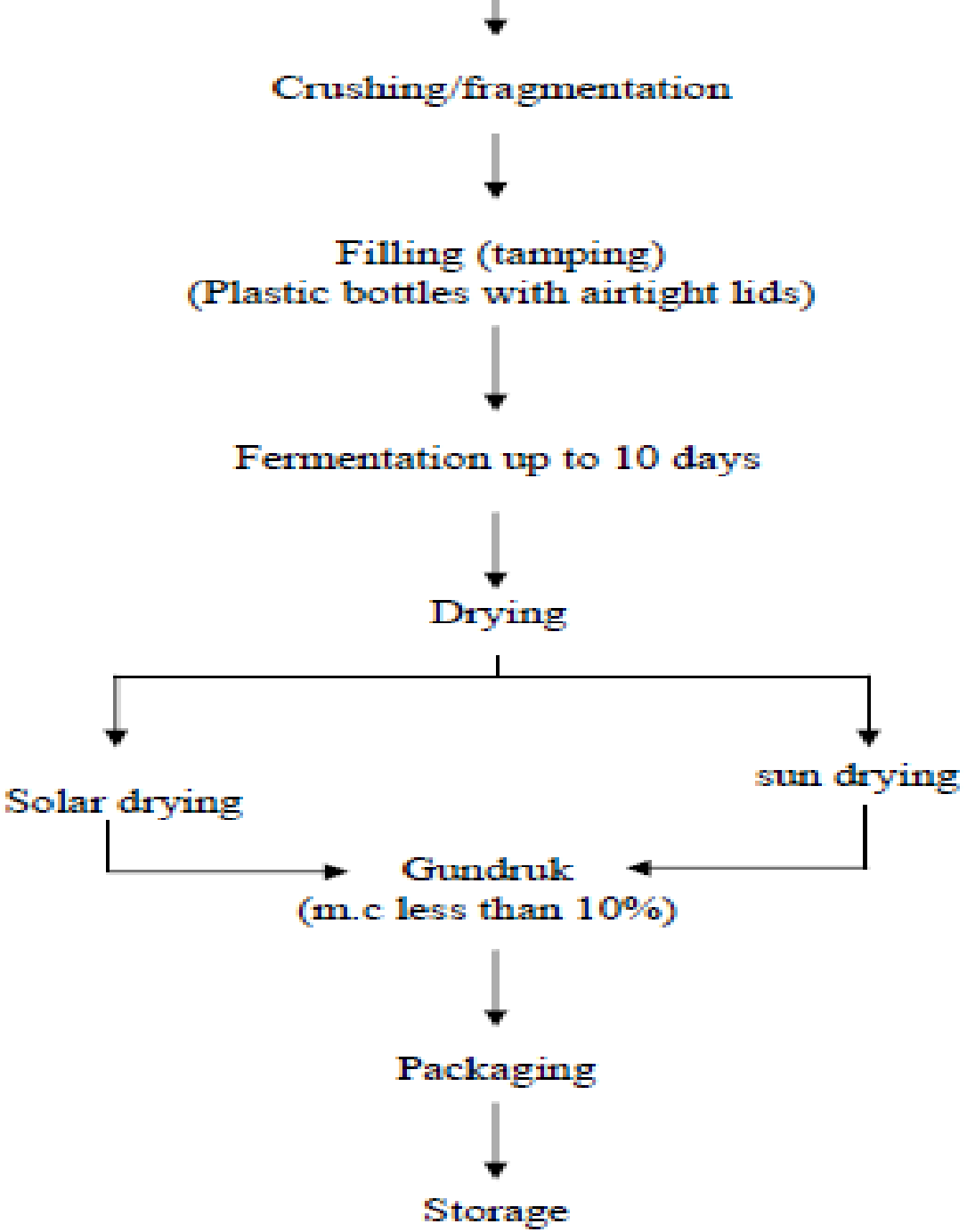
- Lipids: - degraded into free fatty acids which forms esters responsible for flavor.
- Food Starch: -lacks amylases, so can't utilize starch
- Protein: little change on 20 amino acids, due to weak proteolytic activity in LAB


Glucose
Homolactic
Heterolactic
Glucose-6-P
Fructose-6-P
Fructose-1, 6-DP
Glyceraldehyde-3-P
Dihydroxyacetone-P
H_20
2 Pyruvate
2 Lactate
Glucose-6-P
6-phosphogluconate
Ribulose-5-P
Glyceraldehyde-3-P
Acetyl-P
Pyruvate
Acetaldehyde
Lactate
Ethanol

Preparation of Gundruk

Fresh vegetables were wilted for 2～3 days, Placed in an earthen jar, pressed tightly by wooden ladle and added warm water around 30°C at intervals so as to immerse the vegetables. It was then allowed to ferment for 5～7 days. The typical Gundruk flavour and mild acidic taste developed during this period indicating the completion of fermentation.

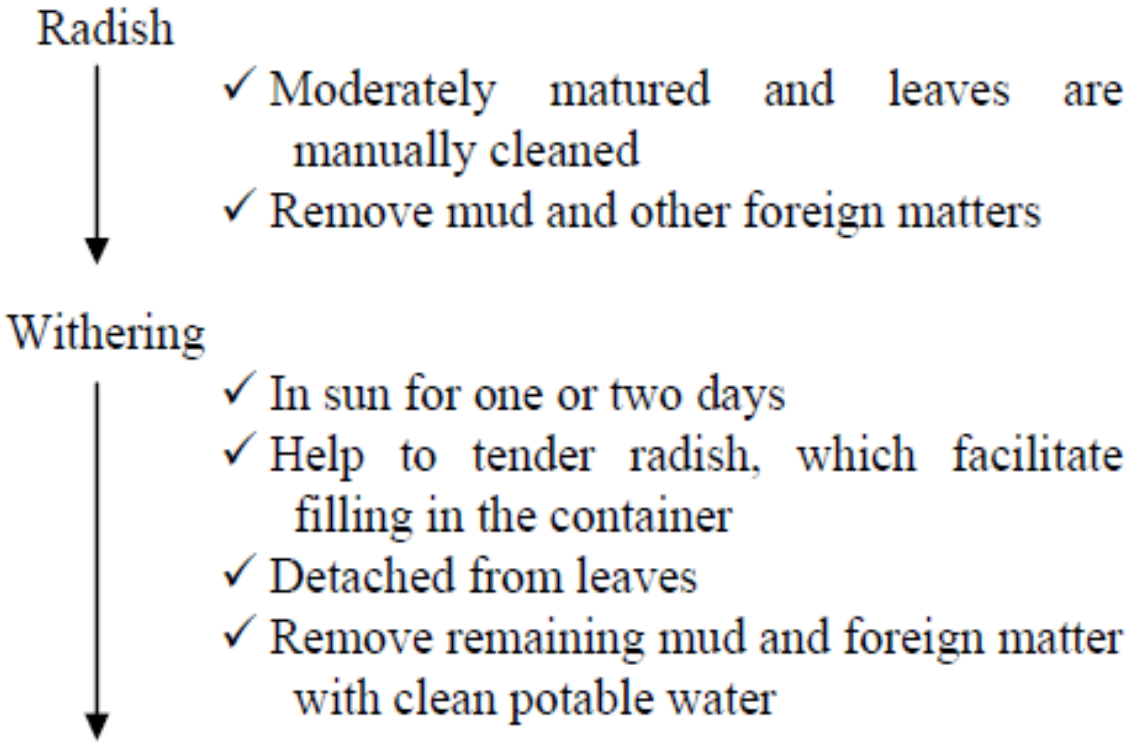


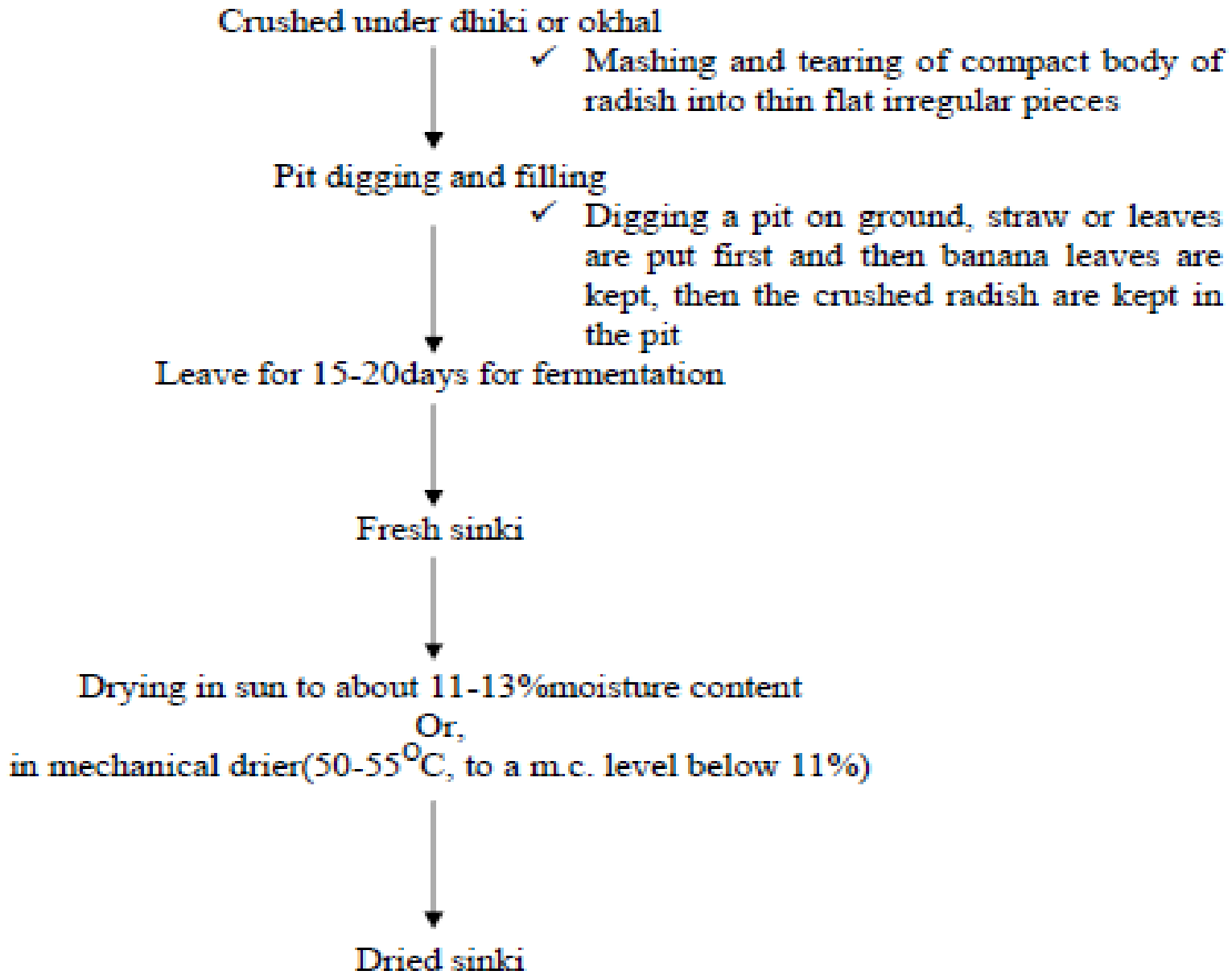

Crushing/fragmentation
Filling (tamping)
(Plastic bottles with airtight lids)
Fermentation up to 10 days
Drying
Solar drying
sun drying
Gundruk
(m.c less than 10%)
Packaging
Storage

Sinki

Sinki is a fermented food product, which is indigenous food of Nepal. Radish is the principle raw material for sinki making. Sinki making tradition has been equally popular both in tarai and hilly region of Nepal. Sinki made from radishes in hilly region is more acceptable, the reason might be due to compactness in body and richness in juice as compared to radishes found in tarai region.

Methods of production




Crushed under dhiki or okhal
✓ Mashing and tearing of compact body of radish into thin flat irregular pieces
Pit digging and filling
✓ Digging a pit on ground, straw or leaves are put first and then banana leaves are kept, then the crushed radish are kept in the pit
Leave for 15-20days for fermentation
Fresh sinki
Drying in sun to about 11-13%moisture content
Or,
in mechanical drier(50-55^{O}C, to a m.c. level below 11%)
Dried sinki

Sauerkraut

- Sauerkraut is made by a process of pickling called lactic acid fermentation that is analogous to how traditional (not heat-treated) pickled cucumbers and kimchi are made. The cabbage is finely shredded, layered with salt, and left to ferment. Fully cured sauerkraut keeps for several months in an airtight container stored at 15 °C (60 °F) or below. Neither refrigeration nor pasteurization is required, although these treatments prolong storage life.
- Fermentation by lactobacilli is introduced naturally, as these air-borne bacteria culture on raw cabbage leaves where they grow. Yeasts also are present, and may yield soft sauerkraut of poor flavor when the fermentation temperature is too high.
- The fermentation process has three phases, collectively sometimes referred to as population dynamics.

➢In the first phase, anaerobic bacteria such as *Klebsiella* and *Enterobacter* lead the fermentation, and begin producing an acidic environment that favors later bacteria.

➢The second phase starts as the acid levels become too high for many bacteria, and *Leuconostoc mesenteroides* and other *Leuconostoc* species take dominance.

➢In the third phase, various *Lactobacillus* species, including *L. brevis* and *L. plantarum*, ferment any remaining sugars, further lowering the pH. Properly cured sauerkraut is sufficiently acidic to prevent a favorable environment for the growth of *Clostridium botulinum*, the toxins of which cause botulism.

- Fermentation was initiated by the species Leuconostoc mesenteroides. This species was followed by gas-forming rods and finally by non-gas-forming rods and cocci.
- Leuconostoc mesenteroides, a heterofermentative species, whose early growth is more rapid than other lactic acid bacteria and is active over a wide range of temperatures and salt concentrations.
- It produces acids and carbon dioxide that rapidly lower the pH, thus inhibiting the activity of undesirable microorganisms and enzymes that may soften the shredded cabbage. The carbon dioxide replaces air and creates an anaerobic condition favorable to prevention of oxidation of ascorbic acid and the natural color of the cabbage. Also carbon dioxide stimulates the growth of many lactic acid bacteria. It also may be that this species provides growth factors needed by the more fastidious types found in the fermentation.

- While this initial fermentation is developing, the heterofermentative species *Lactobacillus brevis* and the homofermentative species *Lactobacillus plantarum* and sometimes *Pediococcus cerevisiae* begin to grow rapidly and contribute to the major end products including lactic acid, carbon dioxide, ethanol, and acetic acid.
- Volatile sulfur compounds are major flavor components of fresh cabbage and also of sauerkraut. However, the major portion of the volatiles of sauerkraut is accounted for by acetal, isoamyl alcohol, n-hexanol, ethyl lactate, cis-hex-3-ene-l-ol, and allyl isothiocyanate. Of these, only the latter two have been identified as major constituents of fresh cabbage.

Composition of sauerkraut

Sauerkraut	Parameter
2%	**Acid content**
2-3%	**Salt Content**
Min 7 days	**Fermentation Time**
Only Cabbage and Salt	**Ingredients**
Finely Shredded	**Cabbage**

Mature cabbage

↓

Wilting for 2-3 days (optional)

↓

Removal of outer and damaged leaves

↓

Washing

↓

Shreddinng

↓

Salt addition (2-2.5%)

↓

Uniform mixing to avoid spoilage

↓

Filling in vats

↓

Covering vats and placing weights for water to ooze out

↓

Fermentation for 2 months at 20-25 °C

↓

SAUERKRAUT

Jand & Rakshi

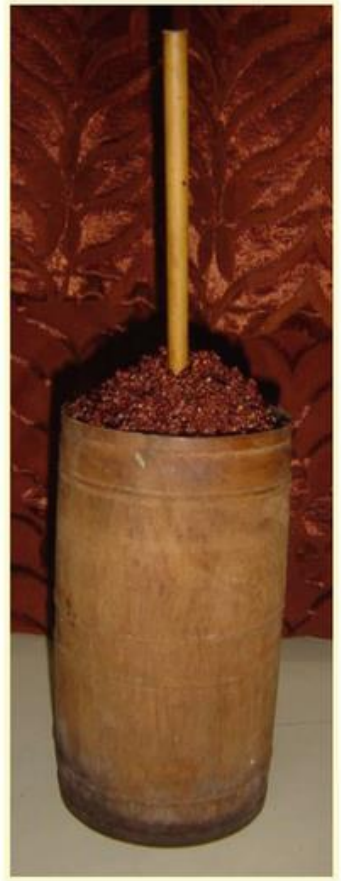
- Jand and rakshi are the traditionally prepared alcoholic beverage from starchy cereals, usually millet (*Eleusine ceracana L gaerth*), by the use of locally prepared starter known as murcha.
- The word jand derived from the Mangaranti language, and is known by many synonyms like chhang by the Tibetans, chii by the rong, tungba by the Nepalese who take jand in a bamboo vessel.
- The technology of jand making has been known since antiquity and is indigenous to Nepal. Jand, slightly acidic alcoholic beverage, is the fermented product prepared from finger millet locally known as 'kodo' following a series of discrete steps.

Method of preparations

Finger millet
↓
Cleaned and washed; cooked
↓
Dewatered and spread for cooling
↓
← added *marcha* (2 %)
↓
Mixed; Packed in heaps and saccharified for 2-4 d
↓
Transferred into an earthen pot, made it air-tight for alcohol fermentation
↓
Fermented for 3-7 days
↓
Poured in a bamboo-made vessel called 'Toongbaa'
↓
← added water
↓
KODO KO JAANR or CHYANG

Finger millets/kodo

Marcha
(starter)



Jaanr/Chee

Raw materials for the jand production or alcoholic beverages production

- Starch, which has been gelatinized by heating, can be readily hydrolyzed to fermentable sugars by enzymes
- Cereal grains (rice, wheat, corn, millet, barley etc) root crops (cassava) or tubers (potato) (all these materials used for the production of distilled alcoholic beverages). The use of wheat or corn for the production of whiskey and the use of potato for the production of vodka
- In Nepal, cereal grains (millet, wheat, maize, rice etc) are used for the production of traditional alcoholic beverages viz. jand (undistilled) and rakshi (distilled) using murcha as starter.
- Although the term jand is commonly used for finger millet beer, beers from maize, rice etc. are also called jand, the name of the beer deriving from the raw material used for fermentation e.g.makai jand (maize beer), vate jand (rice beer).

Reasons for choosing the finger millet for the production of jand and rakshi

- It is cheap raw material
- It is less preferred for food
- Has high α-amylase activity and tannin content
- It can remain in discrete (without much liquefaction) for a long period and thus promote easy handling in case of jand fermentation
- It imparts clean flavor and aroma

Murcha

- It is a starter mixed culture for production of jand and rakshi. It consists of saccharifying molds, fermentating yeasts, bacteria, and the other micro floras such as *Saccharomyces cerevisiae*, *Rhizopus spp*., *Endomycopsis fibuligera*, *Pediococcus pantosaceus* and *Lactobacillus plantarum*.
- Murcha can be prepared from a number of wild plants serving as the source of valuable microflora. The root bark of *Polygata aricaqeta* is probably most prized for murcha making.
- The wholeplant of vernonia spp., contains fermenting yeast, namely saccharomyces cerevisae and *Pichia anamola*.
- Murcha is inoculated to be the cooked cereal in powder form, the amount being regulated by the prevailing temperature and the type of beverages aimed to produce. Generally, 10-20g of murcha is added for 1kg of mash.

Preparation of murcha

- In the traditional method of murcha preparation, glutinous and non-scented rice is soaked in water overnight (10-12 h), added with a few pieces of the root of 'sweto-chitu' (Plumbago zeylanica L.), a few leaves of'vimsen pathe‘ (Buddleja asiatica Lour), and certain spices such as ginger and chilli, and blended using a heavy wooden, foot-driven pestle. Water is added to make dough which is hand-moulded into flattened cakes of 2-5 cm in diameter .
- Old murcha cakes are powdered and sprinkled over new cakes which are then wrapped in fern (Athyrium sp.) fronds with the fertile side (bearing the sori) ouching the cakes. The cakes are covered successively with fresh fronds, straw and finally sackcloth and allowed to ferment at ambient temperature (25-35°C) for 1-3 days. Cakes are dried in the sun and dry adhering fronds are removed. Murcha remains active for several months at room temperature and in a dry place

Improvement in traditional methods:-

- Scientific knowledge of the basis of its raw materials and processes
- Scientific processes and quality control via analysis, particularly microbial checks
- High production rate machinery of hygienic design
- Hygienic packing and distribution system with special attention being attention being paid to shelf life.

Preservation of jand

- Shelf life of jand is of several months
- The strained jand is perishable in terms on organoleptic quality.

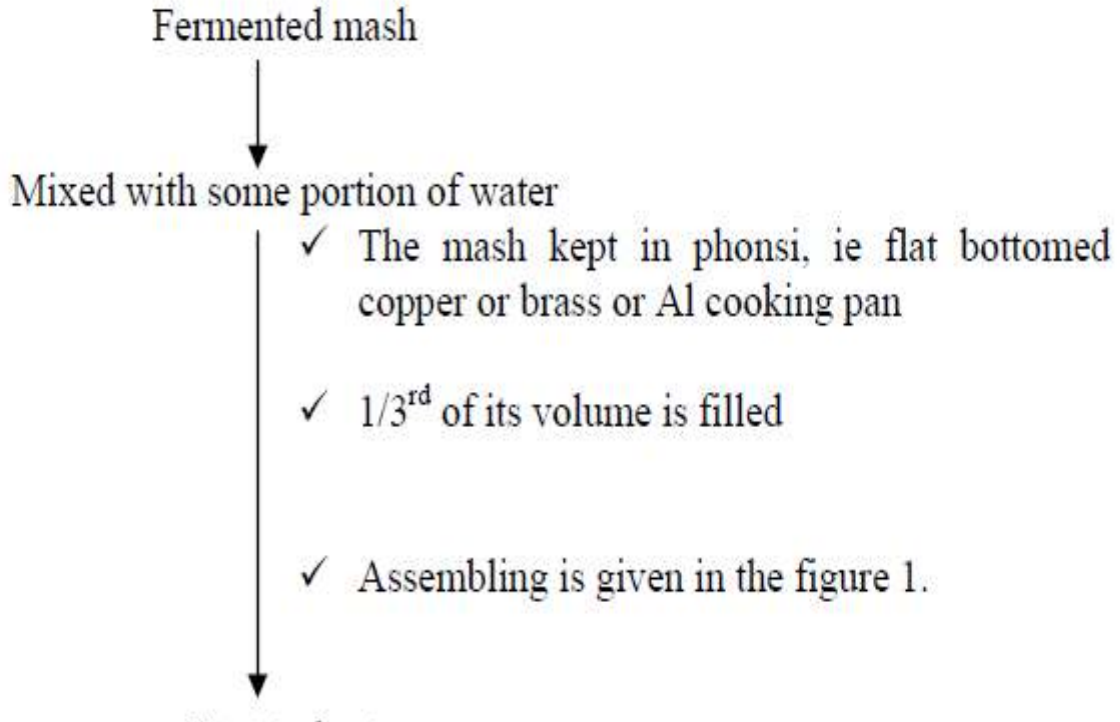
Nutritional aspects of jand

- Chemical composition of millet is not less in comparison to other cereals like rice , wheat, maize etc.
- Nutritional value of jand may not remain same because of the changes in series of steps during processing.
- Jand is superior than the other alcoholic beverages
- During fermentation, the yeasts also synthesize vitamins
- Pasteurization of jand is sufficient to give good liberation of the B-vitamins.
- It contains other components of nutritional importance such as starch, protein, fat, minerals and fibers
- The phytic acid present in cereals binds many minerals and trace elements making them unavailable to the consumers.

Raksi

Raksi is a strong drink, clear like vodka or gin, tasting somewhat like Japanese sake. It is usually made from kodo millet (kodo) or rice; different grains produce different flavors. The Limbus, for whom it is a traditional beverage, drink tongba and raksi served with pieces of pork, water buffalo or goat meat sekuwa. For the Newars, aila is indispensable during festivals and various religious rituals as libation, *prasad* or *sagan*.

Rakshi is prepared by distillation of the fermented mash. The process proper is explained below:



- Water and alcohol pass from the perforated hole of phonsi to paini. In the mouth of paini there is bata where cold water is filled so the surface of bata is cooled whereby the vapor of water and alcohol came in contact with the cool surface of bata it may get condensed and drops down to the nani as shown in the figure.
- When the cold water of bata gets warm due to the vapor it is replaced with cold water when the temperature of bata raises approx. to 40-45 C.Thegrade of the rakshi may also be controlled by the number of times of changing water. The volume of the first collection of distillate (rakshi) obtained is very little but the concentration of alcohol is more. In addition, as the replacing of water progresses the volume of distillate (rakshi) increases whereas the concentration of alcohol decreases.
- According to the water change in bata (large metallic bowl) the name of rakshi is kept: one pane, two pane , threes pane

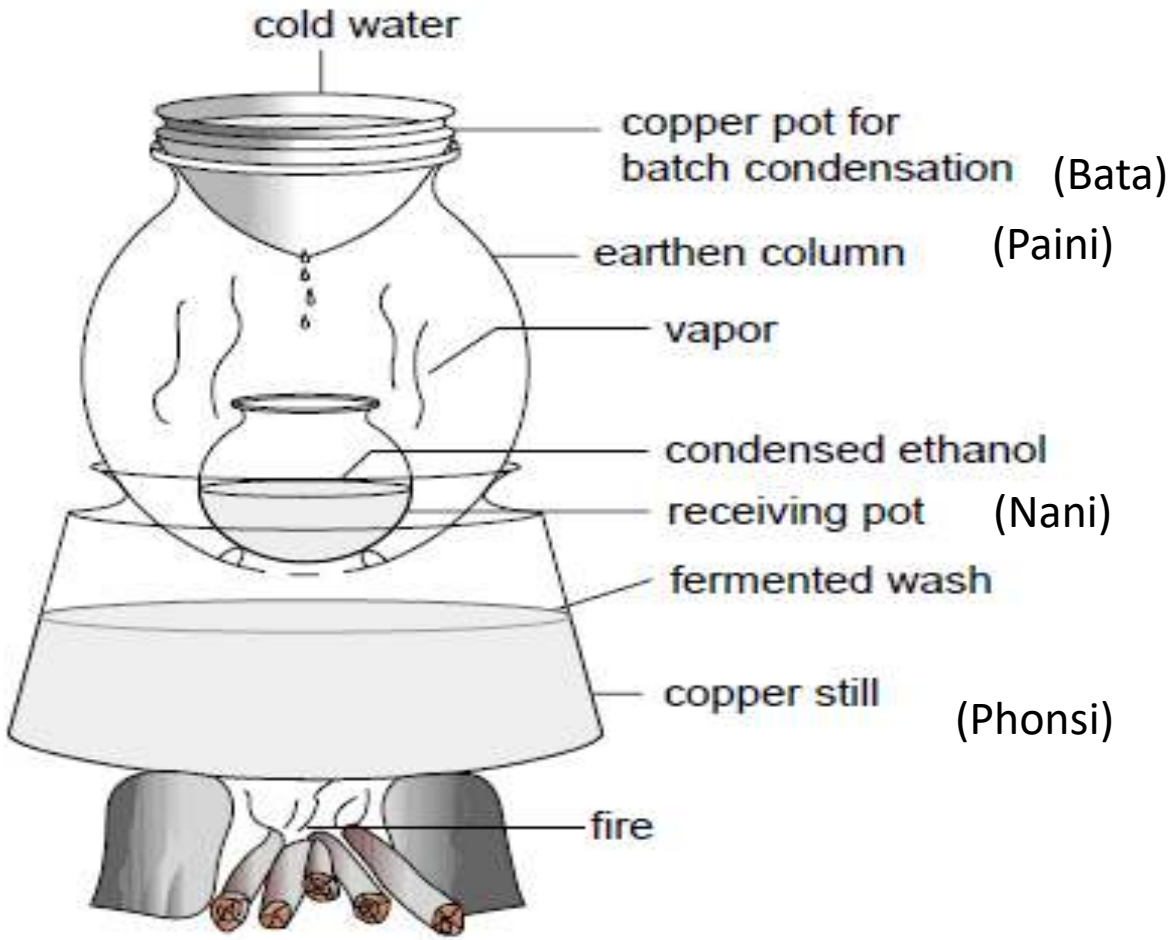


Fig. 2.6 Pot distillation assembly for *raksi* making

Kinema

- Kinema is a soyabean based indigenous fermented sticky, slightly alkaline food with a typical flavor, consumed as a curry in the eastern hilly region of Nepal and Bhutan, Darjeeling, Sikkim and in India.
- It is prepared by natural fermentation of boiled soybeans. Because of fermentation, it has an enriched nutritive value and developed flavors, aroma and textures. It is the preserved product with extended shelf life along with a low cost source of protein in the diet.
- Freshly prepared kinema is covered with a sticky, viscous material and has a pervasive pungent odor of ammonia.

The beneficial effect of fermentation on soyabean which are enlisted below

1. Protein and carbohydrates are partially hydrolyzed into smaller units and become nutritionally available. The flavor undergoes change, derived mainly from specific microorganisms but partly from the substrate and partly from the process.
2. The hydrolysis of macromolecules like protein and oligosaccharides increases the digestibility, protein efficiency ratio and biological value of the bean. It also reduces the cooking time of the products.
3. It helps to manufacture product with a variety of flavors. The reduction of bitterness of soybean is an important feature of fermentation. There is improvement in palatability, acceptability of the food coupled with enhanced digestibility of protein and carbohydrates.
4. There is accumulation of B-vitamins such as folic acid, B-12, and growth factors.
5. Bound minerals in raw soybean are made available by fermentation process.
6. Fermentation accompanied by heat processing inactivates or decreases the antinutritional factors present in raw soybean e.g. Reduction of ricin, ricinoleic acid, trypsin inhibitors etc.this brings down the diarrheal effect of soy-based food products

Chemical composition of kinema:

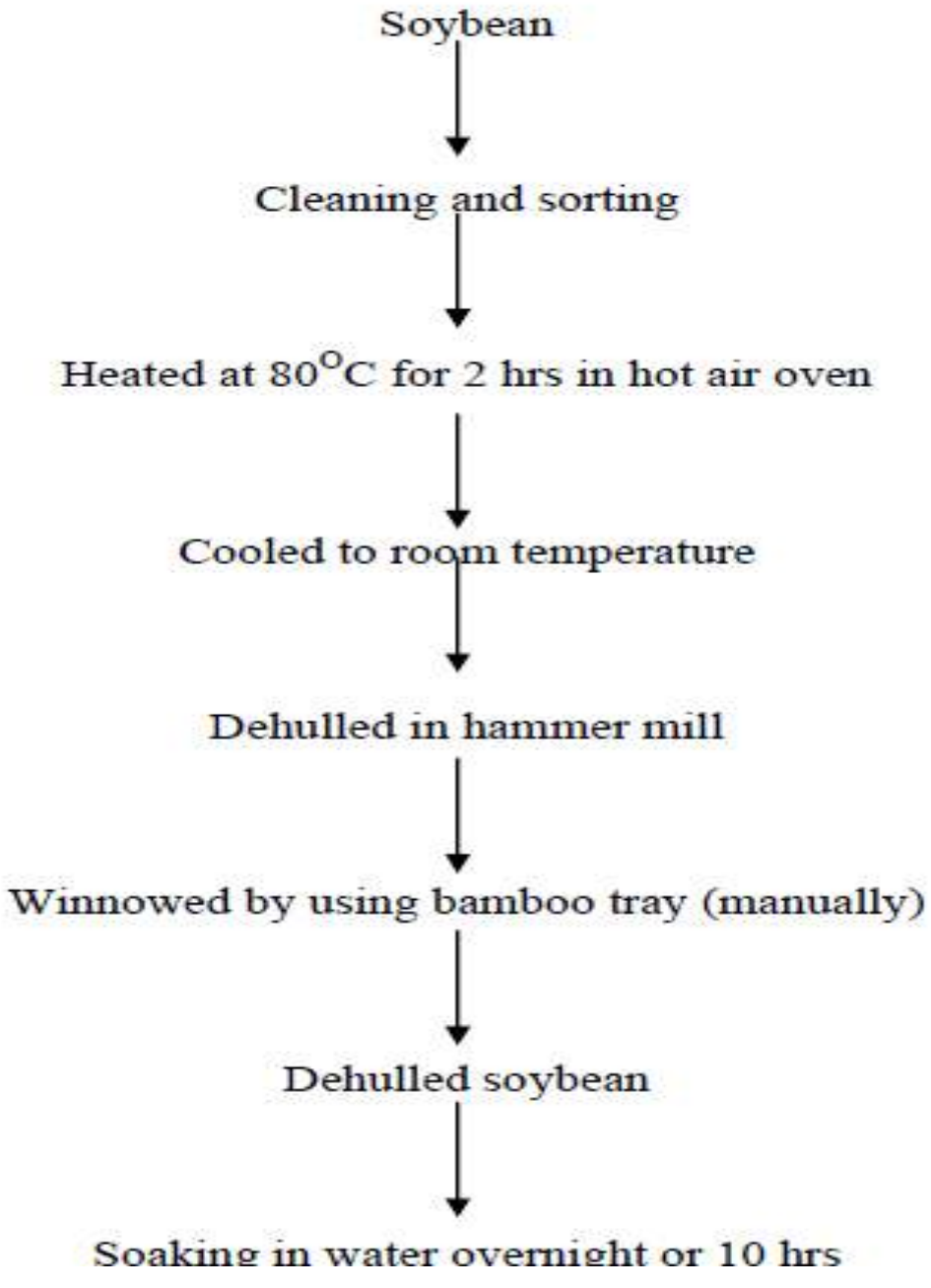
Parameters	Percentage
Moisture	8.9
Protein	46.2
Fat	18.2
Crude fiber	7.0
Ash	5.2
Carbohydrates	14.6
TOTAL	100

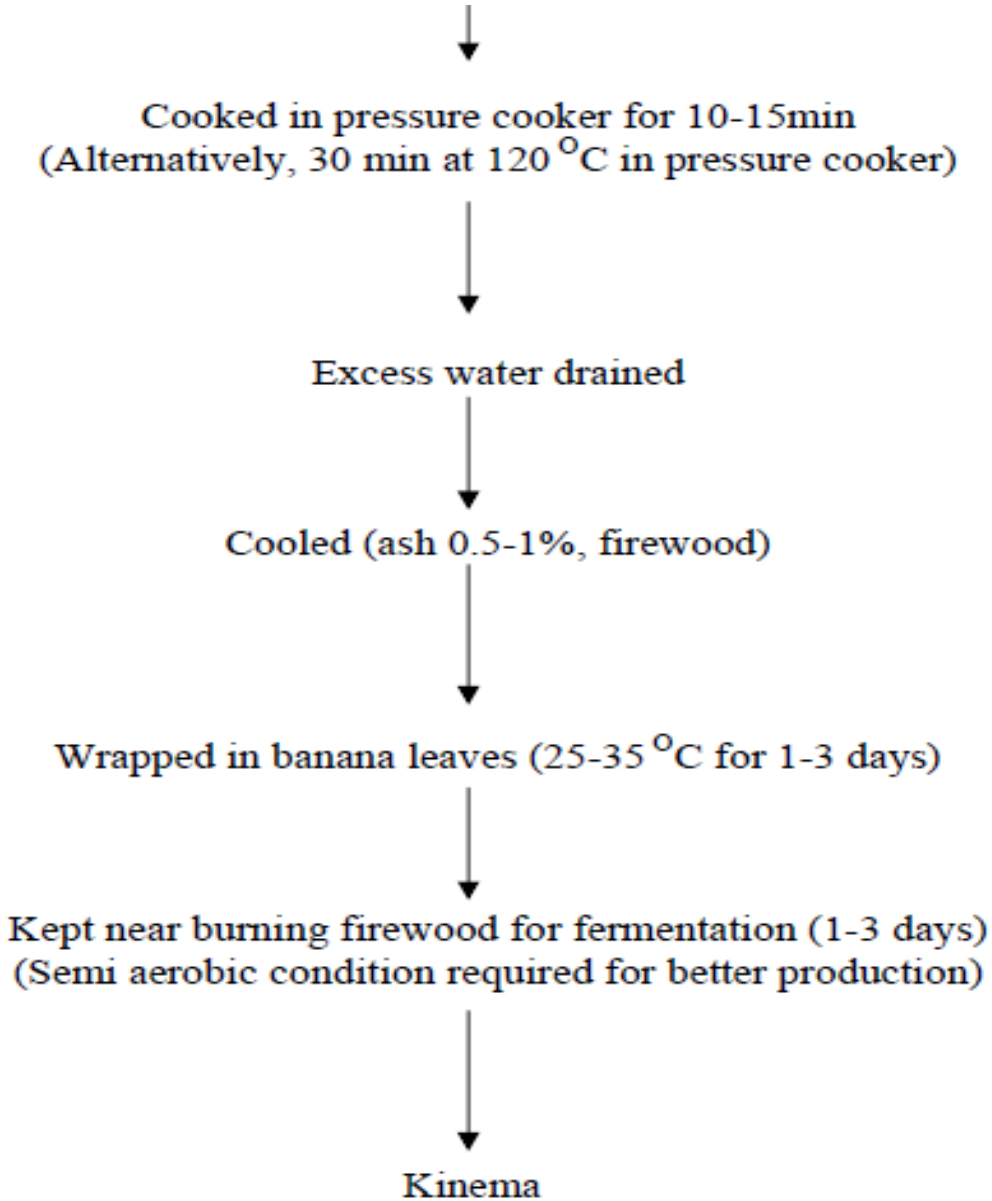
- The pH of the product is around 7.8, and the volatile components are acetoin and 2, 3-butanediol.
- The combined effect of higher pH and natural toxicity, ammonia and other metabolites, inhibits the growth of the organism in kinema.
- Sticky mucilaginous gum on the surface of the soybean substrate is an important physical change brought about by the fermenting organisms.
- The gummy substances are; oxopolypeptides of D-isomeric glutamic acid and γ-glutamyl polyglutamic acid.

The organisms involved in kinema are:

- *Bacillus subtilis*
- *Enterococcus aecium*
- *Candida parapsilosis*
- *Geotrichum candidum*

Preparation of Kinema




Cooked in pressure cooker for 10-15min
(Alternatively, 30 min at 120 °C in pressure cooker)
Excess water drained
Cooled (ash 0.5-1%, firewood)
Wrapped in banana leaves (25-35 °C for 1-3 days)
Kept near burning firewood for fermentation (1-3 days)
(Semi aerobic condition required for better production)
Kinema

Sukuti (Nepali: सुकुटी)

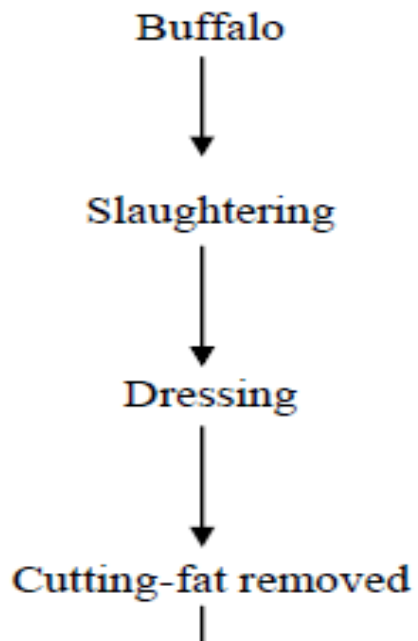
- Sukuti (Nepali: सुकुटी) is a dried meat product of Nepal origin but also use in Himalayan part of India and Tibet usually made from buffalo, and sometimes from lamb or goat. It is a staple dish of the Limbu and Gurung people. Limbu pronunciation: Sakhekya. It was used as a source of protien and also to add variety to diet during winter seasons in the mountain areas. Today food is generally available most year round among mountain communities so Sukuti is a delicacy to be eaten at times. Sukuti is one of Nepal's many types of meat product,

Composition:

Parameters	Buff (lean portion)	Sukuti
Moisture (%)	78	8.4
Crude protein (%)	19.2	77.3
Crude fat (%)	1.2	5.3
Ash (%)	1.2	7.2
Energy value (kcal/100g)	88	357.0

Method of production

Traditional method:



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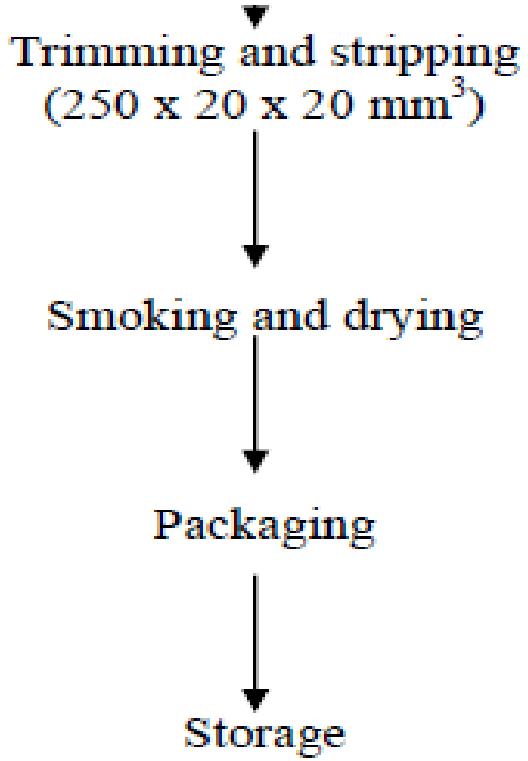
Trimming and stripping
(250 x 20 x 20 mm3)
Smoking and drying
Packaging
Storage

Chhurpi

- Chhurpi is a hard variety of cheese. It is a traditional milk product of eastern Nepal, Darjeeling hills, Sikkim and Bhutan.
- Chhurpi is a popular chhana based traditional milk product of several parts of the Nepal and Indian subcontinent.
- It is prepared by acid coagulation of hot milk, subsequent drainage of whey and drying (smoking) of curd.

Composition of chhurpi:

Chhurpi is prepared from 1% fat and 8.7% SNF and by coagulation with 2% citric acid solution.

Constituents	**Percentage**
Moisture	14.0
Protein	70.36
Fat	6.72
Lactose	3.05
Ash	5.17
Titrable acidity	0.4
pH	5.3

Milk (6.5%fat, 9%SNF)

↓

Separation of cream

↓

Skim milk

↓

Heating (60-65oC)

↓

Adding previous day's whey or dahi

↓

Coagulum of milk is further boiled for ½ hr
(Alternatively, 30-40% of the whey is drained and
the coagulum is further heated until it forms like a long string)

↓

The vat is removed from fire when the color of
the coagulum is changed to creamish appearance

↓

The coagulum is filtered in a clean muslin cloth

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The coagulum (curd) is pressed for 24 hrs with aid of stone

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The mass is cut into long rectangle pieces and
is dried in air by placing it on a sieve or a mesh prepared from bamboo

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After 12-15days the product is dried

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After the product is dried in air, it is dried over the fire and a smoke flavor is developed

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The product is ready for consumption

Needs and Prospects of indigenous foods

- Preservation of indigenous food technologies (food cultural heritage) to preserve one's history and identity
- Develop indigenous food technologies by commercialization and industrialization

Commercialization and Industrialization

- These refer to technology transformation from traditional indigenous method of home or small scale to modern method and industrialized state
- Instances of industrialized indigenous foods (selected) in the world may be taken such as; Sake, Shoyu, Natto, Miso, soy sauce (Japan), fish sauce (Thailand), Tempe (Indonesia, Malaysia, Japan), Papad, Rasogolla (India), maize and sorghum beer (Africa), Ogi and Gari (Nigeria), Pluque (Mexico)

Advantages of Industrialization

- NIFs will be introduced to people of different parts of world
- Income generation
- Feel and pride in industrialization
- Preservation of indigenous foods
- Development of technology of indigenous foods

Basic Conditions to be Considered for Industrialization

1. Technical

- Modern machines, mechanization, high production capacity
- Application of modern science and engineering techniques

2. Social

- Peoples' attraction, acceptance

3. Business/Market Factor

Efforts Needed (Challenges and Opportunities)

1. Agricultural Sector

- Cultivation of traditional species or type of food raw material to maintain authenticity
- Sufficient and consistent supply of raw materials

2. Engineering Sector

- Machine design improvement, designing and fabrication of appropriate machines
- Application of modern equipment and increased mechanization to increase production and better process control such as for grinding, roasting, puffing, frying, steaming, drying, fermentation, etc.

3. Processing Sector

- Application of modern scientific principles, tools, techniques and concepts in production process to stay competitiv

- Raw material standardization, process optimization, product standardization, process economy
- Improvement of hygienic conditions of plant and product, and control of other hazards (e.g. sand in Murai) to ensure product quality and safety
- Maintain freshness, delay deterioration in quality and prevent microbiological and chemical spoilage. Highly perisheble and perishable type NIFs most require preservation
- Preservation and maintenance of microbial culture
- Exploit modern principles of food packaging

4. Academic Sector

- Documentation to introduce NIFs among readers and entrepreneurs alike all around world.
- Inclusion of indigenous foods in university course to grow traditional knowledge in industrial state.
- R & D in various facets of indigenous foods (chemistry, biochemistry, microbiology, biotechnology, nutrition, anti-nutrients, active compounds, toxic compounds, health, starter culture, technology, sensory, value addition, preservation, financial, etc) and knowledge dissemination to establish sound knowledge to transform the indigenous foods (indigenous method) to industrial products (modern method)
- Study flavor chemistry and medicinal properties of uncommonly used Nepalese spices and herbs having characteristic flavor, e.g. Timbur (Zanthoxylum armatum), Jimbu (aromatic leaf garlic-Allium hyposistum) in order to explore their potential in development of specialized spice formulations

5. Social, Trade and Industry

- Sincere appreciation and respect should be shown to indigenous foods
- Enhance mass peoples' attraction and satisfaction towards NIFs; highlight their beauty and dietary values
- Promote food expo and food culture tourism to familiarize indigenous foods to visitors.
- Familiarize and diffuse the technology of indigenous foods beyond the present territories for the good of intercommunity harmony and business as well
- Obtain patent and intellectual property right
- Interest and will of business society
- Project feasibility; maximization of profit

6. National Policy and Legal Matter

- Policies should not be for decoration but for implementation
- Regulatory provisions may be reexamined, e.g. preparation of alcoholic products from finger millet.