

8.

Small-scale textile production using natural dyes

1. GENERAL INFORMATION

1.1 Title of practice or experience

Small-scale textile production using natural dyes

1.2 Category of practice/experience and brief description

The handloom weaving project of UBINIG (Policy Research for Development Alternatives) in Bangladesh, operates as part of an alternative approach to the industrialisation process. Handloom weaving activity is not based on the use of fossil fuels. This ecological practice is being integrated with the practice of ecological agriculture in the rural areas where the project is in operation.

The project is also designed to avoid the use of chemical dyes in cloth production, as this causes environmental and health hazards. The use of natural dyes is still very limited and is confined to very sophisticated process of cloth production, which is often very expensive. In this project, clothes are being produced with the use of various forms of natural dyes. Experiments to find the sources of natural dyes and mordants are conducted continuously. In this act, farmers and weavers collaborate together. The experiments are directed towards making cloth production cost-effective so that the finished product falls within the purchasing power of the common people.

The marketing is done through Prabartana, the sales outlet of UBINIG. Prabartana is located in Dhaka. It actively promotes handloom-produced clothes, especially clothes that make use of natural dyes.

1.3 Name of person or institution responsible for the practice or experience

Shahid Hussain Shamim and Ashok Karmakar, Prabartana, UBINIG

1.4 Name and position of key or relevant persons or officials involved

Farhad Mazhar and Farida Akhter, UBINIG

1.5 Details of institution

- (a) Address: 5/3 Barabo Mahanpur, Ring Road, Shaymoli, Dhaka-1207, Bangladesh
- (b) Telephone: ++ (880) (2) 329 620, 811 465
- (c) Fax: ++ (880) (2) 813 065
- (d) E-Mail: ubinig@citechco.net

1.6 Name of person and/or institution conducting the research

Shahid Hussain Shamim, Prabartana

1.7 Details of research person/institution

- (a) Address: 2/8 Sir Syed Road, Mohammadpur, Dhaka-1207, Bangladesh
- (b) Telephone: ++ (880) (2) 911 8428
- (c) Fax: ++ (880) (2) 813 065
- (d) E-Mail: ubinig@citechco.net

2. THE PROBLEM OR SITUATION BEING ADDRESSED BY THE PRACTICE/INNOVATIVE EXPERIENCE

The aim of UBINIG's involvement in the handloom sector was to find a way for the progressive transformation of the sector. While development aid and policies were promoting the growth of an import-dependent and export-oriented garment industry, there was a neglect of the existing local handloom sector. The development planners failed to appreciate the necessity of restructuring the traditional home-based industrial activities. Weaving has enormous potential for being an industrial activity and possesses the characteristics of being amenable to transformation. Unfortunately, it did not receive any attention from the government or the so-called development donors. The weavers continued in their occupation only for their survival and livelihood. They had to struggle hard against market forces and the unregulated import and smuggling of clothes into the market.

Started in 1987, UBINIG Tant Prakalpa (UBINIG Weaving Project) presently serves more than 10,000 weavers around the country. The project origi-

nally started in Tangail as an action research program. Now, it is in operation in Tangail, Pabna, Sirajganj, Kushtia and Cox's Bazar.

Tangail is one of the important centres of the handloom sector. Here, there is a large number of artisan weavers using pitlooms. In the union of Pathrail, of Delduar thana of Tangail district, there are many craft weavers producing fine-quality sarees. The weavers belong to either the Hindu or the Muslim religion. However, the traditional weavers, known as Basaks, belong to the Hindu community. The Basaks are respected for possessing great skill in weaving. According to the oral history passed down among the Basak families, Nabab Alibardi Khan brought 25 to 30 Basak families from Murshidabad to cater to the local demand for cloth. These Basaks enjoyed the patronage of the Zamindars, because they produced clothes of fine quality that accorded with the taste of the elite. A large number of Muslim weavers have also been involved in this occupation for a long time. Usually, the Muslim weavers switch from farming to weaving when they lose cultivable land or are faced with a situation of poverty. The pitloom weavers project was started in this area primarily to address the problems facing the small and poor weavers. The small weavers are the ones having not more than two or three looms per family unit.

The weavers carry out the weaving operations with the small amount of capital needed for each production cycle - Tk.3,000 to Tk.4,000 produces 20 sarees, that is, 120yards of fabric. The money can be obtained from Mahajans, the capital-owner weavers. Mahajans are also trader weavers. They advance money to the smaller-scale weavers for the products they produce within a particular production cycle. The working capital received from the Mahajan by the weavers is used for purchasing yarn, dyeing and sometimes for jacquard design.

The money obtained from the Mahajans as an advance puts the weavers in a disadvantageous position in terms of fixing the price of the finished product. The Mahajan can decide the price on his own because he has paid in advance. Skilled weavers have greater bargaining power because their products fetch a better price in the market, but the semi-skilled and unskilled weavers have to accept the decision of the Mahajan in order to be able to receive further working capital. Poor weavers want to have a regular flow of income through sales of their product to meet their subsistence needs.

Apart from the general developmental thrust, there is one very significant aspect of the handloom weaving project. This is the ecological concern. Handloom weaving activity is not based on the use of fossil fuels. This ecological practice is being integrated with the practice of ecological agriculture in the rural areas where the project is in operation.

However, although the handloom technology is ecologically-friendly, the dyeing practice in weaving is not. The use of chemical dyes has been a cause

for concern, for ecological and health reasons. The weavers use VAT and naphthol for chemical dyeing of the yarn. These two methods have already been discarded internationally because they use caustic, hydrosulphuric, nitric acid and acetic acid for mordanting. Moreover, the chemicals used for the dyes are not Azo-free. The workers who are engaged in dyeing are exposed to various health hazards. They use their hands to mix the chemicals, e.g. mixing acid and naphthol in cold water, as a result of which they develop boils. As protection, some of them wear masks over their mouths. According to a worker in a dyeing factory, this work reduces their lifespans by ten years.

The waste-water from the dyeing factory gives off a bad smell and pollutes the surroundings. The trees and plants get burnt and die gradually. Even as a user of clothes dyed with chemicals, one is at risk of getting skin cancer.

The weavers and farmers came together to discuss what could be done to address the problem of the environmental damage caused by the chemical dyeing. In the UBINIG Weavers' Service Centre, which has a factory of semi-automatic looms to produce various kinds of fabrics, a dyeing unit was set up to provide dyeing support to the weavers. But due to the resultant environmental pollution, this could not be continued. An alternative was sought. In 1996, a natural-dyeing unit was set up in a factory located in Nalshoda village of Tangail. A natural-dyeing expert from Laharpur of Chapai Nababganj – a border district in North Bengal – was invited to initiate the dyeing set-up. His name is Tin Kori Das, popularly known as Kori Babu. He showed how natural dye can be extracted from a fruit called Haritoki (*Terminalia chebula*) and from the wood extract of Khoir (*Acacia catechu*). As mordant, he used potassium dichromate and alum (locally known as Fitkiri). The research on the different sources of natural dyes was initiated alongside the adoption of the technique to make natural dyeing cost-effective.

3. DESCRIPTION OF THE PRACTICE/INNOVATIVE EXPERIENCE AND ITS MAIN FEATURES

UBINIG has been working with the small weavers since 1986. This collaboration started off as a research project but has gradually evolved into a means to support the weavers' work. The first three years were spent mostly on action research work. The goal of the project was to make the weavers self-reliant on their own capital sources instead of going into indebtedness through the Mahajan 'advance' credit system. Secondly, it was important to address the relevant policy issues in relation to supporting small weavers.

At present, under a project for the small pitloom weavers, UBINIG is working in Tangail district's two thanas, four unions and 15 villages, with more than 500 weavers, who are provided with working capital as well as

other support services.

The project initially selects the small weavers who are in need of working-capital support. For a start, the weavers owning and operating only one loom were selected.

In the project, the weavers are provided working capital along with other support services such as the supply of yarn, dyeing, design and quality-control services, and marketing of products.

A weaver service centre was established that provides design, dyeing and marketing services, while working-capital support was given to the weavers in need of it. The working-capital support was given to the weavers only in the first year of operation. Gradually, they developed their own capital to run the operation.

Each year, the project supports an average of 200 weavers who receive all the services, including working capital. More than 300 weavers have since been phased out of project support and are running their own enterprises.

Most of the weavers own two or three looms per family unit, which maximizes the use of family labour. The better-off weavers may own up to five looms per unit and hire labour to operate the additional looms.

The project also addressed the question of the roles played by women in these operations. For example, the weaving activities are carried out by the family members in each unit of production. Therefore, all the family members, including husband, wife and children, take part in different activities. Women are mostly engaged in pre-weaving works, which include the very important tasks of processing the yarn and bobbin-making. The men usually weave the cloth and are involved in the marketing of the product. The project also provided support to the women to run a unit of production by themselves. This initiative met with some measure of success and women have started running units of weaving operations in their households.

SUPPORT TO THE WEAVERS

The project provides basic initial capital support to the weavers to set up the looms. The support continues till the weaver feels that he or she can run the enterprise on his or her own. They start off with one loom and the number of looms would be increased to up to at least five.

In order to run the weaving activities smoothly, the project provides intensive support in the form of design, yarn supply, dyeing, quality-control and marketing facilities. With these facilities, the weavers can plan for attaining an optimal size of operation in relation to the use of family labour and to the demands of efficiency and productivity.

Within a period of two years, most of the weavers are able to construct a

house for looms. In the beginning, the usual practice is to set the loom in the main living space of the house, barely leaving a space to sleep in. The next step is to acquire a small patch of land or a cow. The land, usually situated next to the house, would be mainly for growing vegetables and the cow, the source of milk. The cowdung is extremely important in making fuelsticks or fuelcake.

Once the weavers are on their own, they do not ask for working-capital support anymore. But they still require the services of the design, dyeing, quality-control and, most importantly, marketing facilities.

The marketing facility is mostly needed because it is not worthwhile for individual weavers to go all the way to Dhaka to market their products at the expense of concentrating on their production activities. Therefore, they need marketing assistance. The market is not stable throughout the year. There are seasonal effects in terms of high and low demand for products. The weavers need to be assured of a minimum turnover of products.

Here, UBINIG plays the role of a clearing house for the products produced by the weavers and ensures a regular income for their families.

It is important to ensure that the subsistence requirement of the weavers is met, so that they can concentrate on the skill of production. Towards this end, they engage in subsistence food production through ecological agricultural practices. The weaving families also produce vegetables and other crops in their backyards.

The result is a consolidation of their economic activities to include farming as well as weaving. The weavers make concrete plans about the supply of food required daily through agricultural activities, while weaving activities are considered as a form of entrepreneurship for which they need to accumulate enough capital to increase the size of the operation. They have also made plans to develop their households so that the weaving activities can be undertaken properly even though they operate from a household setting.

In the villages where UBINIG is working, the weavers have asked for schools to be opened for their children and also for the provision of health facilities. The children in the weaving families could not go to school because the school timings did not suit them. The children have to help in re-weaving work which is done in the morning. The project thus runs a school and a small health centre to provide services to the weaving and farming families.

NATURAL DYEING

In the production of clothes, dyeing is a very important process. It is the process of imparting colour to textiles and other materials whereby the colouring matter becomes an integral part of it and is not easily altered. The other

very important component of the dyeing process is the mordant. It is an intermediary agent, combining with certain natural dyes to bind the colouring matter to the fibre. Different mordants yield different colours in the same dye bath; while vegetable dyes yield warm, subtle colours, their density and colour fastness are determined by varying concentrations and skilful manipulation of the mordants.

The matter used for dyes and for mordants is the most crucial aspect in determining the colour as well as the effects on health and the environment. Consciousness about the environment and health has led to an evaluation of the matter used for dyeing and for mordants.

Natural dyeing has been introduced into the UBINIG handloom production process due to concern for the environment and health. Cloth production using chemical dyes in the handloom and power looms is not an old or traditional practice. It was only instituted over 100 years ago through commercial and merchandise interest groups. In recent times, the use of chemical dyes has become a common practice. The chemical-dye industry is now the domain of the multinationals such as ICT (UK), Novartis (Switzerland) and Dysin-Chm (India). There are no national companies manufacturing chemical dyes. Bangladesh is entirely dependent on the import of chemical dyes although there is an abundance of sources of natural dyes in the country.

If we look at its history, the practice of natural dyeing is not at all new to this part of the world. In fact, it is as old as the civilization itself. For the people in the East, particularly in the Indian subcontinent, the use of colours was as important as food and water. This was important more as a protective process to keep away the spells of evil spirits. The dyestuffs were exclusively vegetables, minerals and items of animal origin. (*The colour of our lives*, K.V. Chandramouli, 1993)

Therefore, in the search for an alternative which is based on ecological and human-welfare principles, new methods do not have to be invented or discovered. The alternative is in fact deeply rooted in the culture and history of the East.

In Bangladesh, there is a myriad of sources of natural dyes. With its diversity of climatic and geographic conditions, the country possesses an immense wealth/variety of flora and fauna which yields an array of dye-producing shrubs and perennials. Basically, they do not require special care and nurturing. The sources of natural dyes have always been collected. However, some sources such as al, manjistha, safflower and indigo came under organized cultivation because of their exceptional versatility. Increased acreage is devoted to al and safflower cultivation purely because of their dye qualities. Over 300 dye-producing plants are listed in various historical manuals.

The mordant is also derived from natural mineral sources. These are used

to precipitate the active principal of the dye and to fix the colour so as to make it insoluble in water or neutral soap. This technique has been known in the subcontinent from the second millennium B.C. and plays a major part in determining the lustre and performance of natural dyes.

Tangail is a very good place to explore different trees, plants, fruits, herbs etc. for their dyeing potential because this area has an abundance of different tree species with a correspondingly high degree of diversity. Consequently, it was possible to conduct experiments on the potential of various trees and their parts, such as leaves, bark, fruit, flower, stem, seed etc. As mordant, potassium dichromate, soda, iron particles, molasses, alum, fermented rice water and salt were used.

Initially, it was very exciting to get a variety of colours from different natural sources. But once the dyed cloth was washed, it faded. For example, one interesting colour was sourced from the wood of the Jackfruit tree and Marigold or Ganda flower, a very shiny yellow colour. But it did not stay after washing with soap. Another experiment was conducted on the Latkan fruit (in English, it is called Proing (*Bixa orellana*)) which, with fermented rice, turmeric and snail-shell lime, made a nice yellow (in Bangla, this colour is called Basanti). After washing, the colour did not fade, but the use of soap turned it into a shade of orange. The experiments with the bark of Mehagni (*Swietenia mahagni*), Arjun (*Terminalia arjuna*), Babla (*Acacia arabica*), Gab (*Diospyras peregrina*) etc. produced nice colours which did not fade after washing.

Natural dyeing is also very simple in terms of equipment requirements. Therefore, it is very easy for the weaving households to run the operation once they acquire the skills. Very simple utensils and implements are required for dyeing purposes. Earthen pots, mortar and pestle are used which are locally available.

Natural dyes are also used in the production of local wooden toys, mats and baskets, and ivory, pith and all kinds of decorative paintings. The tradition of using of natural dyes is reflected in the names of the colours, such as piyaji, surmai, basanti, asmani, nilambari, sonali, abir and dhani.

TRAINING OF UBINIG PERSONNEL IN NATURAL DYEING

Three members from the UBINIG weaving project received training in Laos through the sponsorship of JVC, Japan in March 1997. The hill people, especially the women, in Laos possess a wealth of knowledge and skill in natural dyeing. The trip was an extraordinary experience for the UBINIG team. They learnt the technique of dyeing with 19 colours using different parts of trees, plants etc. As mordant, they used mud, ash, lime, home-made wine/ alcohol and leaves. The main trees used, which are also commonly used in

Bangladesh as raw materials for dyeing, were jackfruit, mango, teak, etc. Other trees which are not available in Bangladesh were also used.

On their return from the study tour in Laos, the team enthusiastically took up various experiments in natural dyeing using similar techniques, with favourable results. The next step was to estimate the cost and also to obtain the raw materials. The sawdust from the sawmills proved to be a cheaper source than trees. The cost per bundle of yarn was between Tk.250 and Tk.300, which is equivalent to the cost of dyeing the same weight of yarn.

At present, UBINIG specialises in using the skin of the Dalim fruit (*Punica grantem*), bark of Mehegani (*Sweelenia mahagoni*), Horitoki fruit (*Terminalia chebula*), bark of Jiga (*Gramineae*), bark of Paiya (*Meloncanua baccifera*) and Khoir (*Acacia catechu*) as natural-dye matter. The colours are bright and colour fastness is guaranteed. They are also liked by the customers.

The other organisations that are working with natural dyes are Arannya Craft, Bonoj Bornali, BRAC, Kumudini, Proshika and Saptogram. One of the pioneers of the Comilla Khadi, Shailen Guha, used natural dyes in Khadi production. After his death a year ago, the organisation no longer uses natural dyes.

MARKETING: ROLE OF PRABARTANA

Once the weavers join the project, they work hard to develop their skills because without the skills, they cannot compete in the market with better-quality products. The project demands an increase in skills and quality improvement. They also get to know about the consumers' preferences through regular meetings and feedback from the sales outlet of UBINIG, called Prabartana. Prabartana also runs a consumer club for the handloom products, so that consumers' preferences can be better known.

The project weavers are very confident because they feel secure about their economic activities. At the same time, they are able to take advantage of the research being undertaken on product diversification and therefore feel confident about the wide range of market demands that they can meet.

The market uncertainty poses a threat to the weavers. Therefore, ensuring marketing opportunities for them whenever possible, allows them to focus their creative faculties on developing their enterprise. However, the project does not make the weavers entirely dependent on its marketing facilities. It only provides to those who are taking initiatives on different sources for marketing of their products.

Prabartana is the sales outlet of UBINIG. It is located in Dhaka city to form a bridge between the consumers and the producers. It also holds demonstrations on the activities of the weavers and forges links with other organisa-

tions working in the handloom sector and with weavers. The policy-making bodies at the national level are given constant feedback on the issues related to the weavers. Therefore, Prabantana is not only a commercial sales centre for handloom clothes, it plays a multiple role of being:

- (a) a clearing house for the weavers in Tangail as well as in other areas of the country,
- (b) a place to interact with the consumers to get feedback on the quality of the products,
- (c) a research centre for product diversification in the pitlooms,
- (d) a social space to generate interest among the city people in the local handloom industries, and
- (e) a place to demonstrate to the policy-makers the works of the small handloom operations in the country.

Prabantana ensures that the weavers under the project, as well as those outside, produce quality products able to compete in the national and international markets.

The regular and smooth marketing of the products produced by the small-weaver enterprise is the key to their survival. The weavers who have shown successful outcomes have to be assured about marketing. Although they are always on the lookout for marketing possibilities in the local markets, the uncertainty remains to a certain extent, posing a threat to the smooth running of their operations. Here, Prabantana allows them to come back in case of their failure to sell in the local market. Those weavers who run enterprises on their own having been with the project for two years are also allowed to take advantage of Prabantana's clearing-house services.

In the long run, Prabantana is trying to develop a model for such services to be provided at the national level for the weavers so that they can produce clothes without much fear of uncertainty in the market.

4. DESCRIPTION OF THE INSTITUTION RESPONSIBLE AND ITS ORGANISATIONAL ASPECTS

UBINIG is a research organisation formed in 1984. In 1986, it started research on the handloom weaving sector and it has worked with the weavers since 1987. In 1989, Prabantana, the sales outlet, was established in Dhaka to address the question of the marketing of handloom products.

Prabantana is directly responsible for the work on natural dyeing. As a sales outlet, it continuously verifies consumer preferences for colour and the use-effectiveness of the natural dyes. This is done through intensive interactions with the consumers.

The factory and the natural-dyeing set-up is in Tangail, a north-eastern

district in Bangladesh. It is about two hours' drive from Dhaka. This factory is also part of the UBINIG handloom project which works with the pitloom craft weavers in the area. UBINIG also runs an ecological agriculture programme, called Nayakrishi Andolon. The sources of natural dyes are identified with the help of the farmers.

5. PROBLEMS OR OBSTACLES ENCOUNTERED AND HOW THEY WERE OVERCOME

The initial problem faced by the project was in finding the sources of natural dyes. Each source is available only in limited quantities and therefore dyeing cannot be done in bulk. Tangail is a very good place to explore different trees, plants, fruits, herbs etc. for their dyeing potential because this area has an abundance of different tree species with a correspondingly high degree of diversity. The most common sources of natural dyes are jackfruit, mahagni, horitoki etc. But to get them in large amounts is still very difficult.

The mordant is derived from natural mineral sources. As mordant, potassium dichromate, soda, iron particles, molasses, alum, fermented rice water and salt are used.

When it comes to selling the product, the consumers want shiny colours whereas the vegetable dyes look light and simple. *So* initially, sales were slow. The products were only liked by those who are aware of the hazards of chemical dyes. But others were not very interested. Therefore, more publicity is required.

The washing of natural-dyed clothes is another important aspect that needs to be taken into account. In the market, there are detergents and soaps which are very harmful to such clothes. *So* the washing instructions become a very important consideration in marketing the products.

6. EFFECTS OF THE PRACTICE/INNOVATIVE EXPERIENCE

The overall impact of the project is positive. There is now a general awareness of the hazards caused by chemical dyes to human health and to the environment. In Prabartana, a more encouraging response towards natural-dyed clothes has been noted.

7. SUITABILITY AND POSSIBILITY FOR UPSCALING

The factory produces yardage fabric with natural dyes which is sold in Prabartana. There is great demand among the middle- and upper-class customers who are ready to pay a higher price per yard of natural-dyed clothes.

This is mainly out of health concerns. But lower-middle-class people are also buying such clothes nowadays.

There is no competition between natural-dyed products and those produced with chemical dyes as the former still command a very small share of the market. However, the natural-dyed clothes are sold at a relatively higher price. Consumers are buying these products mostly due to their awareness of the hazards of chemicals. However, the cost of production is not very high. The cost of production per yard of natural-dyed cloth is Tk.55.00; these are sold at Tk.65.00 per yard.

On the other hand, the cloth produced with chemical dyes costs Tk.50.00 per yard and is sold at Tk.60.00 per yard. The difference arises because natural-dyed clothes cannot be produced in large quantities. For example, onion skin, a natural-dye source, is not available in large quantities at any one time.

UBINIG does not intend to make the natural-dyed clothes exclusively for the middle-class and rich people. The intention is to lower the cost as much as possible so that the common people can purchase the clothes.

8. SIGNIFICANCE FOR (AND IMPACT ON) POLICY-MAKING

This project is very significant for policy decisions. In Bangladesh, there is no regulation of the chemical-dye business. It follows the regulatory framework of Germany. The main companies in the business are the following: ICI (UK), now ICI (India); Dysin (India); Atik (India); Clariant (Switzerland), formerly Sandoz (Switzerland); and Ciba (Switzerland) & Ciba (India).

It is known that the chemical-dye sales of Ciba alone come up to **Tk. 100** to 120 million. It sells its products through an agent called Magnet Trading Company.

The German regulation on Consumer Goods is followed as a guideline to regulate the use of hazardous chemical dyes. On the other hand, the government is not taking any initiative to increase natural-dyeing activities and to provide support to the small-scale weavers.

9. POSSIBILITY AND SCOPE OF TRANSFERRING TO OTHER COMMUNITIES OR COUNTRIES

The natural-dyeing practice is becoming popular among a small group of entrepreneurs. The only thing they need is training and sources for dyeing and mordants. There is a very good possibility of replicating the project in other districts with weaving pockets. The small-scale weavers are very much willing to take up such work. The experience of this project can be studied by

interested groups in other countries to see whether elements of it can be usefully replicated.

10. OTHER COMMENTS

A list of plants used for dyeing purposes **is** attached as Appendix 1.

APPENDIX 1: Plants Used for Dyeing Purposes

Local name	Botanical name	Family	Part used	Mordant
Dalim	<i>Punica grantem</i>	<i>Punicaceae</i>	fruit shell	alum
Kathal	<i>Artocarpus integrifolia</i>	<i>Moraceae</i>	wood	alum
Manjit	<i>Rubia cardifolia</i>	<i>Rubiaceae</i>	wood	alum
Koroi	<i>Albizoil lucida</i>	<i>Logu</i>	wood	iron
Gab	<i>Diospyras peregrira</i>	<i>Ebenaceae</i>	bark	iron
Jam	<i>Syzygium cumini</i>	<i>Myrtaceae</i>	bark	iron
Mahagni	<i>Swietenia mahagoni</i>	<i>Meliaceae</i>	bark	iron
Horitoki	<i>Tenminalia chebulia</i>	<i>Comperetaceae</i>	fruit	alum
Shegun	<i>Tectona grandis</i>	<i>Verbenaceae</i>	leaf	Iron
Ganda	<i>Tegetes erecta</i>	<i>Compositae</i>	petal	alum
Paiya	<i>Melocanna baccifera</i>	<i>Gramineae</i>	bark/wood	iron
Jiga	<i>Gramineal</i>	<i>Anacaroliacea</i>	bark	iron/alum
Piaj	<i>Alliun cepa</i>	<i>Liliaceae</i>	skin	alum
Khoir	<i>Acacia catechu</i>	<i>Leguminouae</i>	extract	potassium diachrome Supari
<i>Areca catechu</i>	<i>Palmae</i>	fruit	lime/alum	
Arjun	<i>Terminalia arjwna</i>	<i>Comprataceae</i>	bark	alum
Babla	<i>Acia arabica</i>	<i>Legu</i>	bark	caustic soda/iron
Dab	<i>Cocas nucifera</i>	<i>Palmae</i>	coir	caustic soda/alum
Eucalyptus	<i>Eucalyptus spp.</i>	<i>Myntaceae</i>	leaf	iron