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Traditional and rural manufacturing process of black salt

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Abstract

Black salt is an important condiment in the kitchen, which have a lot of ayurvedic properties for health benefits. Black salt are manufactured in the kiln from a long period of time. Technically its involve a thermal process in which white nuggets of salt with some ayurvedic ingredients converted in to black salt on a very high temperature (800-850 °C). The manufacturing of black salt is a very laborious and time consuming work. Some cheapest harmful chemicals may be adulterated in raw while salt and change the colour and taste of it as similar to black salt, but these types of salt are very dangerous for human being. Food regulating authority of India strictly monitors the manufacturing and marketing of black salt.

Keywords: Black salt, manufacturing, health benefits & adulteration

Introduction

In the living world the minerals play a vital role for several biological processes. On an average 54 percent of adult human body is fluid in which minerals are as electrolytes acting at the cell membrane, which permits transmission of electrochemical impulses in nerve and muscle fibers and also control the activity of different enzymatically catalyzed reactions that are necessary for cellular metabolism. Black Salt is a crushed form of fired salt with a strong sulphur smell and taste reminiscent of hard-boiled eggs. It is used extensively in Indian cooking, vegan diets and naturopathic remedies. Traditionally, the black salt was transformed from its relatively colorless raw (nugget of salt) natural forms into the dark black coloured commercially sold *kala namak* through a reductive chemical process that transforms some of the naturally occurring sodium sulphate of the raw salt into pungent hydrogen sulphide and sodium sulphide. Manufacturing process of black salt done within a kiln or Furness, where raw salt is heated, melted and converting into black salt. Raw salt mixed along with small quantities of harad seeds, amla, bahera and babul barks. The fired salt is then cooled, stored, and aged prior to sale. Kala namak is prepared in this manner in northern India. The salt crystals appear black and are usually ground to a fine powder that is pink.

Materials and Method**Equipments & Raw materials for black salt production**

Earthen pot is the basic indigenous equipment required for black salt production; white nugget salt (Including harad seeds Big & Small), amla, bahera or babul bark and Nosader) and Almond shell (for colour enhancement), all these ingredient should be mixed properly in a specified ratio. The losses of ingredients in black salt production are calculated 5 percent

Table 1: Ingredient ration of black salt (in 100 kg)

Sr. No.	Ingredients	Composition
1	white nugget salt	95 kg
2	Harad seed (small)	300 gm
3	Harad seed (big)	500 gm
4	Nausadar (ammonium chloride)	200 gm
5	Amla	600 gm
6	Bahera	400 gm
7	Almond shell	3 kg

Sources: Production site

Manufacturing site: The production unit of black salt is situated in rural area of district

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Meerut (Village - Kazamabad Goon - 250205). Horizontal kiln in the earth are used for black salt production

In horizontally kiln; there are several unite operations are involved for black salt manufacturing. These unit operations are listed below

1. Mud pots manufacturing unit
2. Preparation of kiln for specific size and capacity
3. Firing materials (Coal)
4. Mixing of salt and other ingredients
5. Heating of white nugget salt into mud pot at higher temperature
6. Breaking the fired black Salt pot and categorized the black salt accordingly
7. Black salt packaging and storage.

All of the unit operations are performed separately as discussed in brief

Mud pots manufacturing's unit

It's an optional unit operation, some manufacturer purchases ready to use mud pots for black salt production, while large black salt producer have their own pots making unit. On an average dimension of pots are: height (15-16 inches), mouth size (4.5-5.5 inches), diameters (44-46 inches), and salt capacity 35-40 kgs. Black soil may be good packaging materials for pots making, because of its textural property.



Fig 1: Dimensions of pots used in black salt manufacturing

Preparation of kiln for specific size and capacity

Horizontally types kiln in the earth are so many different size and capacity. Small scale manufacturers have the kiln capacity of 15 pots, but kilns capacity varies according to the production capacity of manufacturer such as 18 pots, 21 pots, 24 pots, 27 pots, 39 pots, 41 pot and 45 pots.



Fig 2: Kiln arrangement

Firing materials (Coal)

Mainly coal is used as firing materials but some manufacturer use cow dung, mixture of coal with molasses (known as *Tikkli*). *Tikkli* is the cheapest substitute for heat production,

but it has low thermal capacity as compared to coal materials. In the kiln the first layers are arranged of coal, then second arranged with cow dung then third one arranged with coal, after that mud pots are hold on this firing materials and starts black salt manufacturing process. On an average 12-14 hours firing is required for making a good quality of black salt, if heating will be low or for a short period of time, then crystal will made low and semi crystal will obtain in higher proportions, Therefore, long heating (firing) are suggested for making good quality of black salt.



Fig 3: Firing materials used in black salt manufacturing

Mixing of salt and other ingredients

Nuggets of white salt are mixed with a specified amount of herbal ingredients, which gives the ayurvedic property to black salt. Triphala consist of three fruits ingredients including Amalaki (*Embolica officinalis*), Bibhitaki (*Terminalia bellirica*), and Haritaki (*Terminalia chebula*). Babul Bark is the main fourth ayurvedic ingredients, which are used for black salt manufacturing.



Fig 4: Ayurvedic Ingredients in black salt

Heating of white nugget salt into mud pot at higher temperature

This process starts at morning because of white salt melting point is nearly 801°C and it required a very high thermal energy (heat), Once kiln start firing, after then mud pots start heating and filling up with white salt and ayurvedic ingredients. During black salt manufacturing the heating temperature arise upto nearly 800-1000°C, One cycle of black salt manufacturing takes 18-24 hours, after that it takes one night cooling time.



Fig 5: Heating of salt

During research work, after 15:30 hours, hot fired pots are left for cooling to overnight, next day the pots are break and black

salt are categorized according to the quality. In Table No. 01, the duration and time required in black salt production is demonstrated.

Breaking the fired black Salt pot; and categorized the black salt accordingly

When kiln pot cooled its breaks with the help of hammer and categorized according to the quality of black salt such as crystal, semi crystal and outer mixture.

- Crystal:** Crystal is the first grade of black salt, which have the core materials of the fired pots. Bright colour, crystal type's texture and appearance are the identity of this salt.
- Semi crystal (Dana):** it contains the second outer part of core black salt pots. It's have some low market value as compared to crystal black salt.
- Outer mixture (Rodi):** Rodi has outer part of black salt pots, it contains some impurities of earthen materials, and this type of black salt has some large pieces size and dull appearance. It's have very low market value as compare to crystal black salt.

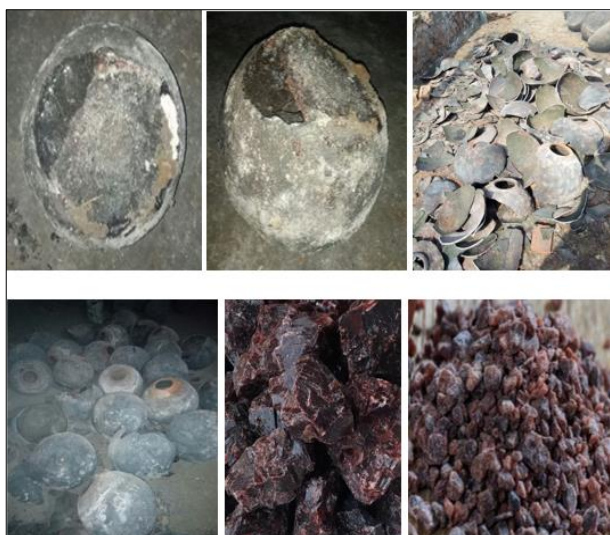


Fig 6: Black salt

Black salt packaging and storage

After grading, milling process start, some manufacturer trading without milling, while some deals with powder of black salt, it's a matter of choice, profit, and available facility.

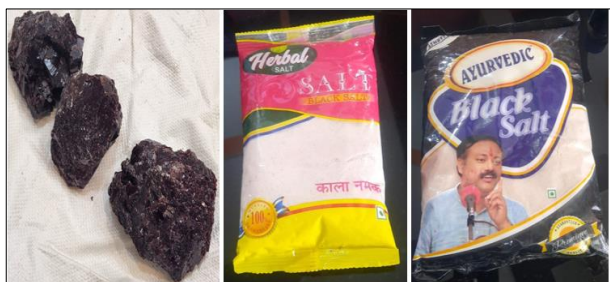


Fig 7: Black salt packaging

Composition

Kala namak mainly contains sodium chloride with trace impurities of sodium sulphate (Na_2SO_4), sodium bisulphate (NaHSO_4), sodium bisulphite (NaHSO_3), sodium sulphide (Na_2S), Iron sulphide (FeS) and hydrogen sulphide (H_2S).

Sodium chloride gives its salty taste, iron sulphide provides its dark violet hue, and all the sulphur compounds provides its slight savoury taste as well as a highly distinctive smell, with hydrogen sulphide being the most prominent contributor to the smell. Black salt contains 36.8% to 38.79% sodium content. The acidic bisulfates/ bisulphites contribute a mildly sour taste. Although hydrogen sulphide is toxic in high concentrations, the amount present in kala namak used in food is small and thus its effects on health are negligible. Hydrogen sulphide is also one of the components of the odour of rotten eggs and boiled milk. Minerals composition of black salt, minerals comparison between table and black salt and Ions percentage in black salt are discussed in table No. 2, 3 & 4 respectively.

Black salt has the following medicinal properties such as Antacid, Anti-flatulent, Antioxidant, Anthelmintic, Adaptogenic, Demulcent, Carminative, Digestive Stimulant; Haematinic (increases hemoglobin levels, Hematogenic (helps in formation of red blood cells), Fat Burner. It's also beneficial in abdominal discomfort and other symptoms related to digestive system disorders such as Acidity, Abdominal pains, Intestinal Gas, Flatulence, Abdominal Distension, Bloating, Anemia, Obesity and Skin diseases. Herbalist, naturopaths and ayurvedic physicians generally recommend black salt in these diseases. In Ayurveda, black salt has medicinal importance and it is an ingredient of many ayurvedic medicines, which are useful for digestive system.

Black salt or *kala namak* commonly used in the kitchen of India Pakistan, Bangladesh, Nepal, Bhutan and other Asian countries, it also used as a part of Ayurvedic medicines and therapies since centuries. Pinkish-grey colour of black salt is due to the presence of iron and other essential minerals. A little stronger than common salt, the black variety adds a distinctive flavor to dishes, and is considered to be a healthier alternative as well. Usually used table salt contains high sodium levels, and should be consumed in limited quantity. On the other hand, black salt is less iodized and a more natural form of the salt. (TIE, New Delhi, January 6, 2020).

Health improving properties of black salt

- Black salt contains alkaline properties which help reduce excess acid in the stomach; it's also improved the digestion and also alleviates intestinal gas.
- Many people consume black salt to be an effective remedy for constipation. Black salt add with ginger and lemon juice in lukewarm water & drink it at morning. The remedy gives batter result for constipation.
- The essential minerals in black salt are known to boost hair growth by strengthening weak hair and preventing split ends. Including black salt in your diet can also help cut down hair fall and reduce dandruff.
- Water retention occurs when fluids get accumulated in your body. This happens when one has an excessive intake of sodium. This is why you need to ditch your high-sodium intake and move to black salt which has lesser sodium.
- Black salt's anti-inflammatory properties and coarse texture helps for healing the cracked heels, and also acts as a cleanser, it also acts as a great body scrub.
- The material mixed in black salt manufacturing provides the additional benefits to the consumers. Such as Amalaki fortified the black salt to Vitamin C and other minerals.

Adulterated black salt

Black salt's manufacturing is time consuming and laborious practices, manufacturing labour (supervisor) face and bear a very high temperature during processing. So that, some manufacturers used raw salt with artificial chemical colors during the production of black salt. Chemicals change the colour and test of normal white salt to pinkish black salt. But such types of chemicals are very harmful to human being & they impart the chronic disease to the consumers. Food regulating authority of India (FSSAI), strictly monitoring the manufacturing and sale of black salt at manufacturing & marketing level.

Conclusion

The research article covers the all possible points for black salt production, processing, properties and other information. In black salt manufacturing, raw salt converted into black salt by the application of thermal heat. On an average, on 800-850 °C temperature raw salt start melting and its impurities burned and it converted into black colour and generates a special taste, colour and smell. Currently a very few literatures are available, therefore a very little knowledge of black salt is available, while it's an important condiments of our kitchen. In future, this condiment has a very broad area for research. The market size of black salt is almost unknown, but few Asian countries manufacture and trade it. It's an ayurvedic product, which have lots of benefits to the consumers. Its trades and manufacturing should be promoted by government, black salt manufacturing is a traditional way to convert raw salt into beneficial black salt by the application of heat.

Table 2: Time and Temperature increment during black salt manufacturing

Sr. No.	Time	Temperature	Duration (In hours)
01	07:30 AM	20 °C	00:00
02	07:45 AM	70 °C	00:15
03	08:15 AM	160 °C	00:45
04	09:00 AM	780 °C	01:30
05	09:10 AM	807 °C	01:40
06	09:45 AM	870 °C	02:15
07	10:15 AM	930 °C	02:45
08	11:00 AM	955 °C	03:30
09	12:00 PM	915 °C	04:30
10	01:00 PM	860 °C	05:30
11	02:00 PM	830 °C	06:30
12	03:00 PM	800 °C	07:30
13	04:00 PM	770 °C	08:30
14	05:00 PM	700 °C	09:30
15	06:00 PM	610 °C	10:30
16	07:00 PM	505 °C	11:30
17	08:00 PM	310 °C	12:30
18	09:00 PM	265 °C	13:30
19	10:00 PM	180 °C	14:30
20	11:00 PM	105 °C	15:30

Table 3: Minerals compositions of black salt

Minerals	Range	Mean
Sodium (Na) (g/g of black salt)	0.34-0.42	0.3783
Chloride (Cl) (g/g of black salt)	0.59-0.61	0.603
Potassium (K) (g/100 of black salt)	0.08-0.15	0.087
Sulphur (S) (g/100 of black salt)	0.3-0.65	0.45
Iron (Fe) (mg/g of black salt)	0.175-1.01	0.431

(Sources: Zuha, S.B., *et al*, 2011) ^[2]

Table 4: Chemical composition of Table & Black salt

Minerals	Table salt	Black salt
Sodium (%)	38.7-39.1	36.8-38.79
Potassium (%)	0.09	0.28
Calcium (%)	0.03	0.16
Magnesium (%)	Less than 0.01	0.01

Table 5: Ion percentage in black salt

Sr. No.	Nutrient Ions	Percentage
01	Sodium Chloride	97.46
02	Magnesium Chloride	0.25
03	Sodium Sulfate	0.88
04	Calcium Sulfate	0.38
05	Iron (Fe ⁺⁺⁺)	3.00
06	Moisture	0.03
07	Water Insoluble	1.00
08	Calcium & Iron	00.00

(Source: Basu, B., *et al* 2015) ^[1]

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