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Survey on Production, Marketing and Consumption of Gundpak: A Traditional Khoa Based Milk Product of Nepal

This study aims to explore a traditional technology of Gundpak production, marketing and consumption in Nepal. The major ingredients used for Gundpak production are Khoa, sugar, ghee and gum, while minor ingredients are dried fruits, nuts, watermelon seeds, battisa powder, Jesthalangwadi etc. The annual production of Gundpak in Kathmandu valley has been estimated approximately 579.1MT and sales about 550.4MT with a worth of NRs. 192.5 million. Mainly, there are two varieties of Gundpak named as normal and medicinal. Majority of Gundpak producers, sale their product in an open tray called Kisti. However, some manufacturers started to pack the product into plastic containers with varying sizes. The shelf-life may vary i.e. one week in summer and two weeks in winter at ambient condition. The market products were found inconsistent in chemical compositions and other quality characteristics. Therefore, there is an urgent need of process optimization as well as quality standardization of Gundpak production in commercial scale.

Keywords: Indigenous food, Gundpak, Production and sales, Sensory quality, Battisa powder and Jesthalangwadi

Introduction

Nepal is rich in different traditional and indigenous foods, among them milk-based products occupy the major volume of market share. Some major popular indigenous Khoa based milk products are Gundpak, Pustakari, Paneer, Khoa, Rasogolla, Lal Mohan, Peda, Burfi, Kalakand, etc. Normally, such types of products are produced by some organized dairies and shops of Halwai community. Amongst all, Gundpak and Pustakari are locally manufactured in a cottage scale especially in Kathmandu valley by a Newari community. Nowadays, the other community people are also involved in the production of such products. Gundpak was first manufactured in Asan, Kathmandu, since 1933 A.D. The term Gundpak was derived from the combination of two words Gund and Pakh (Gund means gum and Pakh means cooked).

The traditional dairy products such as Gundpak, Khawa, Sikarni and Tar are produced only in Nepal in the south Asian region (Aneja et al., 2002). The country people as well as the outsiders especially Indian tourists, who pay their visits to Kathmandu use to buy Gundpak as a souvenir or gift for their family and neighbors. Due to its nutritious and deliciousness the Gundpak is gaining popularity and the demand of product has been increasing day by day not only inside but also outside the country.

Nepalese Mithais (traditional sweets) have been developed to preserve the nutritional quality of milk and to extend its shelf-life under ambient condition. Milk based sweets are mainly prepared from Khoa (partially heat-desiccated milk) and Chhanna (coagulated milk after draining of whey). In

small city and big town the processing of sweets is done on a small-scale by the Halwai s (traditional confectioner), who are considered to be migrated from India from the immemorial time.

However, Gundpak prepared and sold in local markets greatly vary in their composition and nutritional quality. It is being a traditional product; there is no any specific recipe and process for making it. The selection of ingredients and production process varies from place to place and even family to family. They have their own logic on the quality characteristics (Acharya, 2008). The objective of this work is to find out the history of Gundpak production, existing production practice, and marketing and consumer preference of Gundpak.

Materials and Methods

A scheduled questionnaire was developed to collect the data of production and consumption of Gundpak in Nepal. The survey was conducted in the five districts viz. Kathmandu, Bhaktapur, Lalitpur, Banepa, Kavre (Banepa). The five respondents in each location were selected to collect the information regarding on personal views, knowledge and experience on Gundpak manufacturing, origin, the different ingredients used and their functions, recipe, methods of production, desirable quality characteristics and factors influencing them, production statistics, sales and marketing and storage practices. In this study, major focus was made to gather information from the persons, who involved in Gundpak production and selling in the market. The consumers are also selected on the basis of regular consumption of Gundpak. The data collected in the questionnaire were analyzed by using SPSS 13.0 for window software.

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Results and Discussion

Proximate composition of Gundpak

The following are the ranges of proximate composition of the some of the commercial samples of Gundpak.

Table 1. Proximate composition of a typical Gundpak

Parameters	Values (% dry basis)
Protein	10 - 16
Fat	16 - 30
Ash	2.6 - 3.6
Carbohydrates (by diff.)	29 - 55
Energy value (Kcal/100g)	330 - 360

History and nomenclature of Gundpak

According to Maskey (2009) (Owner of new Gundpak store at New Road, Kathmandu) his late grandfather Panna Lal Maskey was the first person to introduce Gundpak in Asan, Kathmandu in 1933 AD. He had used an edible plant gum (also called *Gund* in Nepali) for cooking sweets; he coined the term *Gundpak* (*Gund* means gum and *Pakh* means cooked). In fact, Panna Lal Maskey was inspired by his maternal uncle, who was *Baidhya* (Ayurvedic Doctor) to prepare *Ayurvedic* medicine especially for lactating women with incorporating different herbal and medicinal plants. Later on he incorporated those herbals and medicinal plants products into *Khoa* cooking with *Gund* and it is called *Gundpak*, which has a dual effect of nutritional as well as medicinal purposes.

Definition of Gundpak and its cultural importance

At first, Sharma (2007) attempted to define *Gundpak*; however, he did not mention sugar as a main ingredient and watermelon seeds as an essential raw material for decorative toppings. Therefore, *Gundpak* definition can be modified as a *Khoa*-based dairy product made by cooking the blend of *Khoa*, sugar, ghee and fried *Gund* in ghee with proper agitation and mixing of ground dried dates (*Chokada*), nuts (cashew nut, almond, coconut, pistachio) and spices (cinnamon, clove, small cardamom, large cardamom) followed by topping with partly fried watermelon seeds and dry grapes. Herbal plants powder may be added as an optional ingredient for the development of characteristic flavor and therapeutic value of *Gundpak*.

According to some persons, the product is beneficial to lactating women, healing of wounds, cure of hemorrhage and white discharge. It is also believed that the product is useful for curing of miscarriage baby in women, tired and fatigue persons working in fields, who consume it at nighttime before going to bed. In earlier times the product was made *Baidhya* by using different medicinal plants called *Battisapowder*, so it has high nutritional as well as medicinal value. But now, the different to the community also started its production without addition of such *Battisapowder* called normal *Gundpak*.

However, the product is now diverted to as simple sweets having high nutritional value but less therapeutic use.

Classification of Gundpak

There are different varieties of *Gundpak* available in the market. The varieties differ from place to place or community to community. The manufacturer has given the different name for *Gundpak* according to their way of mixing ingredients and tradition to manufacture and usefulness. Principally, there are two types of *Gundpak*. Among the respondents ($n=180$), the 45 % respondents have no idea about the varieties of *Gundpak*; 44.4 % was noted normal *Gundpak* found in the market. Similarly 1.1, 2.2 and 7.2 % were noted *Sutkeri*, spiced and medicinal, respectively.

Normal Gundpak: It is prepared by using *Khoa*, sugar, ghee, *Gund*, coconut and dry date powder and watermelon seeds. In normal *Gundpak* no *Battisapowder* has been added.

Medicinal Gundpak: It is intended to use for women during pregnancy and lactating period. In some places, it is also called *Sutkeri Masala* or *Mishripakh* (In Newari: *Phakubansapakh* or *Pokhunajwala* or *Mishripakhjwala*). In the other word the *Sutkeri* medicine also called *Battisapakh*. It is somewhat different in ingredient composition to that of *Sutkeri masala*. The *Battisapowder* and *Jesthangwadi* are added to manufacture the *Sutkeri* or medicinal *Gundpak*. The proportion of addition may vary from manufacturer to manufacturer.

Production technology of Gundpak

Major Ingredients and their functions

The major ingredients for *Gundpak* are *Khoa*, sugar, gum (*Gund*), which are described as follows.

Khoa: The term refers to a traditional milk product originated in India, Nepal, Bangladesh and Pakistan. The importance of such milk products have been recognized since *Vedic* times (about five thousand years ago). Recently, the method of production technology of such indigenous product has been studied on scientific basis (De, 1983b). Traditionally, such indigenous dairy products have been manufactured in *Halwai* shops and small dairy business (Patel, 1991). Consequently, there is a large variation in the quality of final products and storage stability (Patel, 1991; Suresh and Jha, 1994). *Khoa* is used as a base material for manufacturing the different sweets (Rajorhia, 2002). It contains several nutrients such as protein, fat, lactose, minerals. It gives consistency, firmness of body and improves the palatability of the product.

According to the PFA rules (1976), *Khoa* is the product obtained from cow or buffalo (even goat or sheep) milk or a combination thereof by rapid evaporation. It is directly consumed as a delicious and nutritious food. Buffalo milk is usually preferred than cow milk for *Khoa* making, since the

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form gives the greater yield and has a more desirable flavor, body and texture. *Khoa* is a product of great commercial importance as it forms an important base material for the preparation of varieties of indigenous milk sweets such as *Burfi*, *Peda*, milk cake, *Gulabjamun* etc., throughout the country (Rajorhia, 2002). It is also prepared and consumed domestically in hilly region of Nepal.

Khoa has a low shelf-life (three days during summer and six to seven days during winter) due to unhygienic preparation and handling, lacking of cool chain, high water activity and high protein and lacking of protective packaging. Since, it is not legally permitted to add any chemical preservative in *Khoa*, it is necessary to maintain a cool chain preferably around -2°C during storage and shipping (Rajorhia, 2002). For packing of *Khoa* as a coated film, laminates with aluminum foil, five layer co-extruded films and metalized polyester/polypropylene etc., with desired functional properties can be recommended for alternative packaging materials depending upon the expected shelf life and marketing requirements. For export marketing of *Khoa*, the use of milk of excellent quality produced hygienically followed by instant chilling is considered essential (Rajorhia, 2002).

Browning of *Khoa* might result to decrease the consumption of products due to poor palatability, appearance, destruction of essential amino acids and vitamins as well as loss of biological value and digestibility. Browning may also produce some toxic substances and metabolic inhibitors (Gordon and Kalan, 1987; Gothawala and Bhavadasan, 1992). In milk products active sulphhydryl groups serve as natural inhibitors in heat induced browning. However, such browning could be controlled in dairy products by limiting heat treatment (i.e. indirect heating system), moisture content, time and temperature of heating and storage condition (Nickerson, 1987; Ragendra *et al.*, 1991).

The chemical analysis of *Khoa* showed moisture content, fat, protein, carbohydrate, total solid and ash as 24.8%, 31.23%, 20.2%, 20.36%, 75.2% and 3.4% respectively. Likewise the pH, acidity and free fatty acid were found to be 6.42%, 0.198%, and 0.10% respectively (Agrawal, 2004).

Ghee: It is a clarified butter fat obtained from cow or buffalo milk. It is used in *Gundpak* as an ingredient in small quantity because *Khoa* itself contains a sufficient quantity of fat. Now a day, some manufacturers also use vegetable ghee instead of animal ghee. However, the product could be inferior.

Sugar: It is normally added to give the taste, color and body to the product. It is responsible for giving characteristic brown color and pleasing aroma (Miller, 1998).

Misri (Sugar crystal): Candy is related to the Sanskrit word as *Khanda*, which means the piece of sugar lump (Aneja *et al.*, 2002).

Edible gum (Gum Arabic): Gum Arabic or gum acacia locally known as gum *Hashab* is the most widely used and traded

as water soluble gum. Gum Arabic is produced by *Acacia Senegal*, but gums obtained from other *Acacias* are also sometimes referred to the same name. There is a tendency by Indian authors, to specify *Acacia Arabic* as the source of gum Arabic. There are more than 120 other *Acacia* species that have been shown to differ greatly from gum arabic in terms of chemical composition and structure (Anonymous, 2010).

Gum Arabic introduced in medieval Europe through Arab, hence the name termed as gum Arabic. Its organized trade started in Sudan in 1820, which still dominates the world gum Arabic production to the extent of 70-80%. Other gum Arabic producing countries are Chad, Senegal, Nigeria, Tanzania, Mali and Mauritania. It is exported as a primary product to industrial countries, mainly Western Europe and the USA (Anonymous, 2010).

Edible plant gum powder/grit in a plant or tree of *Acacia* is used as a binder in the preparation of *Gundpak*. The materials obtained from plant gums are *Tragacanth*, *Karaya*, gum Arabic and gum *Ghatti*. The principal compounds are α -D-glucose, D-xylose, galacturonic acid, α -D-arabinose, D-galactose, rhamnose (mixed Ca, Mg and K salts) (Ranganna, 1986).

Minor ingredients

The minor ingredients for *Gundpak* preparation are fruits, nuts, watermelon seeds and different spices, which are described as follows.

Dry fruits and medicinal plant products: The different dry fruits and herbal products can be used for the preparation of *Gundpak*, such as dry grapes, coconut, date, cashew nut, almond, pistachio, small and large cardamom, seeds (Ash gourd, Cucumber and Water melon), and spice powder.

Almonds (Badam): It has extensive use in various forms in different traditional Indian milk products like *Kheer*, *Burfi* and confections. It has a high nutritive value and provides a typical flavor and richness to food products. They are mostly used as a minor ingredient to bring desirable aroma, flavor, crispness, tenderness, rich color to serve or garnish (Aneja *et al.*, 2002). These are mainly consumed for their cooling and health-promoting qualities. Similarly, almond *Burfi*, made from almond paste, sugar and *Khoa*, is a connoisseur delight. It is served on special occasions. Broken or slivered nuts are used mainly to garnish dairy products like *Kheer*, beverages, sweets and frozen desserts (Aneja *et al.*, 2002). It is used as an ingredient for *Gundpak* production.

Kaju (Cashew nut): These are kernels of dry seeds of *Anacardium occidentale* curved in shape of the letter C. The unprocessed nut gives a taste of starchy with the characteristic flavor of cashew. It is dried and sometimes smoked to give a shelf-life of 6 to 7 months, when kept in dry. Cashew seeds are picked when fully ripe or after falling to the ground. Cashew kernels are extracted from cashew nuts by roasting, shelling and peeling (Aneja *et al.*, 2002).

Dried coconut kernel: The presence of more than 6-7% of sucrose is an indication that sugar has been added. Protein content of dried coconut is about 6%, unavailable carbohydrate content about 18%, crude fiber about 4% along with some mineral contents (Aneja *et al.*, 2002).

Pistachio (Pista): Because of its characteristics flavor and nutritive value, it can be used in appreciable amounts in the manufacture of milk based sweets and frozen desserts. It contains 20% protein, 53% fat, 15% sugar, 6.1% moisture, 3.1% fiber and 3.1% total ash. It also contains most of the vitamins like vitamin A, and B₂ are in appreciable quantity. One hundred of pistachio generates 630 Kcal. It has rich buttery flavor and vivid green color provide exceptional flavor, texture and color to many food products. Pistachio is used as a natural thickener, emulsifier and binder too. As a heavy cream replacer, it can help to reduce saturated fats and eliminate cholesterol in confections. Kernels can be used in whole, dried, sliced and silvered forms (Aneja *et al.*, 2002).

Walnuts: Walnuts are a good source of several vitamins including thiamin, vitamin B and folacin. They are naturally low in sodium and carbonate substantial amounts of dietary fiber. They contain no cholesterol as they are high in unsaturated fats. Walnuts are used in many indigenous dairy products. They add a slightly bitter taste that contrasts well with the sweetness of dairy products. They also make excellent toppings by giving of unique crunch and the desired mouth feel to the consumers (Aneja *et al.*, 2002).

Raisins (Kishmish): The word raisin comes from the French word *raisin* meaning dry grape. In the present context, raisin refers only to the seedless dry grape, produced by natural shaded drying of grapes. Raisins are very sweet, small, round plump and light brown in color with a coat of natural bloom. Raisins are extensively used in India to prepare various sweets and bakery products, whereas *lexiors* (monakka, dry seeded grapes) are used in Ayurvedic medicines (Aneja *et al.*, 2002). It has been used for the decorative toppings in *Gundpak* production.

Small cardamom: It is used in most of the indigenous milk products like *Kheer*, *Payasam*, *Phirni*, *Burfi*, *Peda*, *Gulabjamun*, *Sandesh*, *Shrikhand*, etc., to impart flavor and enrich taste. Large cardamom can also be used in the substitution of small cardamom. It provides taste, aroma or flavor to the products (Aneja *et al.*, 2002). It gives the characteristic flavor and taste to the *Gundpak*.

Battisa powder: The *Battisa* powder contains locally available medicinal and herbal plants together. It is incorporated to make special kind of *Gundpak* suited for pregnant and lactating women. It is also claimed that herbal *Gundpak* possess beneficial or curative effect to the women who have health problems like white discharge, excessive bleeding, pain in lower abdomen, miscarriage, etc. So, it has been used not only as food but also as *Ayurvedic* medicine. The amount of *Battisa* powder mixed in *Gundpak* production varies from producer to producer. The different herbal plants with their botanical and *Sanskrit* names used in the *Battisa* powder preparation are given in Table 2.

Table 2. Locally available medicinal plants used in *Battisa* powder

S.N	LN=Local name ^a SN=Sanskrit name ^d	English name ^b	Botanical name ^c	Parts used ^e
1	LN=Amala SN=Adiphala, Amalaki	Emblic myrobalan Gooseberry	<i>Phyllanthus emblica</i> Linn. <i>Emblica officinalis</i> Gaertn.	Fruits
2	LN=Arjun SN=Arjunah, Kakubhah	Arjun	<i>Terminalia arjuna</i> (Roxb.) <i>Pentaptera arjuna</i>	Bark
3	LN=Ashwagandha* SN=Varahkarni, Asvagandha	Winter celery	<i>Withania somnifera</i> Linn. Dunal	Roots, leaves, fruits and seeds
4	LN=Baayubidanga SN=Vidangah, Vellah	Embelia	<i>Embelia ribes</i> Burm. F. <i>Embelia tsjeriam cottam</i> <i>Embelia robusta</i> Roxb.	Fruits
5	SN=Barro SN=Aksha, Anilaghna	Belliric myrobalan Bustard myrobalan, Bedda nuts	<i>Terminalia bellirica</i>	Fruits
6	LN=Bel SN=Bilva shreephal	Bel tree, Bengal quince	<i>Aegle marmelos</i> (Linn.) correa	Roots, leaves and fruits

7	LN=Bhringaraaj SN=Bhringarajah Tekarajah	Trailing eclipta	<i>Eclipta prostrata</i> <i>Eclipta alba</i> (Linn.) Hassk. <i>Wedelia calendulacea</i> Less <i>Wedelia chinensis</i> (Osbeck) Merrill	Whole plant
8	LN=Daalchini* SN= Tvak, Chocham,	Cinnamon	<i>Cinamomum zeylanicum</i> Blume	Bark and oil
9	LN=Gurjo or Gudchi SN=Amritavalli,Guduchi,	Heart leaved moonseed	<i>Tinospora sinensis</i> (Lour.) Merrill	Leaves, steam, roots
10	LN=Gokhur SN=Gokshura,	Calthrops	<i>Tribulus terrestris</i> Linn.	Whole plant
11	LN=Ikshugandha LN=Harro	Chebulic myrobolon Black myrobolon	<i>Terminalia chebula</i> Retz	Fruits
12	LN= Jethi madhu SN=Yastimadhuh, Madhukah	Liquorice	<i>Glycyrrhiza glabra</i> Linn.	Root
13	Jira*	Cumin	<i>Cuminum cyminum</i> Linn.	Fruits and seeds
14	LN=Jwaanu* SN=Ajmoda, Yavani	Ajowan, Lovage	<i>Trachyspermum ammi</i> (Linn.) Sprague	
15	Kaafal	Box myrtle, Bay berry	<i>Myrica esculenta</i> Bush.	Bark
16	LN=Kaauso SN=Adhyunda Atmagupta Kapikachhu Shukhashimbha	Common cowitch	<i>Mucuna nigricans</i> (Lour) steud. <i>Mucuna imbricate</i> DC. <i>Mucuna pruriens</i> Linn. <i>Dolichos pruriens</i> Linn.	Watery sap of the stem
17	Kachur	East India arrowroot Zeodary	<i>Curcuma angustifolia</i> Roxb. <i>Curcuma zedoaria</i> Rosc.	Rhizome Rhizome
18	LN=Koiraaloo SN=Kachnar, Kovidarah	Mountain ebony, Variegated bauhinia	<i>Bauhinia variegata</i> linn. <i>Bauhinia candida</i> Alton.	Root and bark
19	LN=Kurilo/Sata SN=awarSatawari, Abhiru	Wild asparagus	<i>Asparagus racemosus</i> Willd	Tubers
20	LN=Majitho SN=Manjistha, Yojanavalli	Madder	<i>Rubia manjith</i> Roxb. Ex fleming	Root
21	LN=Marich SN=Maricham	Black pepper, Pepper	<i>Pipper nigrum</i> Linn.	Fruits
22	LN=Naagakeshar SN=Nagapuspah, Nagakesharah	Iron wood tree	<i>Mesua ferrea</i> Linn.	Bark, leaves, Flowers & oil
23	Naagarmoothe		<i>Cyperus scariosus</i> R. Br.	

23	Naagarmoothe			<i>Cyperus scariosus</i> R. Br.	
24	LN=Paasaanved Pakhan bedh SN=Pasanved	or	Rockfoil Coelus	<i>Bergenia ciliata</i> <i>Coleus forskohlii</i> briq <i>Coleus barbatus</i> (Andrews) <i>Benth</i>	Rootstock
25	LN=Pipalaa* SN=Granthika, Magadhi		Long pepper	<i>Piper longum</i> linn.	Roots and fruits
26	LN=Punarnavaa SN=Punarnava, Sothagni		Spreading Hogwood	<i>Boerhavia diffusa</i> Linn.	Whole plant
27	LN=Sataawar/ Bankurilo SN=Satawari, Abhiru		Wild asparagus	<i>Asparagus racemosus</i> Wild.	Tubers
28	Shankhapuspee		Butterfly pea	<i>Clitoria ternatea</i> linn. <i>Jernatea vulgaris</i> Humb.	Seeds, roots and root bark
29	LN=Simal SN=Mocha, Kantakdruma		Red cotton tree	<i>Bombax cieba</i> Linn.	Flower
30	LN=Sutho* SN=Adrakam		Ginger	<i>Zingiber officinale</i> Rosc. <i>Amomum zingiber</i> linn.	Rhizome
31	LN=Tej pat* SN=Tamalpatra		Indian cassia lignea	<i>Cinnamomum tamala</i> (Buch. – Ham.) Nees and Eberm <i>Cinnamomum albiflorum</i> Nees	Roots, Leaf
32	Thulo okhati	-		<i>Astilbe rivularis</i> Bush	Rhizomes

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Recipe for Gundpak

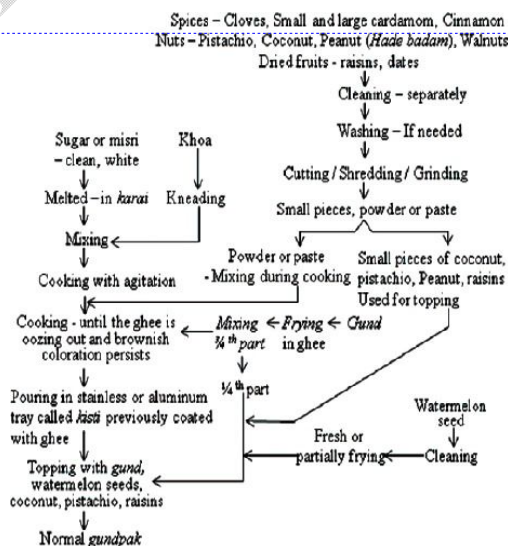
According to the different producers, a general recipe for Gundpak production is given in Table 3.

Table 3. General recipe of Gundpak

Ingredients	Parts
Khoa	100
Sugar	30-35
Ghee	5-10
Gund(gum)	1-5
Fruits, nuts and spices	5-10

Along with this recipe, the fruits like dry dates, dry grapes and nuts like cashew nut, coconut, ground nuts, pistachio, and spices like large cardamom, cinnamon, clove, cinnamon bark etc are used in different proportions.

As per the opinion of some manufacturers, the traditional Gundpak production process is given in the Figure 1. They do not follow the same procedure all the times. The recipe used depends on availability of raw materials so manufacturers interest.



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Figure 1. Flow-chart for the traditional production method of normal Gundpak

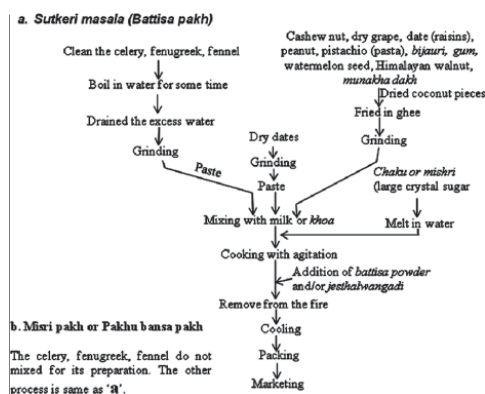


Figure 2. A traditional method for the preparation of Sutkeri masala and Mishri pakh medicinal Gundpak

For the preparation of medicinal Gundpak the same process is applied as normal Gundpak except that Battisa powder and Jeshthalangwadi powder are mixed during cooking. The composition of Battisa powder and Jeshthalangwadi is given in Table 2 and 4 respectively.

Table 4. Medicinal and herbal plants included in the preparation of Jeshthalangwadi

S.N.	LN=Local name SN=Sanskrit name	English name	Botanical name	Parts used
1	LN=Alainchi SN=Aindri, Sithulaela	Large cardamum	<i>Amomum subulatum</i> Roxb.	Fruits and seeds
2	LN=Ashwogandha SN=Asvagantha, Varahkarni	Winter cherry	<i>Withania somnifera</i> (Linn.) Dunal	Roots, Leaves, fruits and seeds
3	LN=Bhringaraj SN=Bhri ngaraj, Tekaraj, Pitab hringaraj, Pitabringa	Trailing eclipta	<i>Eclipta prostrata</i> (Linn.) <i>Eclipta alba</i> (Linn.) Haask.	Whole plant
5	LN=Chandan (Shreekhanda) SN=Srikhandam	Sandalwood	<i>Santalum album</i> Linn.	Heartwood
5	LN=Jaifal/Jaipatree SN=Jatip halah	Nutmeg	<i>Myristica fragrans</i> Houtt.	seeds
6	LN=Kankol (Thulopila) SN=Kankolam	kenard Java	<i>Nardostachys grandiflora</i> DC. <i>Nardostachys jatamansi</i> DC	Roots and rhizome
7	LN=Krishna Jirak/Jhusetil	pepper	<i>Piper cubeba</i> Linn. f.	Dried unripe berries
8	LN=Kush/Usir SN=Darbha, Yagyika,	Black niger	<i>Guizotia abyssinica</i> (Linn. f.) Cass.	Seed oil
9	LN=Marich SN=Maricham	Sacrificial grass	<i>Desmostachys bipinnata</i>	Whole plant
10	LN=Mungrelo SN=Krish najira	Black pepper	<i>Piper nigrum</i> Linn.	Fruits
11	LN=Nilo Kamal	Black cummin	<i>Nigella sativa</i> Linn.	Seeds
12	LN=Rukh Keshar SN=Nagapuspa, Nagakesharah	Blue water lily	<i>Nymphaea stellata</i> Willd.	Whole plant
13	LN=Sukmei SN=Ela, Truthi	nwood tree	<i>Mesua ferrea</i> Linn. <i>Mesua nagasarium</i> (Burm. f.) Kosterm	Bark, Leaves, flower and oil
14		Small cardamum	<i>Ellettaria cardamomum</i> Maton	Seeds

(Source: Anonymous, 2007)

Technology of medicinal Gundpak

The main recipe for Gundpak is Khoa and others are sugar, ghee, cashew nut, dry grapes, edible gum, Battisa powder, Jeshthalangwadi, Gund, watermelon seeds, etc. According to Shrestha (2009), the following technologies are normally used for preparing Gundpak in Patan, Mangal Bazar.

Some manufacturers used greater number of medicinal plants as per the availability and known effect (Table 4).

Jeshthalangwadi: It is another type of powder made by mixing of different medicinal and herbal plants and used to prepare medicinal (Sutkeri) Gundpak (Table 4).

Equipment and accessories: Equipments used for the production of Gundpak are iron open pan (Karai) or open kettle, frying pan, stirring ladle, spoons, stoves, trays (aluminum or stainless steel), knife, balance, thermometer (0-200°C), disposable plates, etc. However, simple Karai, ladle, stoves are used in traditional method.

Cooking fuel: The cooking fuels are wood, kerosene stove, diesel stove, gas stove. Its production is mainly concentrated in the urban area because of scarce of wood, nowadays majority of producers use gas stove.

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Consumption pattern of Gundpak

Demographics of the respondents, who consumed Gundpak regularly, are presented in the Table 5.

Table 5. Consumption pattern of Gundpak according to religion, age and sex

(Respondents, n=180)			
Demographics	%	Demographics	%
<u>Age group</u>		<u>Caste/Tribe</u>	
15-35	83.3	Newar	70.6
35-55	13.9	Brahmin	15.6
55-75	2.8	Chettri	6.1
>75	0.0	Limbu and Rai	3.3
		Choudhary/Berma/Yadav	3.3
		Mangar	1.1
<u>Gender</u>		<u>Religion</u>	
Male	82.8	Hindu	83.3
Female	17.2	Buddhist	12.2
		Muslim	2.8
		Christian	1.7

Quality attributes of Gundpak

Texture/body: According to the respondents' opinion, a soft texture Gundpak was highly preferred in different locations. The sugar, milk protein and fat are the main constituents, which greatly influence on the texture of Gundpak. The consistency of Gundpak is also affected by Gunda, nuts and fruits. The texture mainly affects mouth feel, which is affected by sugar, Gunda, spices, herbs, fruits and nuts that are used in its manufacturing.

According to the survey result, 54.4% of respondents preferred a semi-soft textured Gundpak. In other hand, soft, semi-hard and hard were preferred by 28.9, 16.7% and none respondent respectively.

Among the respondents (n=180), 36.7% was noted that sugar was the main ingredient contributing the texture, whereas 28.9% noted that was contributed by Gunda. Other ingredients that contributing the texture quality were noted as ghee, beaten rice, Khoa at 32, 16, 12 and 2 % respectively.

Appearance/Color: The color of Gundpak is developed

naturally during cooking as noted by 52.2 % of the respondents (n=180), whereas 34.4% reported that the color was developed by sugar. Some respondents (10 %) noted that the color/appearance were due to the artificially added

color, whereas 3.3% was noted protein is responsible for color development in Gundpak.

Mouth-feel/Palatability: Ghee generally increased the palatability of the product. The palatability is important characteristics of Gundpak. Different ingredients used could impart on the palatability of product. According to the respondents (n=180), the palatability of Gundpak was

influenced by ingredients used such as ghee, sugar, Gunda, spices/nuts, and flavor in percentage of 38.9%, 23.3%, 16.7%, 11.1% and 10 % respectively. A 90 % of respondents noted that, no any substance added for color, whereas 8.9 % respondents noted that the added substance is responsible for color. However, about 1.1% respondents were unknown about it.

Taste/Flavor (odor/smell) : As per the survey data (respondents, n=180), the sugar and ghee were found to be the major ingredients contributing (51.1 %) for taste and flavor of the product, whereas it is noted that Khoa, spices & nuts and sugar contributed to 33.3 %, 10 % and 5.6 % respectively.

Storage and shelf-life of Gundpak

Among the respondents (n=180), 64.4 % of respondents reported that the shelf-life of Gundpak during summer season was one week, whereas 38.3 % was reported two weeks in winter. Similarly, the shelf-life of Gundpak was reported for three, four and six weeks in winter by respondents of 27.8%, 23.9 % and 10 % respectively. Therefore, the survey data clearly showed that the shelf-life of Gundpak in summer is one week and 2 week in winter.

Consumption pattern based on age or group of respondents

According to the respondents (n=180), 65.6% of respondents were agreed that all demographic pattern such as sex, age and groups are preferred Gundpak. Respondents at the percentage of 15.6%, 7.8%, 6.7%, 3.3% and 1.1% reported that Gundpak is preferred by other groups such as children, old, adult, very old and adolescent respectively.

Table 6. A survey data for Gundpak production in Kathmandu valley Municipality

Location	Annual production (MT)*
Kavre	6.5
Bhaktapur	9.9
	9.5
Kam	19.9
albinayak Tauma	20.1
di Nawadurgaha	23.7
II Suryabinayak H	89.6
alwai's shops	10.4
Sub-total	15.9
Madhyapur Thimi	2.1
Nagadesh	3.4
Gatthaghar	
Halwai's shops	
Sub-total	15.9
Kathmandu	207.3
	24.3
	16.7
Tahachal	
Naradevi	
Agar	
Nyabaneswar	28.4
Halwai's shops	32.7
Sub-total	325.3
Lalitpur	79.7
	20.4
Chappagaun L	24.6
agankhel Manga	23.6
I Bazar Halwai's	
shops	
Sub-total	148.3
Grand total	579.1

*The production data are mean of five respondents in each location

UNDER PEER REVIEW

Production and sales volume of Gundpak

A tentative production and sales volume of Gundpak in Kathmandu valley is presented in Table 6 and 7 respectively.

From the data of total production and selling, it has been found that there is a deficit in selling at amount of 21.6 MT annually, which might be due to local consumption and sales of the product.

Table 7. Tentative sales volume of Gundpak at different locations of Kathmandu valley

Kavre	Annual Sales (MT)*
Banepa (Halwai's shop)	5.4
Bhaktapur	
Kamalbinayak	20.3
Taumadi	23.8
Suryabinayak	14.5
Nawa Durga Hall	6.7
Datta Traya Halwai's shop	9.5
Sub-total	80.2
Madhyapur Thimi	
Nagadesh	26.9
Gattaghar	1.7
Sub-total	28.6
Lalitpur	
Lagankhel	22.5
Mangal Bazaar	16.6
Patan Dhoka	1.5
Sub-total	40.6
Kathmandu	
New Road	225.9
Asan	31.9
Naradevi	25.3
Nayabuspark	24.2
Nayabaneswor	10.5
Maitidevi	6.7
Kalanki	47.1
Gausala	5.2
Koteswor	3.7
Kalimati	7.8
Machhapokhari	1.3
Tripureswor	3.8
Sundhara	7.6
Sub-total	401
Grand total	550.4

*Data are the average of five respondents in each location

Effect of seasons and galas

In the previous days Gundpak was mainly produced and sales in the winter because of its storage problem. However, it is produced and sold throughout the year. According to the survey report, the sales of Gundpak was found exceptionally high in different galas like *Matatirtha Aunshi* and *Kushe Aunshi*, *Teej*, *Dashain* and *Tihar*, etc.

Conclusion

Gundpak is a popular traditional *Khoa* based milk product produced at cottage scale in Kathmandu valley of Nepal. Some varieties of Gundpak can also be taken as a functional food. *Khoa* is a major raw material for Gundpak production and the amount of *Khoa* sold in the Kathmandu valley was approximately equal to 5.4 million kg per year and its cost around to NRs. 1450 million. About 30-35 % of *Khoa* is used for Gundpak production and remaining is used for other sweets. In this survey, the production and sales of Gundpak in different locations of valley was investigated by developing the pretested questionnaire. Still the majority of producers are found to be selling their products in open trays called *Kisti*. Nowadays, there is a development in trend to package the Gundpak into LDPE and HDPE trays having capacity of half to one kilogram. According to the producers and sellers, the self-life of the products depends on seasonal variability. Additionally, the survey data revealed that it has a shorter shelf-life i.e. one week for summer and two weeks for winter season. From this study work the following recommendations could be drawn for further scientific study.

- Optimization of ingredients and process for Gundpak production
- Study on the shelf-life of product under the suitable packaging materials
- Consumers health safety and risk analysis for such a dairy products
- Detail analysis of micro-nutrients as well as other functional properties e.g. amino acids profile, vitamins, fatty acid profile, minerals and any other functional properties of Gundpak

Glossary of local terminology

Baidhya-A person, who is involved in the treatment of patients by using herbal medicine

Battis powder-Agrinded powder consisting of 32 medicinal and herbal plants mixed together in different proportions

Dashain-Hindu's greatest festival

Halwai-an ethnic community, who are involved in making sweets traditionally as their profession,

Jamara- Tender shoots of barley or other cereal grains sprouted in dark place, which is golden yellow in color and offered with *Tika* on the occasion of *Dashain* by Hindu people as blessing of goddess Durga.

Karai-a frying or cooking vessels made up of iron or aluminum

Khoa-a concentrated milk product

Kisti- a tray made up of metal like aluminum, iron, and stainless steel

Masala-Powder of some medicinal plants

Matatirhaaunshi and Kushehaunshi- Similar to mother's and father's day

Misri-Sugarcandy, large crystals formed on a string

Newari-an ethnic community of Nepal

Pakh - in Newari it means cooked

Pakhunajwala or Pakhubansa - Medicinal or *Sutki* *Gundpak* cooked with *Mishri* and other ingredients

Sutki - Women just after giving birth to the baby

Teej-Teej festival is an important festival for married Hindu women and much anticipated monsoon festival

Tihar-A second greatest festival of Nepal also known as *Dipawali* means festival of lighting

Tika-A mixture of rice with curd and red color (*Abir*), which is put on forehead by elders or respected persons as blessings of god Durga.

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