

## ETHNOBOTANY OF *BAKHAR* USED TO PREPARE RICE BEER (*HARIA*) IN PASCHIM MEDINIPUR, WEST BENGAL, INDIA

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**ABSTRACT** ■ Rice is the one of the major adjunct materials used in brewing beer in the USA, China and Japan. Some brewers prefer rice, because it has lower oil content than corn grits. In India, mostly in tribal dominated areas rice is used in beer preparation. In Paschim-Medinipur, there are many tribal groups who prepare their own local brew using rice grains as the substrate, known as *handia* or *haria*. The rice grain is fermented in to *haria*. For this fermentation and flavouring a unique starter culture is necessary known as '*bakhar*' or 'Rice Beer Cake'. This is also used as flavoring and stability agent of beer. People belonging to different tribal groups prepare this *bakhar* in the form of tablets. To prepare this *bakhar* tablets tribal people generally use 18 (eighteen) plant species as ingredients depending on their availability mostly collected from local forest areas. Among these 18 plant species 14 plant species are usually used by the *ojhas* i.e. the tribal medicine men in the folk medicine for different ailments.

**Key words** - *Bakhar*, Folk-medicine, *Ojha*, Rice beer (*haria*), Tribal people.

### INTRODUCTION

Rice is the one of the major adjunct materials used in brewing beer in the USA, China and Japan (Coors, 1976). Some brewers prefer rice, because it has lower oil content than corn grits (Stewart and Priest, 2006). In India also mostly in tribal dominated areas rice is used as beer preparation. The district Paschim-Medinipur, West Bengal, is inhabited by many indigenous tribes such as *Santhal*, *Kheria-Sabar*, *Lodha*, *Mundari*, *Bhumij* and *Kurmi* belonging to Pre-Dravidian racial stock, who mainly reside in close association with the forest areas of the district. Most of the tribes

prepare their own local brew using rice grains as the substrate known as '*hanria*' or '*haria*'. In addition, each of the tribes also prepare their own unique starter culture cum flavouring and stability agent to carry out fermentation is known as '*bakhar*' or 'rice beer cake'. These starter cultures are prepared in the form of cakes or tablets of 4.5-7.0 cm. in diameter. Some times very small sized tablets with a size of 1.5 – 2.0 cm diameter are prepared. These tablets are generally stored up to several months. The fermentation is usually carried out in earthen pots at room temperature and takes about 4-6 days for

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completion of the whole process. When the fermented stock starts emitting a strong alcoholic smell, it is considered ready to use. This beer is used in all festive occasions and social ceremonies.

Rice having about 90% carbohydrate used widely in various parts of India and abroad for preparation of local brews. There are also reports of rice beer being used as ethnomedicine (Singh and Singh, 2006) in certain ailments. Rice beer is also said to be effective against insomnia, headache, bodyache, inflammation of joints, diarrhoea, urinary problems, expelling worms and as a treatment of cholera (Samati and Begum, 2007 and Deka and Sarma, 2010). Dhal *et al.* (2010) report that rice beer other than being used as wine is also used medication against constipation, urinary infections and liver disorders. It cures jaundice, colic and dysentery. It is also stated (Sahu, 1996) that *haria* protects from sun-stroke and maintains the motility and tone of the gastrointestinal system. The tribes of Mayurbahnj district of Orissa use *haria* to cure jaundice, colic disorders and dysentery (Panda *et.al.* 2014).

#### **METHODOLOGY:**

This study was done mainly among the different tribal communities of Paschim-Medinipur district including Jhargram. Information was collected in different aspects like (i) study of the ingredients of *bakhar* and (ii) study of other usefulness of different plant species used in *bakhar* preparation. For these two phases information was collected through interviews of different tribal people engaged in preparation of this brew. Most of them prepare both *bakhar* and *haria* for self-consumption as well as sale in weekly markets. Sixteen (16) *ojhas i.e.* tribal medicine men were interviewed for the information of uses of different plants in the folk medicine. The persons interviewed belong to eight (8)

persons from *santal*, four (4) from *lodha* and one (1) each from *kheria*, *sabar*, *bhumij*, *mundari* and *kurmi* community. To get accurate information, cross verification was carried out from tribe to tribe. Sample specimens of plant species were collected from the local forest areas, and then dried and sample specimens were obtained for preparation of herbarium. Taxonomic identification of the specimens were done using the flora of regional vegetation by Prain (1903) and then the names were crosschecked with the help of Bennet (1987).

#### **RESULTS AND DISCUSSION:**

There is no standardized parameter available for preparation of the starter culture (*bakhar*) or fermentation mechanism of the beer (*haria*). The proportion of each ingredient is not also specific. *Bakhar* is a mixture of different ingredients of 18 plant species (Table-1), which is used during fermentation of boiled rice to prepare beverages. Among these plant species, 6 species are used as the main ingredient of *bakhar* where as other 12 species are required for qualitative improvement of the beverage (Table-1). Addition of such ingredients makes the beverage commercially more attractive in the local market. These plant materials are mainly used for enhancement of taste, imparting a tinct and providing the characteristic aroma of *haria*. Few species are said to act as preservatives. It is informed that in most of the *bakhar* samples all the 18 species are not added either due to its non-availability or cost effectiveness. Field experiences show that *bakhar* preparation is considered to be a commercially secret knowledge and therefore, not easy to record. Out of 18 species mentioned 14 species (Table-2) are used in folk medicine in this region. Description of the ethnobotanical properties along with their ethnopharmacology of all the species used in *bakhar* is described below.

**Species-wise information:**

1. *Ananus comosus* (L.) Merr.— It is one of the main ingredients of *bakhar*. Young leaves of this species are used as sweetening agent in *bakhar*. Besides being used in *bakhar* leaves are used as anthelmintic and fresh juice is taken to treat hiccup and constipation. Taussig and Batking (1988) state that although the exact chemical structure of all active components of bromelain (an important active principle found in the leaves of the species) is not fully determined, this substance has shown distinct pharmacological promise. Its properties include: (1) interference with growth of malignant cells; (2) inhibition of platelet aggregation; (3) fibrinolytic activity; (4) anti-inflammatory action; (5) skin debridement properties.

2. *Centella asiatica* Urb.—The whole plant is used in *bakhar* to impart good flavour to the brew. This is a commercially important practice in *harial* preparation. The whole plant is also used in ethnomedicine. The whole plant is used against various abdominal disorders, dysentery, and also used as liver tonic. Alcoholic extracts of the plant reported to have shown positive results in the treatment of leprosy Baily (1945). The plant is used in the treatment of various skin diseases such as leprosy, lupus, varicose ulcers, eczema, psoriasis, diarrhoea, fever, amenorrhoea, diseases of the female genitourinary tract and also for relieving anxiety and improving cognition (Kashmira *et. al.* 2010). In this study it is seen that some *ojha* (local medicine practitioner) use it against sunstroke, tonsillitis, deposition of fluid around lungs (pleurisy), liver disease (hepatitis), jaundice, stomach pain, diarrhoea, indigestion, stomach ulcers and asthma also.

3. *Cissampelos pareira* L.— The root of this species is used as a main ingredient of *bakhar*. Field studies reveal that traditionally this plant

is very effective in leprosy. Paste of leaves and roots are used to cure various skin disease, blood impurities, inflammation, dog bites and snakebite poisoning. Experimentally, it has been found that the root of it is a potential herbal medicinal agent (Samanta and Bhattacharya, 2012).

4. *Clerodendrum viscosum* Vent.— In *bakhar* it adds to taste of the beverage. As reported during the field study, the decoction of bark and roots are used in respiratory diseases. Generally 50ml of it is taken two times in a day to cure cough and related fever. The root paste is boiled with castor oil and used during massage on the inflamed joints. The decoction of leaves and roots are used in skin infections.

5. *Coccinia grandis*. (L) Voigt. — The tuberous root is used in *bakhar* as a sweetening agent. In ethnomedicine leaves of the species is used as pain killer. Few leaves are heated mildly and wrapped around the place of swelling to reduce swelling and pain. Khatun *et. al* (2012) studied the antibacterial activity of various extracts of this plant. They found that methanol extracts showed antibacterial activity against *Staphylococcus aureus*, *S. dysenteriae*, *E. coli*. and *Salmonella typhae*.

6. *Costusspeciosus*. (Koen.Ex Retz.) Sm.— The rhizome is used in *bakhar* as an antimicrobial agent and preservative. For commercial preparation of *harial*, use of this rhizome is most effective. Its rhizome is also used in some ethnomedicinal preparations. Powdered rhizome is taken with honey to treat cough and also taken with hot water to treat indigestion. Due to its antimicrobial properties it is used in ringworm infections and also against intestinal worms, urinary diseases, jaundice and tuberculosis. Aqueous extraction of rhizome added with sugar is used to treat leprosy (Khare-2007). It is also applied on forehead for relief from headache (Gupta- 2010). Rhizome is also used to treat

Table-1: List of plants used for the preparation of starter culture (*bakhar*) to produce rice-beer

Sl. No	Scientific Name	Local Name	Family	Use parts	Purpose of use
1	<i>Cissampelos pareira</i> L.	Akanbindi	Menispermaceae	Root	Main ingredient
2	<i>Lygodium flexuosum</i> (L.) Sw.	Kopulata	Schizaeaceae	Leaf&rhizome	
3	<i>Orthosiphon rubicandus</i> (D.Don.) Benth.	Chandua	Lamiaceae	Root	
4	<i>Ruellia tuberosa</i> L.	Chaulia	Acanthaceae	Root	
5	<i>Terminalia alata</i> Heyne ex Roth.	Asan	Combretaceae	Bark	
6	<i>Xanthium strumarium</i> L.	Agarsita	Asteraceae	Whole plant	
<b>Other ingredients used in preparation of <i>bakhar</i></b>					
7	<i>Ananas comosus</i> (L.)Merr.	Anarash	Bromeliaceae	Young leaves	Sweetening agent
8	<i>Artocarpus heterophyllus</i> Lam.	Kanthal	Moraceae	Leaves	Produces a yellowish tinct in the liquor
9	<i>Centella asiatica</i> Urb.	Thankuni	Apiaceae	Whole plant	Aroma
10	<i>Clerodendrum viscosum</i> Vent.	Ghetu	Verbenaceae	Young leaves	Develops bitter taste
11	<i>Cocinia grandis</i> (L.)Voigt	Jangli-Kundri	Cucurbitaceae	Tuberous root	Develops sweetness
12	<i>Costus speciosus</i> (Koen.Ex Retz.)Sm.	Jamlakhoti	Costaceae	Rhizome	Antimicrobial &preservative
13	<i>Marsdenia volubilis</i> Cooke.	Chit Larang	Asclepiadaceae	Bark	Develops bitter taste
14	<i>Oldenlandia corymbosa</i> L.	Banjuluk	Rubiaceae	Leaves	Imparting colour
15	<i>Plumbago zylanica</i> L	Chitwar	Plumbaginaceae	Leafy branch	Process enhancer
16	<i>Scoparia dulcis</i> L.	Mithajangli	Scrophulariaceae	Leafy twig	Develops bitter taste
17	<i>Stephania japonica</i> (Thunb) Miers.	Dhai-ati	Menispermaceae	Tuberous root	As preservatives
18	<i>S. glabra</i> . (Roxb.) Miers.	Dhai-lata	Menispermaceae	Tuberous root	As preservatives

pneumonia, rheumatism, dropsy, urinary diseases, jaundice and leaves are used to treat mental disorders (Srivastava *et. al.* 1986).

**7. *Lygodium flexuosum* (L.) Sw.**— It is one of the main ingredients of *bakhar*. The leaves as well as rhizomes of this species are used to prepare *bakhar* tablet. This is also used as a leafy vegetable in various parts of the country. Rhizome of the plants aid to possess some

medicinal properties and so different tribal communities use it in different ethnomedicinal preparations. Leaves and rhizome are ethnomedicinally useful in the treatment of jaundice and stomach pain by the *kheria* and *sabar* tribes of Paschim-Medinipur and Jhargram District of West Bengal. Similar application has also been reported within *Rabha*, *Oraon* and *Mech* tribes

Table-2: List of medicinal plants with their use parts

Sl. no	Scientific Name	Family	Use parts
1	<i>Ananas comosus</i> (L) Merr.	Bromiliaceae	Leaves, Roots & Fruits.
2	<i>Centella asiatica</i> Urb.	Apiaceae	Whole Plant
3	<i>Cissampelos pareira</i> L.	Menispermaceae	Root, stem & leaves
4	<i>Clerodendrum viscosum</i> Vent.	Verbenaceae	Young Leaf
5	<i>Coccinia grandis</i> (L) Voigt.	Cucurbitaceae	Tuberous root
6	<i>Costus speciosus</i> (Koen.Ex Retz.) Sm.	Costaceae	Rhizome
7	<i>Lygodium flexuosum</i> (L.) Sw.	Schizaeaceae	Root, Rhizome & Leaf.
8	<i>Oldenlandia corymbosa</i> L.	Rubiaceae	Entire plant
9	<i>Orthosiphon rubicundus</i> (D.Don) Benth.	Lamiaceae	Root and leaf
10	<i>Plumbago zylanica</i> L.	Plumbaginaceae.	Leafy branch
11	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Leafy twig
12	<i>Stephania japonica</i> (Thunb.) Miers.	Menispermaceae	Tuberous root& leaves
13	<i>Terminalia alata</i> Heyne ex Roth.	Combretaceae	Bark
14	<i>Xanthium strumarium</i> L.	Asteraceae	Whole plant

in Jalpaiguri District of West Bengal, India (Wills – 2006, Wills, 2009). Freshly collected rhizome of the plant is boiled with mustard oil and used externally against rheumatism, sprains, scabies, eczema and inflammation caused due to cut wounds. They are reported to be particularly useful for carbuncles (Kamble *et. al.* 2010). This fern reported to exhibit antifertility activity in its alcoholic extract. Some tribal groups in Maharashtra use this extract as a contraceptive. In laboratory it showed antifertility activity in rats, mice and rabbits (Gaitonde and Maharaja,1980). This plant is also used to feed domestic animals to treat foot and mouth diseases (Samant & Pant- 2006, Dangol-2008).

**8. *Oldenlandia corymbosa* L.**— Leaves are used in *bakhar* to impart the characteristic colour of rice beer, especially in *haria* prepared for commercial purpose. Field studies reveal that the whole plant specially leaves and roots are also used in ethnomedicine. Entire plant is used in decoction as an anthelmintic, antirheumatic, diaphoretic, digestive, diuretic and febrifuge. It is a common ingredient in mixtures used orally to treat remittent fevers, gastric irritation, nervous depression and as a stimulant tonic. It is also used to treat jaundice and other liver problems, giddiness, flatulence, colic, constipation, bronchitis and even in leprosy.

**9. *Orthosiphon rubicundus*. (D.Don) Benth.**—

The root is used in *bakhar* as a main ingredient. This plant is widely used in traditional medicine to prevent different diseases such as diabetes, kidney stone, oedema, rheumatism, hepatitis, hypertensive and jaundice. The root is used to treat ringworm, and the leaf paste is also applied directly on affected areas. Some reports gathered during field study revealed its use as antidiabetic, anti-inflammatory, antioxidant and hepatoprotective substance.

**10. *Plumbago zylanica* L.** —The leafy branch of this species is used as the process enhancer during rice beer preparation. So it is used as an ingredient of *bakhar*. As reported by local medicine men it is very effective against indigestion, diarrhoea, piles, common cold and cough, bronchitis and chronic sinusitis. Paste of this herb is externally used to reduce skin inflammation, swelling, filariasis and various other disorders of skin. It is used to inhibit the growth of prostate gland causing urinary trouble. Root is used to increase appetite, stimulate digestive power, used as carminative, to cure the spleen enlargement. It also enhances the liver power and used as liver tonic. The root paste is applied externally on carbuncles, wounds and syphilitic ulcers. Leaves of this plant are capable for treating laryngitis and rheumatism of osteoarthritis and rheumatoid arthritis. The leaf extract is used for abortifacient and headache. This herb is not prescribed in pregnancy. Heavy dose of the crude drug may cause heavy periods.

**11. *Scoparia dulcis* L.** — In *bakhar* it adds to taste of the beverage. The field study reveals that the whole plant is used for treating a wide range of disorders including diabetes, herpes, coughs and colds, fevers, nausea, dizziness and as an antidote for snake bites. Traditionally it is used in analgesic, diuretic

and antipyretic, to treat gastric disorders such as diarrhoea and dysentery. Shoot of the species is used in digestive problems, pulmonary complaints, urinary troubles, mouth sores and fevers. The fresh or dried plants are used externally to treat a wide range of skin problems, including pimples, impetigo, ulcers, eczema, bruises and contusions. The whole plant is taken in low doses with milk to relieve vomiting in infants; while in higher doses it is used to induce vomiting to clear out the digestive system.

**12. *Stephania japonica*. (Thunb.) Miers.**—The tuberous root is used in *bakhar* as a preservative. In commercial preparation of *haria* it is used to preserve the brew for few more days. In ethnomedicine it is used in the treatment of diarrhoea & dysentery, gastritis, fevers, dyspepsia, hepatitis and urinary disease. The crushed leaves are applied in breast infections. Leaves are mounted on abscess, which helps in bursting. Leaves are macerated in a glass of water and are taken after mixing with molasses to cure urethritis. Root paste is warmed and rubbed in hydrocele to get some relief.

**13. *Terminalia alata* Heyne ex Roth.**— The bark of stem is used as the main ingredient of *bakhar*. Besides this the bark is used in some ethnomedicine, such as the boiled juice extract of bark is mixed with the leaf juice of *Ocimum basilicum* Linn. then used against injuries, bronchitis, and it also stops bleeding. The bark is used in traditional medicine against diarrhoea. The bark is used in ulcers, fractures, astringent, antidysenteric, antiasthmatic, bronchitis, expectorant, diuretic, liver cirrhosis, anaemia, diabetes and also capable of reducing fever.

**14. *Xanthium strumarium* L.** — It is one of the most important ingredients of *bakhar*. The whole plant is used in *bakhar*. Without this plant *bakhar* is not generally prepared. This

plant is also used in some traditional medicine practices like cooling, laxative, fattening, tonic, digestive, antipyretic, appetizer, diaphoretic, diuretic, antirheumatic and sedative. The alcoholic extract of the plant showed antibacterial, antimalarial and antifungal activities. The plant is used for its medicinal properties against cancer (Martin *et.al.* 1986), tuberculosis, wound, headache, rheumatism and abdominal pain (Fouche *et. al.* 2008).

#### CONCLUSION

It is evident from the study that *bakhar* acts as catalyst during preparation of *haria*, a popular rice beer in the tribal dominated areas of South-west Bengal. Almost all the ingredients of *bakhar* are used in ethnomedicine. *Haria* being a regularly used brew, its ingestion also leads to ingestion of many medicinal herbs. It is suggested that a series of microbial studies should be undertaken in future to study different microbial activities in *haria* induced by different ingredients of *bakhar*.

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