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Documentation of local post harvest methods and value addition of different NTFPs in Narayanpur forest area of Chhattishgarh

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Abstract

Non timber forest products (NTFPs) playing a significant role in the protection of the livelihood safety net of the forest dwellers of Narayanpur Chhattisgarh. The present study was undertaken with the objective of Documentation of local post harvest methods and value addition of different NTFPs in Narayanpur forest area. The study was carried out in two blocks namely Narayanpur & Orchha block. Under Narayanpur block Chhotedongar, Benoor & Bharanda villages come and Orchha block is consisted of Orchha, Gudadi & Basing. And this sites come under Narayanpur, district of Chhattisgarh. This forest harbors about 51 plants as NTFPs included 19 trees, 5 shrubs, 8 herbs, 5 grasses, 10 climbers and 4 bio-products. People used processing techniques to produce value added products like preserve, candy, jam, RTS, nectar squash/leather/slab, powder of *Aegle marmelos*, herbal oil, nutraceutical ingredients, fruits powder, and vegetable powder of *Bauhinia variegata*, Jams, jellies, tarts, chutneys, beverages (nectar, squash and syrup) pickle and candy of *Emblca officinalis*, jellies, candy of *Tamarindus indica*, amchur, juices, nectars, concentrates, fruit bars, flakes dried fruits pickle, candy of *Mangifera indica* etc. Dry karil (*Dendrocalamus strictestrus*) and mushrooms are used as vegetables. The liquor prepared from *Madhuca longifolia* is the common beverage consumed in varying quantities by all the Adivasis of the study area. Salphi obtained from *Caryota urens* is used for baverage. Bio-product, food and chutneys from *Rhynchophorus ferrugineus*, *Solenopsis invicta* and many types of value added product are made by people. This product used by local people for its own purpose and they supplies market for money earning.

Keywords: NTFPs, RTS, bio-product, chutneys, value added product

Introduction

The United Nations Food and Agriculture Organization (FAO) estimated that 80 per cent of the developing world relies on Non-Timber Forest Products for nutritional and health needs. Studies on the role of NTFP in South India indicate that tribes in Western Ghats regions depend to an extent of 50 per cent on NTFP as a source of income also as the major source of employment (Girish, 1998; Ganapathy, 1998; Hegde *et al.* 1996, Suryaprakash, 1999) [3, 11, 1]. NTFP include all the products obtainable from forest other than timber. NTFP have been classified into fibers and flosses, grasses, cane and fodder, essential oils, tannins and dyes, gums and resins, drugs and medicines, edible products, oil seeds, leaves, animal, mineral and miscellaneous products.

Chhattisgarh is third largest state of India in terms of forest cover which is 5.6 million hectares which is 44.21% of state and 8.06% of the country. Madhya Pradesh and Arunachal Pradesh being at first and second in terms of forest cover (Forest Report, 2011). The Forest Department, Government of Chhattisgarh helps the rural people financially, and by making SHGs for collection, procurement, processing and export of NTFPs through Chhattisgarh Minor Forest Products Marketing Federation (CGMFPFED), which is very marginal as compared to the potential. Although NTFPs can be processed into a number of value-added products, it is usually sold in the raw form by the primary collectors. CGMFPFED has a scheme to share 80% of profit from NTFP trading as incentive wages to collectors of tendu leaves, 15% for collection, sale and the warehousing and the remaining 5 out of the total population of Chhattisgarh, tribals constitute about 32.5% mostly living in dense forested areas in Sarguja and Bastar and are known for their unique lifestyle, rituals, traditions and superstitions.

Some of the major tribes of Chhattisgarh include Gond, Baiga, Korba, Abhuj Maria, Bison Horn Maria, Muria, Halba, Bhatra and Dhurva tribes. Majority of the tribes of Chhattisgarh depend upon forestry, hunting, fisheries and some local cottage industries for their livelihood. Bastar is the land of tribes and about 70% of the total population of Bastar comprises tribals, which is 26.76% of the total tribal population of Chhattisgarh. The combined population of Scheduled Castes and Scheduled Tribes in Chhattisgarh is significantly higher at 44.7% for temporary reimbursement of costs to societies.

Narayanpur district have dense forests and are rich in Non-Timber Forest Produces (NTFPs). Because of having these NTFPs, the district is contributing a major revenue income to the state. The important NTFPs available in Narayanpur district are Chironji, Amchur, Vaybidang, Karanji, Marorphali, Mango Kernal, Tamarind, Kosa Cocoons, Peng Seeds, Korkoti Seeds, Nirmali Seeds, Ambadi, Amla, Charota Seeds, Hara Chirayta, Mahua, Tora, Harra, Bamboo, Boda, Mushroom, Dhavai Phool, Bhelwa Seeds, Sal seed, Mahul (seed, leaf, rope), Tikhur, different type of tubers, medicinal plants, Cane (Beth), etc.

Material Methods

The study was carried out in two block namely Narayanpur block- Chhotodongar Benoor, Bharanda and Orchha block-Orchha, Gudadi, Basing site Narayanpur, district of Chhattisgarh and data was collected on rainy, winter and summer season when the NTFPs are extracted from forests and sold in the market. The data was collected on the basis of questionnaire developed for this experiment regarding, processing of the harvested NTFP before storage and marketing of the produce. Out of total tribal families residing in each selected village, a representative sample of 20 percent respondents were selected by purposive sample. Conservation practices of tribal's was also observed and recorded during the study.

Result and Discussion

The collected 51 plants as NTFPs included 19 trees, 5 shrubs, 8 herbs, 5 grasses, 10 climbers and 4 bio-products. These were collected, processed and sold in the market as well as for own consumption of local people. Mostly fruits were collected and processed by using sun dryer, air dry and electric dryer. The fruit processing technique was carried out for *Syzygium cumuni*, *Diospyros melanoxylon*, *Aegle marmelos*, *Tamarindus indica*, *Semecarpus anacardium*, *Schleichera oleosa*, *Embllica officinalis*, *Buchanania lanzan*, *Mangifera indica*, *Terminalia chebula*, *Terminalia bellirica*, *Strychnos potatorum*, *Litsea sebifera* and *Azadirachta indica* etc. The medicinal plant Kalmegh was kept for 2-3 days in sunlight for drying. The most of the trees, shrubs, herbs and

grasses were used for medicinal purposes. People used processing techniques to produce value added products like preserve, candy, jam, RTS, nectar squash/leather/slab, powder of *Aegle marmelos*, herbal oil, nutraceutical ingredients, fruits powder, and vegetable powder of *Bauhinia variegata*, Jams, jellies, tarts, chutneys, beverages (nectar, squash and syrup) pickle and candy of *Embllica officinalis*, jellies, candy of *Tamarindus indica*, amchur, juices, nectars, concentrates, fruit bars, flakes dried fruits pickle, candy of *Mangifera indica* etc. Dry karil (*Dendrocalamus strictestrus*) and mushrooms are used as vegetables. The liquor prepared from *Madhuca longifolia* is the common beverage consumed in varying quantities by all the tribes of the study area. Salphi extracted from *Caryota urens* is used for hard drink. Bio-product, food and chutneys from *Rhynchophorus ferrugineus*, *Solenopisis invicta* and many types of value added product are made by people for their own consumption and sold in the market to get income to be utilized for other commodities. Shankar *et al.* (2014) [10] concluded that the treatment or recipe combination 1:1.5:2.5 (Tikhur starch: Sugar: Water) was best for the preparation of tikhur Barfi. On the other hands tikhur Barfi prepared through the recipe 1:1.5 2.5 (Tikhur starch: Sugar: Water) had a pleasant flavor, taste moisture, texture appearance and over all acceptability. The value addition technology with training can change the livelihood of the tribes after scientific training.

Pethiya and Surayya (2005) [8] concluded that value addition to NTFPs can be carried out at three stages, pre-harvesting, during harvesting and post harvesting stages. He revealed that primary processing (FD level), secondary processing (at traders level) and consumer industry (industry level) will be the best chain with the help of this system and better price can be given to the primary collector. Similar observations have been recorded with this experiment where, collection, post harvest and marketing are very poor, this shows confirmation with findings of the above worker. *Mangifera indica* and *Embllica officinalis* could be harvested by shaking branches, hitting the fruit with stick, plucking fruit by hand plucking and with knitted net attached at the end of a bamboo stick. The first two methods are destructive harvesting techniques, which damage the tree and reduce the value of harvested fruit through physical damage. The fruit of *Embllica officinalis* (Aonla) can be boiled to remove the seeds and extract the pulp. The pulp dried for 4-5 days and grind to obtain powder form.

The collected material like leaves, flowers, seeds, fruits, juices and rhizomes are processed with the local methods for making plates, rope, broom, medicines, basket, beverage and many types of value added products. The collection of produce and its post harvest technique is playing a significant role to preserve quality material for longer duration for further marketing and earning money.

Table 1: Processing, storage techniques and value addition of NTFPs used by local inhabitants and scientific methods for sustainable utilization Tree

S. No	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Bel (<i>Aegle marmelos</i>)	Collected fruits kept in clean place in sunlight for 5-6 days for drying. After drying its fruit skull automatically crack down.	After drying people sold it immediately.	Collected fruits should be kept for 3-4 days on clean cloth or tarpaulin or poly sheet for sun drying. Fruits are put in extremely hot water for few minutes then remove. This process is repeated for 2-3 times for removing its hard	The dry orange colour and spotless pulp should be packed in plastic bags.	After extraction of bel pulp used for the preparation of various fruit products viz., preserve, candy, jam, RTS, nectar squash/ leather/slab, powder etc. which can be commercially exploited.

				cover. The pulp of fruit should be cut in four parts then pulp spread on clean cloth or bamboo mats for drying. Fruits completely dry in 15-25 days.		
2.	Char (<i>Buchanania lanzan</i>)	Collected seed kept for 2-3 days in sunlight for drying after removing its pulp from fruit.	Dried seed kept in an open room before selling.	Collected fruits should be put in a tank which is filled with fresh water than fruits rubbed under water so that pulp come out and float, which could be removed by decantation and seeds settled down on the bottom. To test healthy seeds for storage seeds are put in a tank full of water, seed settled in bottom would be considered as sound seed.	Well-dried seeds should be packed in jute bags for storage.	Roasted seeds are used as dry fruit. Seeds are used as condiment and to increase flavor in various sweets.
3.	Kachnar (<i>Bauhinia variegata</i>)	Fresh flower buds and leaves were used as vegetable. i) Sometimes the leaves are dried for 2-3 days in sunlight to use in lean period.	Dried leaves were stored in any moisture proof container or plastic bag.	Not commercialized.	-	The product range consists of Herbal Extract, Herbal Oil, Nutraceutical Ingredients, Fruits Powder, Vegetable Powder and many more.
4.	Bahera (<i>Terminalia bellirica</i>)	i) Selected fruits spread in clean place to dry in sunlight for 4-5 days.	Well-dried brown fruits were stored in simple jute bags.	Collected fruits should be spread on clean cloth for 10-15 days then its hard portion should be separated from mingy (seeds). This separate hard cover/pulp again keeps it for 4-5 days to dry.	Completely dried pulp should be packed in Jute bag, which has plastic cover in inner part.	Triphala churn.
5.	Aonla (<i>Emblica officinalis</i>)	Collected fruits were boiled 10 min. for removing seeds. Then seeds are removed and kept for 4-5 days in sunlight for drying. Its colour should be reddish brown after drying.	Dried fruits were kept in jute bags or clay pot.	Collected fruits washed in plenty of running water properly. For commercial production, rotary washers, or fitted with moving conveyor belt and soft roller brushes are generally employed. Blower fan, solar dryer or pressure less dehydration process is used for drying. Vacuum dehydration process is used at commercial level to maintain its original value.	Completely dried reddish brown colored fruits should be packed in plastic bags for storage. During packing time mouth of bags should be kept little open to avoid smell.	Jams, jellies, tarts, chutneys, beverages (nectar, squash and syrup) Pickle and candy etc.
6.	Tendu leaves (<i>Diospyros melanoxylon</i>) Tendu fruit	Collected leaves were kept in sunlight for 3-4 days to dry. Fresh fruits are sold in market thus no need of any process.	For storage leaves were tied in bundles. No need of storage.	The collected leaves should be dried in partial shade. 20-40°C temperature is good to dry the leaves.	Well-dried leaves of same size should be tied with soft rope in bundles then stored.	Bidi, cigarettes.
7.	Bhelwa (<i>Semecarpus anacardium</i>)	Generally people used the fruits as it is, but sometimes they dry in sunlight for storage and separates from seed.	Dried fruits were stored in bamboo baskets or clay pots.	Not commercialized	-	Ink and medicines.
8.	Mahua Flower (<i>Madhuca indica</i>)	Collected flowers are spread in clean place evenly for 3-4 days in sunlight for drying.	Dried flower were kept in open and bamboo basket before marketing.	Collected flowers should be spread as thin layer on polythene sheet for drying in sunlight.	Well-dried flowers should be packed in jute or plastic bags immediately after last drying.	Food material (laddu, kismis, biscuit), bio diesel and wine.
9.	Jamun	Fresh fruits are sold	No need of	Not commercialized	Fresh fruits of the	Jamun juice is prepared

	(<i>Syzygium cumuni</i>)	in market.	storage.		washing smashed pulp after filter converted in juice.	and preserved then sold in the market.
10.	Kusum (<i>Schleichera oleosa</i>)	Collected fruits kept as it is for 6-7 days and then it could be uncovered. After collection of fruits pulp is removed and seeds were separated. Seed were kept in sunlight for drying.	Dried seeds were stored openly in room.	First uncover the collected fruits then crushed by means of fluted wooden roller or crushers are used to remove its pulp. Collected seed evenly spread on clean cloth or polythene sheet for 4-5 days for drying.	Dried seeds should be packed in jute bags for storage.	Edible oil, pickled. The ripe fruits are sold in the market.
11.	Imli (<i>Tamarindus indica</i>)	Collected fruits were spread for 2-3 days in room then uncovered.	Uncovered fruits were kept in bamboo baskets.	Collected fruits were spread on polythene sheet for 2-3 days to dry then uncovered.	Phool Imli should be packed in plastic bags and Auti Imli packed in Jute bags for storage.	Jellies, chutneys, beverages (nectar, squash and syrup) Pickle and candy etc.
				Uncovered fruits fiber and seed should be removed, which is called Phool Imli.		
				Imli with seeds and fiber called auti Imli.		
12.	Mango (<i>Mangifera indica</i>)	Fresh fruit are collected and sold in the market. Damaged fruit are cut into small pieces and dried in the sun light and sold in the market.	Seeds kernels and dry fruits are stored in small container.	Fresh fruit are collect for aamchur preparation. Fruits are chopped, and seeds are dried in sunlight	Aamchur should be packed in plastic bags. Dried seed and fruits packed in Jute bags for storage.	Aamchur, juices, nectars, concentrates jams, jelly powders, fruit bars, flakes dried fruits pickle, candy.
13.	Sal (<i>Shorea robusta</i>)	The resin is collected from tree trunk with the help of wounds made the resin secreted from wounds	Gum stored in bamboo basket.	Gum is collected from the cut part of the plant and dried in the sunlight known as Dhoop.	Gum should be stored in aluminum and steel container.	Soap, Sal butter which is used for cooking, Sal seed cake is used as feedstuffs. The resin sold in the name of lobhan.
		Fire used then collecting the seeds and sold in the market.				
14.	Harra (<i>Terminalia chebula</i>)	Selected fruits spread in clean place to dry in sunlight for 4 -5 days.	Fruits stored in dry place. Well-dried fruits were stored in simple jute bags.	Collected fruits should be spread on clean cloth for 10-15 days then its hard portion should be separated from mingy (seeds).	Completely dried fruit should be packed in Jute bag, which has plastic cover in inner part.	Triphala churn.
15.	Nirmali seed (<i>Strychnos potatorum</i>)	Collected seed kept for 2-3 days after removing its pulp from fruit.	Dried seed kept in an open room before marketing.	Collected fruits should be put in a tank which is filled with fresh water than fruits rubbed under water so that pulp come out and flout, which could be removed by decantation and seeds settled down on the bottom.	Well-dried seeds should be packed in jute bags for storage.	Roasted seeds are used as dry fruit. Seeds are used as condiment and to increase flavor in various sweets.
				To test healthy seeds for storage seeds are put in a tank full of water, seed settled in bottom would be considered as sound seed.		
16.	Maida chhal <i>Litsea sebifera</i>	Tree is felled and bark is extracted	Dried bark in sunlight packed in jut bag.	Tree is not felled and bark is extracted from the mature portion of the tree.	Well-dried seeds should be packed in jute bags for storage.	Bark is used as a medicine
				After extraction of bark time is given for healing.		
17.	Karanj seed (<i>Pongamia piñnata</i>)	Immature pads are also collected	Dried seed kept in an open room before selling	Mature pods are collected and dried in a scientific way	Well-dried seeds should be packed in jute bags for storage.	Oil is extracted and used as a insecticide and medicine. Plant part is also used as manure.
18	Salfi (<i>Caryota urens</i>)	Inflorescence is removed and liquor beverage is collected	Stored in earthen pot	Some part of inflorescence must be kept remained in the tree for seed	-	-

				production.		
19.	Kullu	The incision in the tree trunk made too deep some time the tree die	The collected gum is not kept in clean surface for drying due to this the gum quality affected	The incision in tree is made superficial and the chemical treatment is done so that the tree trunk is safe for another harvesting of the gum from some tree.	The collected gum is kept and dried in clean surface so that the dirt is not stacked in gum and quality will be superior.	The Kullu gum fetches good market price because it is used in pharmaceutical industry

Shrubs

S. No.	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Ainhi (<i>Helicteres isora</i>)	Fruit and twig were used for medicine purpose.	Fruits were dried in sunlight one week and then stored..	Fresh fruits are collected and dried in sunlight.	Dried fruits should be packed in jute bags for storage.	Medicine, ropes and cloth.
2.	Ber (<i>Zizyphus mauritiana</i>)	Fruits were kept 3-4 days in sunlight. Ber fruit were generally sold fresh in market. Sun dried fruits also sold in market.	Dried fruits were kept in jute bags or bamboo basket.	Undamaged and disease free fruits are selected then washed in plenty of water and spread on clean cloth or polythene sheet for drying in sunlight for 5-6 days. Dried fruit pulp should be grinded to get powder form.	The fruit pulp powder should be packed in plastic packets for safe storage.	Chhuhara, jam, candy, beverages ber roti etc.
3.	Chhind (<i>Phoenix acaulis</i>)	Leaves and fruit were properly dried 2-3 days in sunlight.	Leaves are stored in dry place.	Not commercialized.	-	Juice is a good beverage, broom, mat, baskets are made from the leaves, and fruits are edible.
4.	Karonda (<i>Carissa carandus</i>)	Fresh fruits and flower are used and sold in the market.	No need of storage.	Not commercialized.	-	Pickle and chutneys.
5.	Chameli (<i>Jasminum arborescens</i>)	Fresh fruits and leaves were used as medicine.	No need of storage.	Not commercialized.	-	Cosmetic perfume, oil, soap.

Herbs

S. No.	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Charota (<i>Cassia tora</i>)	Its leaves were dried in sunlight for 2-3 days. The collected pods of Charota are kept in sun light to crack the pods for easy separation of seeds. Separated seeds are again kept 1 day in sunlight for drying.	Dried leaves and seeds were kept separately in bamboo baskets or any other container.	Tray drier or electric drier should be used for drying seeds.	Leaves and seeds should be stored separately in plastic bags.	<i>Cassia tora</i> tea is an herbal, pure, natural and non-polluted green health beverage (coffee-tea), substitute for coffee and sodas.
2.	Mushroom	Fresh mushroom used as vegetable and sold in market. Some types of mushroom are sun dried and fire (fume) for storage.	Dried mushroom are kept in any container such as clay pot or bamboo basket.	The caned mushrooms with saline water are processed.	The can of mushroom stored in room temperature it is available in shops.	Pickle, papad, health power powder, and use as a vegetable.
3.	Kalmegh	Collected leaves,	Dried leaves,	Fresh plants are collected	The grinded	Medicine. Aurvedic

	<i>(Andrographis paniculata)</i>	fruits or whole plant were kept 2-3 days in sunlight for drying.	fruits and stems were placed in open room.	and cleaned with water, chopped into large pieces then dried in the sunlight.	producer from churn is packed in plastic bottles or poly pack.	medicine preparation purpose.
4.	Tikhur <i>(Curcuma angustifolia)</i>	Rhizomes are collected and sold in market.	Dried rhizomes were kept in jute bags or bamboo basket in dry place.	Rhizomes are collected and cut it into small pieces and grind, Five to Ten-times rinsed in water, then dried in sunlight white solid powder is obtained as known as Tikhur.	Powder should be packed in plastic bags.	Food material Barfi, sweets, sarbat are prepared for fast.
5.	Safed musli <i>(Chlorophytum tuberosum)</i>	Collected tubers are cleaned and dried.	Dried rhizomes were kept in jute bags or bamboo basket in dry place.	Collected tubers are cleaned and dried.	Powder should be packed in plastic bags or in plastic bottles.	Allopathic medicines, sex tonic, Immunity-improving drug.
6.	Kali musli <i>(Curculigo orchoides)</i>	Collected tubers are cleaned and dried.	Dried rhizomes were kept in jute bags or bamboo basket in dry place.	Collected tubers are cleaned and dried	Powder should be packed in plastic bags.	Ayurvedic medicine
7.	Gengi <i>(Curcuma zedoaria)</i>	Rhizomes are collected and sold in market.	Dried rhizomes were kept in jute bags or bamboo basket in dry place.	Rhizomes are collected and cut it into small pieces and grind, Five to Ten-time rinsed in water, then dried in sunlight.	Powder should be packed in plastic bags.	Ayurvedic medicine
8.	Satawar <i>(Asparagus racemosus)</i>	Rhizomes are collected and sold in market.	Dried rhizomes were kept in jute bags or bamboo basket in dry place	Rhizomes are collected and cut it into small pieces and grind, Five to Ten-times rinsed in water, then dried in sunlight and powder prepared.	Powder should be packed in plastic bags.	Ayurvedic medicine

Grasses

S. No	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Munsel <i>(Iseilema nervosum)</i>	Fresh leave are use.	No need of storage.	Not commercialized.	-	-
2.	Kans <i>(Saceharum spoutaneum)</i>	Collected spikes kept 3-4 days in sunlight for drying.	Dried spikes tied in bundles and broom manufactured during rainy season.	Not commercialized.	-	Broom.
3.	Phulbahari <i>(Thysanolaacns maxima)</i>	Collected spikes kept for 3-4 days in sunlight to dry.	Dried spikes tide in bundles and Broom manufactured.	The spikes are fixed in steel/plastic tube tightly and sold in the market.	Stored in godown	The handle of broom plying a Significant role in extra price.
4.	Bans <i>(Dendrocalamus strictus)</i>	Harvested bamboo culms keep in sunlight for drying it may cause cracks.	Dried bamboo stored only for few days before selling.	Seasoning process is used for its long life and strength. Air seasoning is generally used.	Bamboo stored in such a way that equal length and thick stem stored in grade basis for sale.	Making bamboo box, bamboo container and other bamboo product. Lot of handicraft articles is available in the market.
5.	Kusal <i>(Heteropogan contortus)</i>	Collected spikes kept 3-4 days in sunlight for drying.	Dried spikes tied in bundles and broom manufactured during rainy season.	Not commercialized.	-	Broom.

Climbers

S. No.	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Mahul <i>(Bauhinia vahlii)</i>	Collected leaves tide in bundles of 100 leaves.	Collected leaves kept in closed room before selling.	Collected leaves kept in a well-closed room before making plate With the help of machine leaves are joint or stitched. Molding machine is used for press the Dona and	Plates and Donas tied separately in bundles and packed in thin polythene bags carefully for storage	Making Plates, donas storage box, malt and rope. The attractive and moulded dona pattal fetches good market price.

				Plates.		
2.	Ramdatoon (<i>Smilax zeylanica</i>)	Harvested twig crushed by wooden rollers then removed its fiber and kept 2-3 days for drying.	Dried fiber rolled in bundles for storage.	Not commercialized.	-	Rope.
3.	Baichandi (<i>Dioscorea hispida</i>)	Fresh root are used for medicinal purpose.	No need of storage.	The chips of Baichandi is prepared after boiling then dried in sunlight then packed in plastic bags.	Stored in room/godown.	Attractive neat and clean thin chips with smart packing fetches good price
4.	Karukand (<i>Dioscorea bulbifera</i>)	Rhizomes are collected from soil and cleaned with water and sold in market as a vegetable.	Rhizome stored only for few days before selling.	Rhizomes are collected from soil and cleaned with water then the upper surface is removed and dried in the sunlight.	Rhizome should be packed in jute bags for storage.	Use as a vegetable and medicine.
5.	Bodal (<i>Cucumis meloagrestis</i>)	Fruits are collected and cut into small pieces and dried in the sunlight.	Dried material stored in plastic container.	Not commercialized.	-	Food material (chips) Badi, Papad, pickle and mushroom powder.
6.	Amarbel (<i>Cuscuta reflexa</i>)	Collected climbers kept 2-3 days in sunlight for drying. Fresh climber used as medicine.	Dried climbers tied in bundles for storage.	Not commercialized.	-	Use as a medicine.
7.	Anantmoool (<i>Hemidesmus indicus</i>)	Roots are collected from soil and cleaned.	Dried root should be packed in jute bag for storage.	Roots are collected from soil and cleaned with water then dried in the sunlight and made powder.	Powder should be packed in plastic bags for storage.	Medicine tablet.
8.	Peng (<i>Celastrus paniculatus</i>)	Seeds are collected. Climber is collected by forcefully snatching the climber. So the immature fruits are damaged.	Dried root should be packed in jute bag for storage.	Mature seeds should be collected.	Powder should be packed in plastic bags for storage.	Oil is extracted. Also used as a medicine.
9.	Khekshi (<i>Momordica dioica</i>)	Fruit are collected.	Sun dried fruit should be packed in polythene bag for storage.	Some plants may be left with fruit so that mature seed spread for next year regeneration	-	Medicine value and used as vegetable.

Bio- product

S. No.	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Honey (<i>Aphis dorsata</i>)	The local collection method honey extracted from honeycomb.	Collected honey kept in container like clay pot.	All dirt and unwanted material removed from honey.	Well-processed honey should be stored in bottles with smart packing and labeled sold in market.	It has attractive chemical properties for baking and a distinctive flavor when used as a sweetener.
2.	Kosa (<i>Cocoon</i>) (<i>Antheraea mylitta</i>)	Trees are felled and Cocoons are collected and sold in the market.	Should be stored in open room.	Cocoons are boiled in water; then, Kosa fibres are extracted by rupturing the cocoon	After processing cocoon should be packed in jute bags for storage.	Silk saris, cloth and various dress material prepared.
3.	Chind kira (<i>Rhynchophorus ferrugineus</i>)	Weevil are collected by dissecting the plant	Roasted in fire and stored by wrapping in Mahul leaves.	Weevils should be reared for sustainable production.	-	Salt, turmeric powder is used for giving longevity and chutney is eaten.
4.	Chpora (<i>Solenopsis invicta</i>)	Trees are felled for collecting the ants.	Sun dried and stored.	Trees should not be felled. Bamboo made instrument is used for collecting ants.	-	Salt, turmeric powder is used for giving longevity and chutney is eaten.



Imli (*Tamarindus indica*)



Chhind kira (*Rhynchosporus ferrugineus*)



Bamboo dry (*Dendrocalamus strictus*)



Chapora (*Solenopsis invicta*)



Tikhur (*Curcuma angustifolia*)



Mahul seed (*Bauhinia vahlii*)

Plate 1: Value added products sold in local market



Phool bahari (*Tysanolaena maxima*)



Anola (*Emblica officinalis*)



Mahua flower and Mahua ras (*Madhuca longifolia*)



Plate 2: Value added products sold in local market



Plate 3: Value added bamboo and broom products sold in local market

Conclusion

The results of the investigation revealed that there is need to improve the post harvest methods with scientific knowledge against the local post harvest methods through which the NTFPs are processed. There is also need that during collection of any NTFP the hygienic sustainable collection methods can be apply to obtained the no contaminated product the hygienic drying with no dust in solar dryer may be used. The fully ripened fruit or matured rhizome will be collected to get quality produce which may fetches good price in the market. We have already discussed the local methods of post harvest and value addition verses scientific methods of post harvest. In case of value addition the hygienic harvesting till the processing of final products no contamination or zero contamination process will be used. The use of preservatives' as and when needed is utilized proper packaging sealing of the processed product fetches good market price.

References

1. Ganapathy MS. Collection and marketing of non timber forest products –A study in Kollegal taluk of Karnataka. M.Sc. thesis, University of Agricultural Sciences, Bangalore, 1998.
2. Geibler J, Kristof K, Bienge K. Sustainability assessment of entire forest value chains: Integrating stakeholder perspectives and indicators in decision support tools. *Ecological Modelling*. 2010; 221(18):2206-2214.
3. Girish MR. Role of non-timber forest products in tribal Economy – An economic study in Western Ghats region of Karnataka. Ph.D thesis, University of Agricultural Sciences, Bangalore, India, 1998.
4. Jagwan SS, Singh N, Zargar KA. Non-timber Fruit Products (NTFPs) livelihood and nutrition interface- A case study from the Garhwal, Himalaya. *Journals of Non-Timber Cor. Product*. 2010; 16-17:1-2.
5. Kandari LS, Omprakash MD. Enhancing livelihood through Non Timber Forest Product (NTFPs) collection, Orissa, India. *Annals of forestry*. 2009; 17-19(1-2):251-257.
6. Morsello C, Ruiz-Mallén I, Diaz MDM, Reyes-Garcia V. The effects of processing non-timber forest products and trade partnerships on people's well-being and forest conservation in Amazonian societies. *PloS one*. 2012; 7(8):e43055.
7. Pandit PK. An assessment of Non Timber Forest Products of Jhargram Division. *Indian Forester*. 2011; 137(8-12):1250-1255.
8. Pethiya BP, Surayya T. Economies of NWFP value addition and microfinance impact on forest dwellers livelihood in Madhya Pradesh. *Invention Forestry Review*, 2005; 7(3):227-231.
9. Rath S, Mohanty RC. Antifungal screening of *Curcuma longa* and *Cassia tora* on dermatophytes. *Int. J. Life Sci. Pharma Res*. 2013; 2(4):88-94.
10. Shankar Deo, Shukla N, Nag JL, Sahu MK. Study on preparation procedure and standardization of recipe for tikhur Barfi. *Internat. J. Proc. and Post Harvest Technol*. 2014; 5(2):156-164.
11. Suryaprakash S. An economic analysis of NTFP in the tribal economy in the Western Ghats region of Karnataka. (Report), UAS, Bangalore, 1999.
12. Velde DW, Rushton J, Schreckenber K, Marshall E, Edouard F, Newton A, Arancibia E. Entrepreneurship in value chains of non-timber forest products. *Forest Policy and Economics*. 2006; 8(7):725-741.