X. Prepared Starter for fermented country beverage production

1. Bakhar
2. Marcha (Murcha)
3. Hamei
4. Pham
5. Ipoh
6. Mod pitha
7. Vekur pitha
8. Thiat
9. Ranu dabai
10. Ranu tablet (Ranu goti)
11. Keem
12. Balam (Balma)
13. Dhehli
1. **Bakhar**

   **Place of origin/usage:** North India.

   **Beverage prepared using this starter:** *Pachwai* (Indian rice beer).

   **Ingredients of starter:** Ginger and some plant materials, rice flour, powdered cakes from previous batches.

   **Preparation of starter:** Ginger and other plant materials are dried, ground and added to rice flour. Water is added to make a thick paste and small round cakes of 1.0 to 1.5 cm in diameter and formed and inoculated with powdered cakes from previous batches. The cakes are then wrapped in leaves, allowed to ferment for 3 days and then sun dried.

   **Microorganism(s) involved:** *Rhizopus* sp., *Mucor* sp. and at least one species of yeast.

   **Reference(s):** Hutchinson and Ram Ayyar, 1925.

2. **Marcha**

   **Other names, if any:** Murcha

   **Place of origin/usage:** Darjeeling and Sikkim

   **Beverage prepared using this starter:** *Bhaati Jaanr, Kodo ko jaanr* and *Raksi*

   **Ingredients of starter:** Rice/millet or wheat, roots of *Plumbago zeylanica*, leaves of *Buddleja asiatica*, flowers of *Vernonia cinerea*, ginger, red dry chili and a pinch of powdered old *marcha*.

   **Preparation of starter:** Soaked glutinous rice is mixed with roots of *Plumbago zeylanica* (‘guliyo jara’), leaves of *Buddleja asiatica* (‘bheemsen paate’), flowers of *Vernonia cinerea* (‘sengreknna’), ginger, red dry chili and a pinch of powdered old *marcha*. The mixture is then made into paste by adding water and kneaded into flat cakes of varying sizes and shapes and placed individually on the ceiling floor made up of bamboo stripes above the kitchen, bedded with fresh fronds of ferns, *Glaphylopteriolopsis erubescens* (‘pire uneu’) and covered with dry ferns and jute bags. These are left to ferment for 1-3 days, the longer period being used under the colder condition. Finally, cakes of *marcha* are sun dried for 2-3 days.

   **Physical profile of starter:** *Murcha* cakes are mildly acidic (pH 5.2) and contain 13% w/w moisture and 0.7% w/w ash (dry weight basis).
Microbiology of starter: *Saccharomyces bayanus; Candida glabrata; Pichia anomala; Saccharomycopsis fibuligera, Saccharomycopsis capsularis* and *Pichia burtonii* are present in the *marcha*. Among them, the *Saccharomyces bayanus*, *Candida glabrata* and *Pichia anomala* are involved in the production of ethanol. *Pichia burtonii* has high amylolytic activity. In addition to yeast, LAB and *Mucor circinelloides, Rhizopus chinensis* are also present in the *marcha*. The strains of LAB present in *Marcha* have little or no role in alcohol production. Preliminary screenings of amylolytic activities of LAB isolates have no role in saccharification and liquefaction of starchy substrates. The inability to utilize starch by LAB indicates that they are not significant contributors to the breakdown of starch of substrates during preparation of *Marcha* itself or any beverage; probably their role is to give flavour and impart mild sour-taste to *Aitanga, Kodo ko jaanr* and *Bhaati jaanr*, traditional cereal-based alcoholic beverages of Manipur and Sikkim, respectively.


3. Hamei

Place of origin/usage: Eastern Himalayas

Beverage prepared using this starter: *Bhaati Jaanr, Aitanga and Kodo ko jaanr.*

Ingredients of starter: Crushed raw rice, powdered bark of *Albizia myriophylla* (‘yangli’) and a pinch of previously prepared powdered *Hamei*.

Preparation of starter: Traditionally *Hamei* is prepared from crushed raw rice mixed with powdered bark of *Albizia myriophylla* (‘yangli’) and a pinch of previously prepared powdered *Hamei*. The dough is pressed into flat cakes and is kept over rice husk in a bamboo basket for 2 - 3 days at room temperature (20 - 30°C) and then sun dried for 2 - 3 days. The different types of *Hamei*, viz. *Andro, Sekmai, Phayeng, Jiribam, Bishenpur* and *Tengnoupal* are prepared using similar ingredients and methods except with the slight differences in shape, size and coverings during the process of fermentation.

White rice of about 3 kg was pre-soaked for about half an hour and dried for 15 min to remove excess water. The white rice is prepared traditionally by pounding in a wooden mortar (*Shumban*) with a wooden mallet (*Shuk*) and the powder mass thus
obtained is called Yam. Finely chopped or powdered about 250 – 300 gm dried bark of Albizia myriophylla Benth. (Yanglee) plant is mixed with required amount of water and filtered. The filtrate obtained appears brownish in colour. A homogenous mixture paste is prepared by mixing Yam and Yanglee filtrate. From this paste mass, a cake like structure in the form of elliptical or rounded flattened mass is prepared known as Hamei. Pressing a small portion of paste mass in between the palms does the preparation of Hamei cake in the form of a flattened mass. The shape, sizes and forms are changed according to the convenience of the practitioner.

The prepared Hamei is stored for 4 - 5 days over a hearth for future use. For storage, the Hamei is kept over a mass of paddy husk or paddy straw and covered with straw and finally by cloths, for keeping the mass warm and free from extreme heat or cold. In winter, more layers of cloths are used. After 4-5 days of storage (fermentation), after fine water drop/droplets appear over its surface, it is taken out and air dried. The whole process is done under diffused or dim light. The Hamei is ready for use only when the alcoholic smell comes from it.

**Chemical profile:** The flavouring agents that developed during storage are diacetyl, volatile phenols and esters.

**Microbiology of starter:** The average population of LAB in Hamei was 6.9 log cfu/g. It is interesting to note that Hamei contained bacteriocin-producing Pediococcus. The strains of LAB present in Hamei have little or no role in alcohol production. Preliminary screenings of amylolytic activities of LAB isolates have no role in saccharification and liquefaction of starchy substrates. The inability to utilize starch by LAB indicates that they are not significant contributors to the breakdown of starch of substrates during preparation of Hamei itself or any beverage; probably their role is to give flavour and impart mild sour-taste to the beverages.

**Reference(s):** Singh and Singh, 2006.

**4. Pham**

**Place of origin/usage:** Arunachal Pradesh.

**Beverage prepared using this starter:** Themsing.

**Ingredients of starter:** Rice and leaves of Solanum khasianum.
Preparation of starter: Yeast tablet made of indigenous rice paste and leaves of *Solanum khasianum*.

Microorganism(s) involved: Yeast.

Reference(s): Singh et al., 2007(a).

5. *Ipoh*

Place of origin/usage: Arunachal Pradesh.

Beverage prepared using this starter: *Apong* and *Ennog*.

Ingredients of starter: Rice and powder of seeds of *Veronia cinerea* (L.) Less and *Clerodendron viscosum* Vent.

Preparation of starter: *Ipoh* is prepared through a laborious process of drying and grinding rice into fine powder and mixing powder of seeds, bark of locally available plant species, viz. *Veronia cinerea* (L.) Less and *Clerodendron viscosum* Vent. Now, this thoroughly mixed powder is taken into a large vessel (*Dekchi*) and made into a paste using previously stored rice water. The paste becomes slightly greenish–white and emits smell of mixed herbage. The paste is poured and spread on clean gunny bags or bamboo mats and made into disc shaped small cake or biscuit. The biscuits are then carefully placed to dry out completely either in the attic above the fireplace of traditional houses or left in a cool dry place for 3–4 days after which it is stored for use. These can be stored up to one year.

Microorganism(s) involved: Yeast.

Reference(s): Tiwari and Mahanta, 2007.

6. *Mod pitha*

Place of origin/usage: Assam and Arunachal Pradesh.

Beverage prepared using this starter: *Sujen*.

Ingredients of starter: Rice and 31 plant materials.

1. Bulb of *Allium sativum* L. (Liliaceae)
2. Leaves of *Artocarpus heterophyllus* Lamk. (Moraceae)
3. Bark of *Ananas comosus* (L.) Merr. (Bromeliaceae)
4. Leaves of *Alpinia malaccensis* Rosc. (Zingiberaceae)
5. Leaves of *Alternanthera sessilis* (L.)R.Br. ex DC. (Amaranthaceae)
6. Fruit of *Capsicum annuum* L. (Solanaceae)
7. Leaves of *Cinnamomum bejolghota* (Buch.-Ham) Sw. (Lauraceae)
8. Leaves of *Centella asiatica* (L.) Urban. (Apiaceae)
9. Leaves of * Coffea bengalensis* Roxb. (Rubiaceae)
10. Leaves of *Costus speciosus* J. E. Sm. (Costaceae)
11. Leaves of *Desmodium* sp. (Papilionaceae)
12. Leaves of *Cyprus* sp. (Cyperaceae)
13. Leaves of *Desmodium pulchellum* (L.) Benth. (Papilionaceae)
14. Leaves of *Equisetum* sp. (Equisetaceae)
15. Fronds of *Lygodium flexuosum* (L.) Sw. (Lygodiaeace)
16. Leaves of *Melastoma malabathricum* L. (Melastomataceae)
17. Leaves of *Mussaenda roxburghii* Hook.f. (Rubiaceae)
18. Leaves of *Myxopyrum smilacifolium* (Wall.) Bl. (Oleaceae)
19. Leaves of *Naravelia zeylanica* (L.) DC. (Ranunculaceae)
20. Grains of *Oryza sativa* L. (Poaceae)
21. Leaves of *Psidium guajava* L. (Myrtaceae)
22. Leaves of *Pothos scandens* L. (Araceae)
23. Roots of *Pteridium aquilinum* (L.) Kuhn. (Pteridaceae)
24. Leaves of *Pycnarrhena pleniflora* Miers. (Menispermeaceae)
25. Leaves of *Rubus* sp. (Rosaceae)
26. Leaves of *Saccharum officinarum* L. (Poaceae)
27. Leaves of *Selaginella semicordata* (Wall) Spreng (Selaginellaceae, Pteridophyte)
28. Leaves of *Scoparia dulcis* L. (Scrophulariaceae)
29. Leaves of *Solanum torvum* Sw. (Solanaceae)
30. Leaves of *Thunbergia grandiflora* Roxb. (Acanthaceae)
31. Leaves of *Zanthoxylum oxyphyllum* Edgw. (Rutaceae)
32. Bulb of *Zingiber officinale* Rosc. (Zingiberaceae)

**Preparation of starter:** Rice grains (Saol), plant species, a round bamboo utensil (*Kula*), round bamboo utensil for sieving (Saloni), wooden grinder (*Dheki*), a rectangular frame made of bamboo (*Dhua sang*), aluminium utensil (*Soriya*) and straw (*Kher*) are required
for the preparation of *Mod pitha*. A handful each of cleaned leaves, fronds, barks, roots and bulb of the plant parts are put in a round bamboo utensil (*Saloni*) and kept for a day for sun drying. Rice grains (*Saol*, 2-3kg) is soaked in water for about 2 hours, mixed with the dried plant materials and grounded in a wooden grinder (*Dheki*). The grounded powder is taken out, sieved in a round bamboo utensil (*Saloni*) and the coarse part is returned to the wooden grinder (*Dheki*) for grinding. The process is continued until a fine powder is obtained. Already available aged *Mod pitha* (2 or 3) are added to the mixture while grinding, which acts as an inoculant. Grounded powder is put into an aluminium utensil (*Soriya*), water is added to make a sticky paste and small round cakes (2-3 cm in diameter and ca.1 cm in thickness) are prepared. Cakes are then kept on clean, dry paddy straws spread on a round bamboo utensil (*Kula*) and again covered with straws. A round bamboo utensil is then kept on a *Dhua sang* tied about 1 m above the fireplace in the kitchen for drying. This procedure of baking continues for a couple of weeks until the *Mod pitha* becomes hard. *Pitha* is then ready for use in *Sujen* brewing. Unused *Mod Pitha* is stored in small earthen pot (*Tekele*), mouth of which is covered with a bunch of straws. It can be stored for 2-3 months and can be used as and when required.

**Reference(s):** Deori *et al.*, 2007.

### 7. Vekur pitha

**Place of origin/usage:** Assam.

**Beverage prepared using this starter:** *Ahom*.

**Ingredients of starter:** Leaves of *Lygodium flaxuosum* L., *Leucas aspera* Spreng., *Cissampelos pereira* Linn., *Scoparia dulcis* Linn., *Cinnamomum glanduliferum* Meissn. and *Piper betle* Linn. and powder of rice grain, previously prepared *pitha* (*ghai pitha*).

**Preparation of starter:** Leaves of few wild plants are used as additive ingredients which act as attracting agent of Yeast *Saccharomyces cereviceae*. Among the plant material used with yeast are *Lygodium flaxuosum* L., *Leucas aspera* Spreng., *Cissampelos pereira* Linn., *Scoparia dulcis* Linn., *Cinnamomum glanduliferum* Meissn. and *Piper betle* Linn.. The leaves of these plants are collected from the wilderness and dried in sunlight for 1-2 days. Sun dried leaves are ground to powder and mixed with the powder of rice grain in a vessel containing few ml of water. Here, the powder of previously prepared *pitha*
commonly called ghai pitha is mixed with freshly prepared pitha as source of Yeast. The semi-solid pitha is mixed with required ingredients and rolled into plate-disc shaped. It is then wrapped with leaves of Musa paradisiaca Linn. and kept in air locked condition over fire heart. The fire heat is maintained at 90-180 cm. height for 4-5 days till dry. The disc shaped dried pitha (fermenting agent) containing yeast, rice powder and plant material is known as Vekur pitha, which is kept for future use.

**Microorganism(s) involved:** Saccharomyces cereviceae.

**Reference(s):** Saikia et al., 2007.

**8. Thiat**

**Place of origin/usage:** Mahalaya.

**Beverage prepared using this starter:** Kiad.

**Ingredients of starter:** Local red rice (Oryza sativa L.); leaves of Amomum aromaticum Roxb.

**Preparation of starter:** Oryza sativa L. (Kho-so, a local red rice); leaves of Amomum aromaticum Roxb (Khaw-iang/Haw-iang); Musa paradisiaca L. (Sla-pashor - leaves of banana); spring water (Um-pohliew); a mortar made of hard wood of Schima wallichii (DC.) Korth (Thlong); a pestle made of hard wood of Docynia indica (Wall.) Decne (Surai); a round basket (Malieng), a cone-shaped basket (Khrie), a rectangular frame--all made of bamboo, Dendrocalamus hamiltonii Munro (La-er) are required for the preparation of Thiat (Samati and Begum, 2007). A handful of washed and cleaned Amomum aromaticum Roxb. leaves are sun dried and ground into powder in a mortar made of hard wood of Schima wallichii (DC.) Korth (Thlong) by a pestle made of hard wood of Docynia indica (Wall.) Decne (Surai). Then, 1-2 kg of Oryza sativa L. (Kho-so) soaked in water is also ground in a mortar made of hard wood of Schima wallichii (DC.) Korth (Thlong) by a pestle made of hard wood of Docynia indica (Wall.) Decne (Surai). The process is continued until a fine powder is obtained. Thiat (natural yeast) cakes are made from the ground rice powder mixed with Amomum aromaticum Roxb (Khaw-iang/Haw-iang) leaves powder, which are put in a cone-shaped basket (Khrie) and spring water (Um-pohliew) is added to make a sticky paste and small round cakes are prepared with standard size of 4-5 cm in diameter and 0.8-1cm in thickness. These cakes are then kept in a round
basket (Malieng) and covered by leaves of banana (Slapashor). A round basket (Malieng) is hanged on a bamboo made a rectangular frame (Laer), which is exposed to sunlight or tied about 1.20-1.50m above the fireplace/hearth for drying until the cakes get harden and then are used for rice brewing as natural yeast.

**Microorganism(s) involved:** Yeast.

**Reference(s):** Samati and Begum, 2007.

9. **Ranu dabai**

**Place of origin/usage:** West Bengal.

**Beverage prepared using this starter:** Jhara or Harhia.

**Ingredients of starter:** Machine dehusked raw rice grains (10 kg), tuberous roots of *Coccinia grandis* (500 gm); terminal young and soft leaves of *Clerodendrum viscosum* (300 gm); whole plant of *Vernonia cinerea* (350 gm) and leafy branches of *Plumbago zeylanica* (250 gm) are used. The tribes namely ‘Tiggas’ generally do not use other plants. But 300 gm of *Rauvolfia serpentina* roots replaces *Coccinia grandis* roots. Other plants are used in much less quantity i.e. 50 – 100 gm only for 10 kg of rice. About 1 kg of the bark of *Wattakaka volubilis* is used if Ranu Dabai is made only with this plant. Rice and 13 plant materials are used (of which five - *Oryza sativa, Coccinia grandis, Plumbago zeylanica, Vernonia cinerea* and *Clerodendrum viscosum* are essential) for the preparation of a good quality of starter mixture. The following table describes the ingredients and parts of plant materials and their usage for the preparation of the ranu dabai. *Rauvolfia serpentina* if available in sufficient quantity replaces *Coccinia grandis*. However, sometimes, they use only the bark of *Wattakaka volubilis*. This plant is rare but most of the other plants are easily available in the locality.
Properties of the herbal plant parts used in the preparation of *Ranu dabai*

<table>
<thead>
<tr>
<th>Name of the plant</th>
<th>Parts of the plant</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Oryza sativa</em> L. (Poaceae)</td>
<td>The machine dehusked raw rice grains.</td>
<td>Main bulk of the starter material, Paddy straw used as an insulator</td>
</tr>
<tr>
<td><em>Coccinia grandis</em> L. (Cucurbitaceae)</td>
<td>Tuberous root</td>
<td>Develops sweetness</td>
</tr>
<tr>
<td><em>Vernonia cinerea</em> L. (Asteraceae)</td>
<td>Whole plant</td>
<td>Produces sweetness</td>
</tr>
<tr>
<td><em>Clerodendrum viscosum</em> Ventenat (Lamiaceae)</td>
<td>Terminal and soft leaves</td>
<td>Produces bitterness</td>
</tr>
<tr>
<td><em>Plumbago zeylanica</em> L. (Plumbaginaceae)</td>
<td>Leafy branches</td>
<td>Process enhancer</td>
</tr>
<tr>
<td><em>Stephania japonica</em> (Thunb.)Miers (Menispermaceae)</td>
<td>Tuberous root</td>
<td>Preservative</td>
</tr>
<tr>
<td><em>Stephania glabra</em> (Roxb.) Miers (Menispermaceae)</td>
<td>Tuberous root</td>
<td>Preservative</td>
</tr>
<tr>
<td><em>Oroxylum indicum</em> L. (Bignoniaceae)</td>
<td>Bark</td>
<td>Imports bitter taste</td>
</tr>
<tr>
<td><em>Mussaenda roxburghii</em> Hook.f. (Rubiaceae)</td>
<td>Root</td>
<td>Develops sweetness and yellowish tint in liquor</td>
</tr>
<tr>
<td><em>Scoparia dulcis</em> L. (Scrophulariaceae)</td>
<td>Leafy twigs</td>
<td>Improves sweetness</td>
</tr>
<tr>
<td><em>Rauvolfia serpentina</em> L. (Apocynaceae)</td>
<td>Root bark</td>
<td>Develops bitterness</td>
</tr>
<tr>
<td><em>Artocarpus heterophyllus</em> Lam. (Moraceae)</td>
<td>Leaves</td>
<td>Improves sweetness and yellowish tint in liquor</td>
</tr>
<tr>
<td><em>Wattakaka volubilis</em> (L.f) Benth (Apocynaceae)</td>
<td>Stem bark</td>
<td>Develops bitterness</td>
</tr>
</tbody>
</table>

**Preparation of starter:**

- **Washing of rice and storing of wash water** - After cleaning the rice grains on a flat traditional utensil generally made of sliced bamboo (‘Soop’) it is taken in a vessel (made of clay-metal/PVC) for washing. Clean water is poured in it, stirred and decanted. The decanted wash-water is preserved in a bucket for future use.

- **Mixing and grinding** - It is done with a traditional wooden husking machine called ‘Dhiki’. At first, all freshly collected plant materials (i.e. except rice grains) are chopped and ground properly and taken out on a traditional sliced bamboo utensil (‘Soop’). Rice grains are then put in the pit of wooden husking machine (Dhiki) and when partially powdered a few (3–4 large tablets for 10 kg of rice) old *Ranu Dabai* tablets are added. After some time, the plant paste is also added to it and allowed to mix properly. When the rice grains are properly powdered and mixed with plant paste, it is then taken out on a
sieve (Chakni) and the coarse part is returned to the wooden husking machine. After completing sieving, woody and fibrous materials are rejected.

- **Tablet preparation** - The powdered material (Gunda) is now taken in a large vessel (Dikchi) and made into paste using the previously stored rice wash water. The paste becomes slightly greenish-white and emits the smell of mixed herbage. Clean gunny bags are then spread on the floor under shade or inside the rooms. No die is used for preparing the tablets; these are completely hand made. The standard size is 4.5–7 cm in diameter, which is arranged in rows on the gunny bags, where these are kept for 40–60 minutes. Tablets loose some amount of water and become little tough. Very small sized tablets of around 1.5–2 cm in diameter are prepared, some times. Tablets of 14–15 cm in diameter are also prepared.

- **Incubation** - It is done inside a large basket (Dhakiya) made of sliced bamboo. Clean and dry straw is spread on the bottom of the basket and some tablets are kept on it. These are then covered with straw and another layer of tablets is kept on it. The process is repeated until the basket is full. Then a larger amount of straw is added at the top. The entire set is covered with polythene sheet and/or gunny bags and stored in a dark and warm place. The incubation period varies from 2 to 3 days in warm season and 4–6 days in winter. The inside temperature rises considerably (bukhar) and the set starts emitting pungent Harhia-like smell. During this, a layer of cottony mycelia develops on the tablets. The fungal mycelia produce a mat of black sporangia in damp weather or if stored for a slightly longer period.

- **Drying** - The tablets are taken out of the basket and are kept in single layer on large sized circular flat bamboo basket called ‘Dagra’ and get dried under the sun for 7–8 days. Now, the *Ranu Dabai* is ready for storing and for use.

- **Storing**: Dried *Ranu Dabai* is kept in small bamboo baskets and stored in a dry place. These can be stored up to one year.

**Microorganism(s) involved**: Some fungal organisms.

**Reference(s)**: Ghosh and Das, 2004.

10. **Ranu tablets**

**Others names if any**: *Ranu goti*. 
Place of origin/usage: Central India.

Beverage prepared using this starter: Handia and Mahua.

Ingredients of starter: A mixture of roots, barks, rhizomes, leaves of about 20-25 plant species listed below and rice flour.

1. Root of Argyreia bella (C.B.Clarke) Raizada (Convolvulaceae)
2. Root of Bombax ceiba L. (Bombacaceae)
3. Leaves of Buchanania lanzan Spreng. (Anacardiaceae)
4. Root of Casearia graveolens Dalz. (Flacourtiaceae)
5. Stem bark of Cassine glauca (Rottb.) O. Ktze (Celastraceae)
6. Root of Catunaregam spinosa (Thunb.) Tirvengadum (Rubiaceae)
7. Root of Cissampelos pareira L. (Menispermaceae)
8. Root of Crotalaria albida Heyne ex Roth (Leguminosae)
9. Root of Cryptolepis buchanani Roem. and Schult. (Asclepiadaceae)
10. Seed of Datura metal L. (Solanaceae)
11. Root of Elephantopus scaber L. (Asteraceae)
12. Root of Euphorbia prolifera Buch. Ham. ex D. Don (Euphorbiaceae)
13. Root of Hemidesmus indicus (L.) R.Br. (Asclepiadaceae)
14. Root/stem bark of Holarrhena pubescens Wall. ex Don (Apocynaceae)
15. Whole plant of Knoxia sumatrensis (Retz.) DC. (Rubiaceae)
16. Root of Pueraria tuberosa (Willd.) DC. (Leguminosae)
17. Root/whole plant of Scoparia dulcis L. (Scrophulariaceae)
18. Root of Senecio nudicaulis Buch. Ham. ex D.Don (Asteraceae)
19. Stem bark of Symplocos racemosa Roxb. (Symplocaceae)
20. Root of Tylophora rotundifolia Buch.- Ham. ex Wt. (Asclepiadaceae)
21. Leaves of Wattakaka volubilis (L.f.) Stapf (Apocynaceae)

Preparation of starter: Rice is soaked in water, pounded, and kept in shady place for drying. The plant species used in preparation of Ranu goti are collected mostly from forests and sometimes grown in the kitchen garden. The roots, leaves, bark, seeds of the plants are sun dried and pounded, powdered and dried in sun. The powder is mixed with flour thoroughly in the ratio of 1:2, and rolled in small pieces in the form of small cakes.
These tablets are kept in closed room for drying. After drying, these Ranu tablets or Ranu goti are used for preparing local beverages.

Reference(s): Kumar and Rao, 2007.

11. Keem

Place of origin/usage: Himalayan region.

Beverage prepared using this starter: Soor.

Ingredients of starter: Barley flour, Cannabis sativa, Sapindus mukorossi and plant materials as listed below.

1. Root of Achyranthes aspera L. (Amaranthaceae)
2. Root of Adhatoda zeylanica Medik. (Acanthaceae)
3. Root of Aerva sanguinolenta (L.) Bl. (Amaranthaceae)
4. Leaves of Alysicarpus vaginalis (L.) DC. (Fabaceae)
5. Leaves of Arachne cordifolia (Decne.) Hurusawa (Euphorbiaceae)
6. Root of Artemisia roxburghiana Wall. ex Bess. (Asteraceae)
7. Root of Berberis lycium Royle (Berberidaceae)
8. Whole plant of Boerhaavia diffusa L. (Nyctaginaceae)
9. Whole plant of Cajanus scarabeoides (L.) de Pitit-Thou. (Fabaceae)
10. Whole plant of Callicarpa macrophylla Vahl. (Verbenaceae)
11. Leaves of Cannabis sativa L. (Cannabaceae)
12. Root of Carissa opaca Stapf ex Haines (Apocynaceae)
13. Whole plant of Cassia tora L. (Caesalpiniaceae)
14. Leaves of Cinnamomum tamala (Buch.-Ham.) Nees ex Eberm. (Lauraceae)
15. Root of Cissampelos pariera var. hirsuta (Buch.-Ham. ex DC.) Forman (Menispermaceae)
16. Whole plant of Cocculus hirsutus (L.) Diels (Menispermaceae)
17. Root of Colebrookia oppositifolia Sm. (Lamiaceae)
18. Root of Cymbopogon martini (Roxb.) Wats. (Poaceae)
19. Leaves of Datura stramonium L. (Solanaceae)
20. Whole plant of Dicliptera roxburghiana Nees (Acanthaceae)
<table>
<thead>
<tr>
<th>No.</th>
<th>Plant Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.</td>
<td>Root of Euphorbia royleana Boiss. (Euphorbiaceae)</td>
</tr>
<tr>
<td>23.</td>
<td>Bark of Ficus benghalensis L. (Moraceae)</td>
</tr>
<tr>
<td>24.</td>
<td>Fruits of Ficus semicordata Buch.-Ham. ex Sm. (Moraceae)</td>
</tr>
<tr>
<td>25.</td>
<td>Root of Geranium nepalensis Sur. (Geraniaceae)</td>
</tr>
<tr>
<td>26.</td>
<td>Whole plant of Ichnocarpus frutescens (L.) R. Br. (Apocynaceae)</td>
</tr>
<tr>
<td>27.</td>
<td>Whole plant of Indigofera linifolia (L.f.) Retz. (Fabaceae)</td>
</tr>
<tr>
<td>28.</td>
<td>Whole plant of Leucas lanata Benth. (Lamiaceae)</td>
</tr>
<tr>
<td>29.</td>
<td>Leaves of Melia azedarach L. (Meliaceae)</td>
</tr>
<tr>
<td>30.</td>
<td>Whole plant of Parthenocissus semicordata (Wall.) Planch. (Vitaceae)</td>
</tr>
<tr>
<td>31.</td>
<td>Whole plant of Physalis minima L. (Solanaceae)</td>
</tr>
<tr>
<td>32.</td>
<td>Root of Pinus roxburghii Sargent (Pinaceae)</td>
</tr>
<tr>
<td>33.</td>
<td>Root of Punica granatum L. (Punicaceae)</td>
</tr>
<tr>
<td>34.</td>
<td>Root of Rhus parviflora Roxb. (Anacardiaceae)</td>
</tr>
<tr>
<td>35.</td>
<td>Whole plant of Roylea cinerea (D.Don) Baill. (Lamiaceae)</td>
</tr>
<tr>
<td>36.</td>
<td>Root of Rubus niveus Thunb. (Rosaceae)</td>
</tr>
<tr>
<td>37.</td>
<td>Leaves of Sapindus mukorossi Gaertn. (Sapindaceae)</td>
</tr>
<tr>
<td>38.</td>
<td>Leaves of Skimmia anquetila Taylor and Airy Shaw (Rutaceae)</td>
</tr>
<tr>
<td>39.</td>
<td>Bulbils of Syzygium cumini L. (Myrtaceae)</td>
</tr>
<tr>
<td>40.</td>
<td>Leaves of Vitex negundo L. (Verbenaceae)</td>
</tr>
<tr>
<td>41.</td>
<td>Leaves of Woodfordia fruticosa (L.) Kurz. (Lythraceae)</td>
</tr>
<tr>
<td>42.</td>
<td>Root of Zanthoxylum armatum DC. (Rutaceae)</td>
</tr>
</tbody>
</table>

**Preparation of starter:** Chopped fresh twigs of *Cannabis sativa* (8 kg), 5 kg leaves of *Sapindus mukorossi* and 10-15 kg in total of different plant species (as listed in the above Table) are dried in the shade and powdered. The powder prepared from the plants is mixed with about 50 kg of Barley flour. To the desired quantity of above dry mixture is added a sufficient quantity of Jayaras (an infusion prepared by keeping finely chopped leaves and tender parts of *Melia azedarach, Zanthoxylum armatum, Leucas lanata*, and *Dicliptera roxburghiana*), in a big container for whole night and doughed in to a round cake of about 1-2 kg weight. By repeating this process, many cakes are prepared for their use round the year. The cakes so formed are further processed by placing them on plant bed (locally called *Sathar*) made up of
tender shoots of *Cannabis sativa* and *Pinus roxburghii* alternately between the cakes in a closed room. The whole set up is allowed to remain undisturbed for 24 days. On the 25th day, the room is opened and the cake is put upside down and allowed to remain there for another 12 days. The cakes are then taken out and allowed to dry in the sun or open air. When the cakes dry up, they are ready for use as starter.

**Reference(s):** Rana *et al*., 2004.

12. **Balam**

**Others names if any:** Balma.

**Place of origin/usage:** Uttaranchal.

**Beverage prepared using this starter:** Jann.

**Ingredients of starter:** Wheat with the following herbs and spices.

1. 1 kg of Wheat (*Triticum aestivum*) Flour
2. 5 to 10 g of Clove (*Chinnamomum zeylanicum*) Powder
3. 5-10g of *Amomum subulatum* (Cardmum) Powder
4. 20-30g of *Piper longum* (Pepper) Powder
5. 40-60g of Old balam powder Powder
6. 3-4g of *Ficus religiosa* (Pipal seeds) Powder (not often used)
7. 2-3g of wild chilies (Mirchi ghash) Powder (not often used)

**Preparation of starter:** First the raw wheat is washed in water and sun dried, later this is ground into flour and then it is roasted over fire and removed before it becomes brown in colour. The roasted flour is then mixed with spices like *Cinnamomum zeylanicum*, elachi (*Amomum subulatum*), *Piper longum* (kalimirch), leaves of wild chilies (mirchi-ghash) and seeds of *Ficus religiosa* (papal). In this mixture, powder of old balam is also added. The appropriate quantity of required ingredients in the preparation of balam is shown in the above table. The addition of old balam powder is a must, without this production of fresh balam is not possible. The mixture so prepared is then thoroughly mixed up with the required quantity of water and is rolled into a thick paste. This mixture is then pressed between palms to make balam balls of the required size. These balls are then dried in shade and stored for future use for a long period of time.

**Reference(s):** Roy *et al*., 2004
13. *Dhehli*

**Place of origin/usage:** Himachal Pradesh.

**Beverage prepared using this starter:** *Sura.*

**Ingredients of starter:** Barley flour and herbs (*Pistacia integerrima*, *Solanum xanthocarpum*, *Clitoria ternatea*, *Aegel marmelos*, *Viola cinerea*, *Cannabis sativa*, *Trachyspermum copticum*, *Micromeria biflora*, *Spiranthes australis*, *Saussurea* sp., *Bupleurum lanceolatum*, *Drosera lunata*, *Salvia* sp., *Arisaema helleborifolium*, *Fragaria* sp., etc.).

**Preparation of starter:** Herbal mix or *Dhehli* preparation is an annual community effort, in which elderly people go to forests on the 20th day of Bhadrapada month (usually 5 or 6th September) and collect approximately 36 fresh herbs. Some of the important herbs used in *Dhehli* preparation are *Pistacia integerrima* (Kkakar shinga), *Solanum xanthocarpum* (Katari), *Clitoria ternatea* (Kkayal), *Aegel marmelos* (Bhel), *Viola cinerea* (Banaksa), *Cannabis sativa* (Bhang), *Trachyspermum copticum* (Ajwain), *Micromeria biflora* (Chharbara), *Spiranthes australis* (Bakarshingha), *Saussurea* sp. (Bbacha), *Bupleurum lanceolatum* (Nimla), *Drosera lunata* (Oshtori), *Salvia* sp. (Kotugha), *Arisaema helleborifolium* (Chidi ri chun), *Fragaria* sp. (Dudlukori). The collected herbs are crushed in stone with a large conical cavity (‘Ukhal’) using a wooden bar (‘Mussal’) and the extract as well as the plant biomass are added in to the flour of roasted barley and are roughly kneaded. This is put in to a wooden mould, to give the shape of a brick and dried, is called *Dhehli*.

**Reference(s):** Thakur et al., 2004, Savitri and Bhalla, 2007