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QUALITY OF MEDICINALLY IMPORTANT BAL HARAD (*TERMINALIA CHEBULA*) FRUITS IN THE MARKET OF CENTRAL INDIA

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ABSTRACT:

Adulteration or substitution in medicinal plant raw material is taking heavy toll on the credibility of the Ayurvedic drug market. The selected district Katni is a major trading centre of non timber forest products including medicinal plants. The objective of the study is to determine the anomaly in the small harad (*Terminalia chebula*.) market sample and adulteration problems existing in the local market. Prevalent malpractices adopted by various stakeholders in the study area are mixing of broken fruits of baheda (*T. bellerica*) and big size Harad, coloring of fruits etc. The major causes of adulteration found in the market are more demand from Ayurvedic industries, scarcity of raw material and increase in volume of raw material by adopting various malpractices etc. Paper suggests various ways and means to combat quality problem in the raw small harad trade.

KEY WORDS: Adulteration, Harvesting, Market, Quality, Small Harad.

INTRODUCTION:

Harad, bal Harad or *Chebulic myrobalan* (*Terminalia chebula*) belongs to family Combretaceae is a large tree, abundant in north India and southwards to the Deccan at 1,000 to 3,000 ft. Its fruits are obovoid or ellipsoidal from a broad base, glabrous. *Chebulic myrobalan* is highly regarded as the 'king of medicines' in the Ayurvedic Medicine. Fruit contains a constituent which has a wide antibacterial and antifungal spectrum and also inhibits growth of *E.coli*. Its fruit is mild laxative, stomachic, tonic, astringent, purgative, adaptogen, hepatoprotective, febrifuge, antispasmodic, expectorant, anti-asthmatic, antiviral and hypoglycaemic. It is useful in

ophthalmia, hemorrhoids, dental caries, bleeding gums, ulcerated oral cavity and in many other diseases according to Ayurveda. It is also useful in asthma, piles and cough and used in tanning of leather and purification of petroleum. There are frequent rejections of export consignments and negative externalities are very high. The raw herbal materials purchased from various places have different quality due to climatic and geographical reasons (GoI, 2000). At present most herbal raw materials are still harvested or wild crafted under completely uncontrollable conditions (Lange, 2004). Indian Ayurvedic industries generally face the problem of adulteration and substitution at raw material stage. Scientists (Uniyal and Joshi, 1993; Rawat *et al.*, 1996; Shome *et al.*, 1997; Rawat, 2005) observed that in herbal markets of the country, sometimes not only the various species of particular genus but entirely different taxa are being sold under the same vernacular name. The means of adulteration and substitution may be deliberate or sometimes unintentional (Mitra and Kannan, 2007). Occasionally in place of the genuine herbs, substituted species which have similar appearance are deliberately mixed. This generally happens when the required raw (dry) materials are in scarcity (Sunita, 1992). Adulteration in market samples is one of the greatest drawbacks in promotions of herbal products from India (Dubey *et al.*, 2004). The efficacy of many drugs is fading because of the adulterated, dried raw materials profusely available in the indigenous market. Due to adulteration and altered efficacy, the faith in crude drug promotion has declined (Gupta *et al.*, 2003; Daniel, 2004; Mishra, 2008; Mishra, 2010; Mishra, 2011). The objective of the present study is to determine the anomaly in the harad (small) market sample and quality as well as adulteration problems prevailing in the market. An effort was also made to observe various malpractices adopted by different stakeholders in the trade of harad fruits in the Katni market.

STUDY AREA:

The district Katni being situated at the junction of the Vindhya and Satpura Mountain ranges and carries mostly tropical mixed deciduous forest. The district extends from 23°37'N to 24°40'N and from 79°57' E to 80°58' E and its height from sea level is 392 mts. The district is rich in flora especially in terms of medicinal plants and has a variety of species. The entire produce from the villagers are procured by the middleman and are brought to the Katni. Around 12-13 raw medicinal plant (MFP) traders were located in the city, exclusively trading raw medicinal plants. Field survey of Katni forest division was done during September 2007 to March 2008, to get an idea about present harvesting practices of small harad in the adjoining natural forest. Selected collectors, traders were interviewed with the help of questionnaires. Out of six forest ranges, three ranges namely, Bahuriband, Rithi and Dhimarpura were selected on

the basis of availability of plant, traders and primary collectors. The selected ranges were densely covered by natural forests and harad trees, and villagers are mostly depends on NTFP collection for their livelihoods.

MATERIALS & METHODS:

1. Survey of Gatherers (primary collectors):

A field survey of Katni forest division was done with the help of semi structured questionnaire. Method adopted by primary collectors to harvest fruits from the natural forest was closely examined at the time of fruit harvesting. Total of three forest ranges were selected for collecting data. Persons involved (15% House Holds) in each forest range were interviewed about the time and method of harvesting, tools used etc.

2. Survey of market traders:

These were surveyed to get an idea of quality of raw material, the substituted species, their name, different malpractices adopted by the traders/stakeholders in the local market etc. Traders exclusively selling raw medicinal plants in the local market were chosen randomly for present study. Out of total twelve (12) traders, four (04) were surveyed (33%) with the help of pre designed questionnaires.

Ocular (Organoleptic) analysis of dry fruit samples collected from forest and market :

Visual inspection was done on one kilogram raw fruits (dry) procured from trader as well as forest on the basis of different morphological parameters. After sorting of the raw (dry) material, various grades were made (Table-1).

Method of raw material/ sample collection:

1. Forest (Control) sample: The harad trees in each selected forest range were identified and protected against anthropogenic factors like cattle, immature harvesting by locals etc. Fresh fruits were collected by hand pricking in the month of October. Fruits were collected by the team members with the help of forest department staff, villagers etc. Cleaning, washing of fruits was done under laboratory conditions. Drying was done under open sunlight conditions by spreading fruits on plastic sheet. The raw (dry) material was than packed in polybags and kept under room condition till further analysis

2. Market sample: Traders selling raw small harad were identified through local market survey. One kilogram of raw (dried) fruit sample was purchased from each selected traders. At the time of purchase, the traders were asked to provide fresh and good quality fruits, preferably collected

from the native forest areas. Also, the material (dry) was purchased during the harvesting season, to minimize error like old stocked material etc.

The identification and documentation of adulterated species and other chaff material was done with the help taxonomist, botanists and consulting flora, secondary literature etc. Besides this, local Vaidyas, forest department officials and medicinal plant experts were also consulted. . Ocular evaluation was done by using scientific weighing balance, power lens etc.

RESULT :

Prevalent harvesting practice and processing of small harad

Collection of small harad fruit commences in the second week of September. The harvesting of fruits is generally done by shaking the trees and pricking up of fruits from the ground. The fresh (wet) fruits are kept in the gunny bags and carried back to home. Processing was done by spreading fruits on stone tiles, then cover them by wet blanket or wet jute bags and kept for 2-3 days. The fruits are then kept in a wooden block. The fruits are then pressed with the help of another wooden block from upper side so as to remove the excess tannin and moisture from the fruits. The “wooden press” was used to compress middle portion of fruits. Fruits are then sun dried and stored in jute bags and kept in kothi ghar (grain store house) for few days.

Prevalent malpractices adopted by the Middleman/traders:

Sometimes middleman imbibes *whitish green* small harad fruits in black colour synthetic (chemical) solution. They usually imbibe in black color solution upto 24 Hours and then dried it. This makes the fruit color black and fetches more rate in the market. Mixing of medium and big size fruits of same species is rampant, as the big size fruits are cheap as compared to small harad. Besides this, small pieces of Baheda (*T. bellerica*) fruits were also commonly mixed in this species. The sole objective of the traders to mix cheap, similar looking material in harad fruits is to enhance the volume of their produce thereby fetches more income from market.

DISCUSSION:

The data depicted in Table-2 shows visual observation of samples collected from natural forest (control) and local traders of Katni. It is clear from the data that maximum proportion (75.0% or 750 gm./kg) of good quality fruits was found in samples collected from natural forests. On the contrary, very less proportion (Avg.26.7% or 267.75 gm./kg) of good quality fruits was found in the samples collected from market traders, followed by second grade(Avg.36.8%). The amount of Adulterant species was recorded more (Avg.10% or 102.3 gm/kg) in samples collected from traders, whereas nil in the samples collected from forest. The proportion of diseased fruits was

recorded more (Avg.14.5% or 145 gm./kg.) in market samples in contrast to nil in forest samples. However, less amount of soil, sand was observed in both (Avg.4.8 and 4%) the samples, respectively. The market samples analysis indicates that mixing of big size, broken and diseased small harad and other adulterants like broken Baheda (*T.bellerica*) fruits is rampant in the local market of Katni. Mostly trader as well as collector adulterated genuine material by adding similar looking fruits of other species and cheaply available alternatives to increase the volume. Sample analysis shows that not only traders but collectors also mix lot of similar looking fruits (i.e. Baheda) with the genuine material. Middleman and traders also adopted malpractices like imbibing of “green” fruits in black color chemicals etc. It was also noted that originally color of small harad fruit is black, which fetches more prices in the market. Rawat *et al.*,1996; Rawat, (2005), Shrivastava *et al.*, (1998) observed that in herbal markets of the country, not only the various species of particular genus but entirely different taxa are being sold under the same vernacular name. The market sample of Bhui amla (*Phyllanthus niruri*) botanically equated with *Phyllanthus amarus* are mixed with other allied species of *Phyllanthus spp.* (Bratatis and Dutta,1990). Substitution and mixing of similar looking fruits of other species was observed in the market samples collected from Katni market. Coloring of fruits in black color solutions and mixing of chaff matter was also observed in the market samples. These malpractices adopted by various stakeholders in the trade were also reported by Mishra *et al.*, 2009, Mishra and Kotwal., 2009, Mishra, 2009, Mishra and Kotwal, 2010 and Mishra 2011.

CONCLUSIONS:

Increasing demand of small harad (*T.chebula*) fruits in the national market and Ayurvedic industries, scarcity of raw produce and greediness of traders were the main reasons behind adulteration in this species. Market sample analysis shows that traders as well as collectors mix various adulterants which are similar in appearance. Primary collectors after harvesting of small sized harad, compressed the fruits on both side with the help of heavy weight stones, plates etc. This was done because most of the Ayurvedic industries and market desires *small sized* and *flat* harad for manufacturing bulk medicines. The demand and prices of small(bal) harad was observed more in comparison with big harad fruits in the market. Generally, traders adulterated genuine material by mixing Baheda fruit and broken parts of big harad. They also imbibe fruits in black color solution for few hours and after drying they sell in the market and get more price of the substandard produce. These malpractices were adversely impacting the quality of small harad fruits which has more demand in the Ayurvedic medicine manufacturing units and market.

Intensive training on scientific harvesting methods and awareness to all stakeholders is required on priority basis so as to curb the raw material quality. Local level NGOs may be involved along with forest department staff to prevent mixing and other malpractices in the market. There is complete lacking of proper training of traders regarding material identification, processing and storage. Hence, suppliers and traders should be trained and educated about the World Health Organization (WHO) standards on Good Collection practices (GCP) and Good Manufacturing Practices (GMP). Ayurvedic manufacturing industries also foresee that a sustainably collected raw material (certified) will have more credibility than an uncertified lot. This would aid that only certify (trained) community members are allowed to collect and not one and all on basis of a demand assurance. End users and other stakeholders are also not aware about the correct identification of raw material. Hence, there is need to educate them on mass scale so that quality of raw material can be improved.

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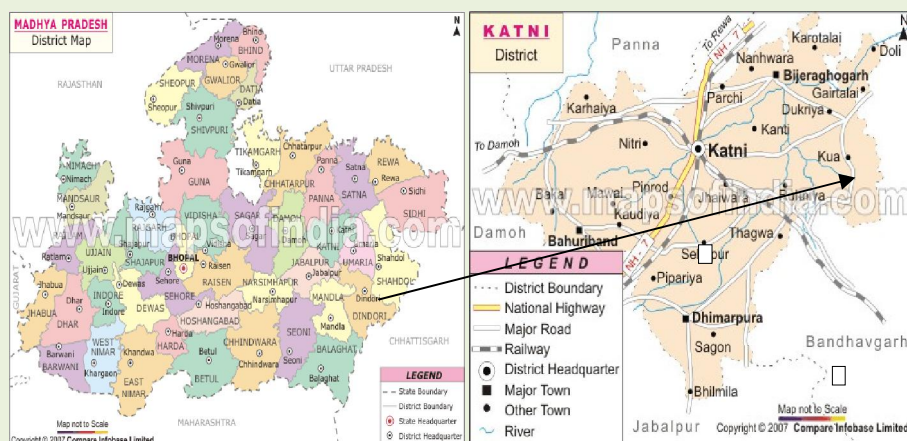


Fig.1:Map of study area

Table: 1. Grading of small harad (dry) sample collected from natural forest and Katni market

Sl. No.	Sorting under different categories / grades	Details of grades, specifications.
1.	Good quality (Grade I)	Good looking, small size, even shape & size, non infected etc.
2.	Average quality (Grade II)	Medium sized, slightly inferior but not infected by fungus.
3.	Species infected by fungus, insect	Fruits infected by fungus, insect attacked, hollow fruits, white spots on surface etc.
4.	Other species/ Adulterants found	Totally different species from genuine species.
5.	Chaff matter	Husk, twigs, leaves, pods, rope pieces etc.
6.	Soil & Sand	Particles of soil, sand adhered with dry material and small stones etc.

Table:2. Visual analysis of various grades of Bal harad (*T. chebula*) collected from natural forest and local market of Katni

Sample collected from	Grade- I (gms./kg)	Grade-II (gms./kg)	Infected by fungus, insect (gms/kg)	Adulterant/Other species found (gms./kg)	Chaff matter (gms./kg)	Soil & sand (gms./kg)
Forest sample collected from natural forests of Katni division, processed under lab.						
Forest (control)	750.00±0.89 (75.0%)	215.00±1.06 (21.5%)	00	00	45.00±0.89 (4.5%)	40.00±0.89 (4.0%)
Market samples collected from 04 local traders of Katni						
Trader-1	200.00±1.09 (20.0%)	525.00±0.80 (52.5%)	150.00±0.79 (15.0%)	110.00±0.67 (11.0%)	5.00±0.57 (0.5%)	10.00±0.78 (1.0%)
Trader-2	245.00±0.89 (24.5%)	450.00±0.35 (45.0%)	185.00±0.78 (18.5%)	Nil	50.00±0.60 (5.0%)	75.00±0.10 (7.5%)
Trader-3	335.00±1.09 (33.5%)	300.00±0.34 (30.0%)	150.00±0.56 (15.0%)	200.00±0.44 (20.0%)	Nil	15.00±0.19 (1.5%)
Trader-4	290.00±0.57 (29.0%)	200.00±0.87 (20.0%)	100.00±0.56 (10.0%)	100.00±0.76 (10.0%)	215.00±0.54 (21.5%)	95.00±0.23 (9.5%)
Traders (Market) Avg.	267.50 (26.7%)	368.75 (36.8%)	145.00 (14.5%)	102.50 (10.3%)	67.50 (6.7%)	48.75 (4.8%)

*= Small size Baheda fruit (*T.bellerica*), Broken parts of big and medium size harad (*T.chebula*)