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## Review Article

### Dyeing and Medicinal Plants Used in the Area of Mouhoun in Burkina Faso

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#### Abstract:

Although there is great investment in natural dyes, there are few scientific data on the traditional knowledge of their biological activities by the African people. This study investigates the nutraceutical and medicinal uses of traditional dyeing plants in the region of Mouhoun in Burkina Faso. An ethnobotanical survey was conducted in this region with plant dyers and traditional healers of this locality. The survey covered the techniques of dye extraction by the dyers, the modes of application, the diseases treated, the parts of the plants used and the modes of administration. Eighty-nine (89) dyers and/or traditional healers, including 44 women, were interviewed. A set of dye plants belonging to 12 plant families were identified. The ethnobotanical data obtained were examined in relation to the phytochemical and pharmacological data available in the literature.

**Keywords:** dye plants, medicinal plants, ethnobotanical surveys, Mouhoun.

#### 1. Introduction:

Today, traditional medicine is still the main source of preventive and curative care for populations in many parts of developing countries. Similarly, in most of these regions, despite the availability of synthetic dyes, many people continue to use plant extracts to color fabrics, masks or food because medicinal reasons. Various researches have shown that some dyes from plants generally possess desirable colour properties and good performance on natural fibres which are comparable to some highly rated synthetic dyes (Siva, 2007; Purohit *et al.*, 2007; Padma and Rakhi, 2007). Natural dyes have also better biodegradability and generally have higher compatibility with the environment. They are nontoxic, non-allergic to skin, non-carcinogenic, easily available and renewable (Adeel *et al.*, 2009; Siva, 2007; Samanta and Agarwal, 2009). Thus, many plant species are used as both medicinal and dye plants. Thus, the plants with betalaines intervene in the treatment of the paludism of nourrissons (Hilou, 2006). The indigotin of *Indigofera* sp has properties hépatoprotectrices (Singh *et al.*, 2001) and indirubin treats chronic leukaemias (Han, 1994). The yellow natural dyes (flavones and isoflavones) are powerful disinfectants which revitalize the skin; the indigo gives a feeling of cooling (Mahanta *et al.*, 2005).

In Africa, a number of studies have been done on medicinal plants and some on dyeing plants. We can cite Nacro *et al.*, 1993, P. A. G. Wanyama *et al.*, 2011 etc.... Nonetheless, there are few data on the use of dyeing plants to treat and prevent diseases. In order to document the dyeing and medicinal uses of dye plants, we have conducted an ethnobotanical survey of the Mouhoun region in Burkina Faso, West Africa. This region has the largest river basin of the country and has a rich biodiversity.

#### 2. Materials and Methods:

##### 2.1. Study area:

The Mouhoun region is located in the northwest of Burkina Faso, West Africa (photo 1). It consists of six of the following provinces: Balé, Banwa, Kossi, Mouhoun, Nayala and Sourou (photo 2). The capital city of the Mouhoun region is Dédougou. This region covers an area of 34,497 km<sup>2</sup> (12.6% of the country) and has an estimated population of 1,440,560 inhabitants (11.23% of the country's population). The Mouhoun region is bounded to the north and west by Mali and is located in the Sudano-Sahelian zone. The dry season lasts from seven to nine months in the northern region and four to six months in the south. The main spoken languages in the Mouhoun region are in the following order: Dioula, Mooré, Dafing, Bwamu (Bobo) San (Samo) and Fulfulde (Fulani). Their

respective status varies from province to province. For example, in the provinces of Kossi and Bale, the

main language is Bwamu (Bobo).



Photo 1: Boucle du Mouhoun's card



Photo 2 : Burkina Faso's card

## 2.2. Method of Data Collection:

Knowledge about medicinal and dyeing plants, like most traditional knowledge in Africa, is transmitted from one generation to another by oral communication. Additionally, the traditional uses of medicinal plants differ from one region to another and from one ethnic group to another. To identify traditional knowledge and practices about these plant species, a field investigation was deemed the most appropriate method. An ethnobotanical survey of dyers, traditional healers and herbalists was conducted in the Mouhoun region. The goal of the survey was to collect as much information as possible about the medicinal uses and techniques of the extraction of coloring substances from dyeing plants in this region. The survey was conducted during the months of July and August 2011. The selected survey sites were the following cities or villages: Dédougou, Karo, Koumandia, Safan, Tchériba, Tougan, Gassan, Kougny, Tchiériba, Zaba and Nouna.

We used a survey formula with a questionnaire. The issues discussed were related to the medicinal uses and extraction techniques of dye substances from plants. To gain the trust of respondents, we visited the traditional chief in each village and explained the purpose of the study. Subsequently, he sent us in the company of one of his advisers to meet with traditional healers or village dyers. The interviews with the dyers, traditional healers and herbalists were conducted in the language of choice of the interviewee. Generally, Moore or Dioula, according to the locality, was the language used. Sometimes, we found it useful to have the intervention of an interpreter. For respondents

who were dyers only (not traditional healers), we have, after the investigation about the uses of dyeing, conducted a survey on the medicinal uses of the species with traditional healers.

## 2.3. Species Identification and Establishment of Voucher Specimens:

Specimens of the aforementioned plants were harvested on site by respondents, allowing a preliminary identification of species with the help of agents of the environment protection service present in every province. Subsequently, a herbarium was established to complete the identification by the botanist Professor Jeanne R. Millogo. These voucher specimens have been deposited at the herbarium of the Université de Ouagadougou.

## 3. Results and Discussion:

### 3.1. Traditional Knowledge:

Conducting an ethnobotanical study in the Mouhoun region allowed us to discover a wealth of traditional knowledge, in terms of traditional medicine, dyeing techniques, sculpture and religious mask-making. These practices are encouraged by the late conversion of the inhabitants of the region, in which there are still areas that are mainly animist, to monotheistic religions and by the rich flora due to the presence of the biggest river in the country, the Mouhoun River. This region is also on the border of Mali, where plant dyes are highly developed. Additionally, there are governmental programs that support the local crafts organizations (e.g., PROMART, Program to Support the Crafts

Industry). These projects help dyers, among others, to keep their businesses, as they have become threatened by imports of foreign textile and chemical dyes. During this ethnobotanical survey, we interviewed 89 dyers, 44 of whom were women. They referred us to the plants they used for dyeing, the colors obtained, the colored objects and techniques for extracting dyes. Furthermore, a set of dye plants belonging to 12 different families were identified. The results are shown in Table 1.

### 3.2. Traditional Preparation of Dyes and Colorants:

#### 3.2.1. *Anogeissus leiocarpus*

After 2 hours, a yellow dye can be extracted from decoctions of the young leaves of *Anogeissus leiocarpus*. After cooling, the resulting liquid is then filtered to remove plant residue. The pieces of fabric to be dyed are then soaked in the decoction 2 to 3 times per week for 2 weeks. The more the fabric is soaked, the more the yellow color persists. Old clothes that have faded can also be recolored by soaking in the decoction. To overcome the seasonality of the availability of plant leaves (only in rainy season), stocks are made by drying fresh leaves harvested during the rainy season. To obtain a black color, dyers apply mud, extracted from the lowlands, on the tissues already yellow-dyed by a decoction of *Anogeissus leiocarpus* young leaves. Before the mud is applied, it is left to ferment for several weeks in water. The mud can also be used to design various patterns on fabrics. The ability to design patterns truly marks the artistic superiority of dyers.

#### 3.2.2. *Lannea microcarpa*:

After one hour, a red dye can be extracted from decoctions of *Lannea microcarpa* bark. After cooling, the filtered decoction is used to soak the fabric to be dyed. After each dip, the tissues are routinely dried in the sun. The decoction of the bark is also used for dyeing fibers used in masks. One can also use the infused or macerated bark of *Lannea microcarpa*, but in this case, the duration of fabrics soaking must be extended by two to three days to obtain a good color tone. To obtain a black color, mud can also be used as in the case of *Anogeissus leiocarpus*. Good fermentation of mud is obtained by kneading clay with water, the bran of millet and gum from *Lannea microcarpa*.

#### 3.2.3. *Indigofera tinctoria*

The leafy twigs of this plant are used to extract indigo dye. The work of indigo is well developed in the Mouhoun region, especially in Kougnie and Safané. Over 70% of the dyeing works in these two

localities use indigo. Several indigo wells, which are 2 to 3 meters deep (the approximate length of textile pieces to be dyed), are arranged around the dyeing workshops. The interior of each well is made of cement to prevent the infiltration of water into the basement. The availability of *Indigofera tinctoria* leaves is seasonal. Therefore, it is customary to build up stocks during the rainy season by spraying fresh *Indigofera tinctoria* leaves and conditioning them as small balls, which are easy to store and use throughout the year. Each well is filled with water and a few scoops of leaves (10 to 14 balls) are added. Also, 1 to 2 kg of soda is added and the solution is subsequently stirred with a long bamboo stick until homogeneous. Maceration is allowed to occur for 7 to 10 days, after which the well volume is filled with clean water. When the dye bath is able to dye a hand in contact blue, the bath is then ready for dyeing. The fabric to be dyed is subsequently immersed in the well and stirred using a bamboo stick. After the first soaking, the fabric is dried in the sun. Soaking can be repeated in the same dye bath two or more times, depending on how dark a color is needed. To obtain white figures on a blue background, pieces of fabric can be attached in the desired pattern before or after the first soaking. Dyeing activities are usually performed by groups of artisans. Nonetheless, there are sometimes dyers that work individually or with their children. In this case, they use large tubs and barrels instead of wells even if the dyeing techniques used are the same as those described above.

#### 3.2.4. *Parkia biglobosa*

The *Parkia biglobosa* plant is used by women in the Mouhoun region to color pots. The dye is extracted by macerating the dried fruit pods of the plant. After baking, new pots are immediately dipped in the dye bath. After drying in the sun, the pots have a shiny dark-red color.

#### 3.2.5. *Lannea acida*

The *Lannea acida* plant is used for dyeing pots, and it can also be used instead of *Parkia biglobosa*. The filtered decoction is used to color pots black.

#### 3.2.6. *Sclerocarya birrea*

The *Sclerocarya birrea* plant is sometimes used for coloring pottery black. The plant extract used is a decoction of the stem bark.

#### 3.2.7. *Mitragyna inermis*

The *Mitragyna inermis* plant is also used in dyeing. To obtain a black color, one uses a decoction of plant leaves.

### **3.2.8. *Cochlopermum tinctoria***

To obtain a yellow tint, a decoction of the roots of *Cochlopermum tinctoria* can be used.

### **3.2.9. *Terminalia avicennioides***

A yellow dye is produced from *Terminalia avicennioides* by macerating or making a decoction of its leaves or roots.

### **3.2.10. *Terminalia laxiflora***

Dye extraction from *Terminalia laxiflora* is done in the same manner as from *Terminalia avicennioides*.

### **3.2.11. *Acacia nilotica***

The *Acacia nilotica* plant is frequently used for dyeing in the Mouhoun region. Because of its thorns, *Acacia nilotica* is often used to enclose gardens, fields and even the courts. The decoction of the pods of the plant produces a dye bath that colors shiny fabrics and masks black. The powder of cloves is also used as a mordant. The stembarks of *Acacia nilotica* are also used to extract red dye via decoction. For tanning hides, an infusion of the powder of cloves is used in the presence of potash. The leather is then soaked for less than 24 h. Soaking the skin in the solution for over two days can cause damage.

### **3.2.12. *Ximenia americana***

The *Ximenia americana* plant can be used for tanning leather in the absence of *Acacia nilotica* pods. *Ximenia americana* roots are harvested, cut into small pieces, stripped of bark, pulverized and the resulting powder is used for tanning leather.

### **3.2.13. *Hibiscus sabdariffa***

The *Hibiscus sabdariffa* plant is used as natural dye for food and juice in the preparation of tô, a traditional dish made from cornmeal or millet. The dye is obtained from the decoction or maceration of the calyces of the flowers, which can also be used for their acidifying activity. In the absence of calyces, the leaves of the *Hibiscus sabdariffa* can be used.

### **3.2.14. *Tamarindus indica***

The *Tamarindus indica* plant is also a source of natural dyes used in the preparation of juice. Both leaves and pods can be used, though the pods are often preferred to extract the orange dye. For this purpose, the pulp is extracted from the pods and

the dye is extracted by decoction or maceration. The resulting extract also acidifies the foods it colors.

### **3.2.15. *Sorghum bicolor***

The *Sorghum bicolor* plant is involved in the process of coloring mask fibers and tanning leather. To color mask fibers, the petioles of the leaves (surrounding the stem) of the plant are used. These leaves are then macerated for a day before use. For tanning, the filtrate of macerated seed (red) powder is used.

### **3.2.16. *Vittelaria paradoxa***

The stem bark of the *Vittelaria paradoxa* plant is harvested after being stripped of its scaly suber. After drying, the powdered stem bark is extracted by maceration for one day. After the resulting solution is filtered, a dye that colors leather brown is produced.

### **3.2.17. *Kaya senegalensis***

The bark of the *Kaya senegalensis* plant is used to dye cloth yellow. The dye is extracted by decoction of the *Kaya senegalensis* stem bark.

### **3.2.18. *Vigna subterranea***

The leguminous *Vigna subterranea* food plant is generally co-cultivated with millet. Fresh leaves of this plant can be used to extract a blue dye used by some dyers. The extraction is done by macerating fresh pulverized leaves in the presence of potash. The resulting solution is filtered producing a blue dyeing solution for fabrics.

### **3.2.19. *Acacia seyal* and *Acacia senegal***

The gums of the *Acacia seyal* and *Acacia senegal* plants are generally used as mordants to fix dyes. The macerated gum also produces a bright-red dye used to color masks and wooden tools.

## **3.3. Ethnomedicinal Uses of the Dyeing Plants:**

To identify the diseases treated by these plants, we asked 13 traditional healers in the Mouhoun region, 7 of whom were women. All dye plants cited by the dyers are, according to traditional healers, commonly used to treat many infectious diseases (bacterial and viral). Table 2 lists diseases commonly treated by plants in the Mouhoun region.

**Table 1: dye uses of listed plants**

Species (Latin binomial)	Family	Local names (in Moore and Dioula)	Processed items	Coloration or propriety	used material	plant	Frequency of uses by the respondents
<i>Acacia nilotica</i>	Mimosaceae	Pegué-nega bagana	Fabrics, heads of masks	Black gloss, red	Pods		13,48%
<i>Acacia senegal</i>	Mimosaceae	Gon-miougou	Fabrics, heads of masks	Mordant	Gum		5,62%
<i>Acacia seyal</i>	Mimosaceae	Gon-pèlga	Fabrics, heads of masks	Mordant	Gum		4,49%
<i>Anogeissus leiocarpus</i>	Combretaceae	Siiga galama	Fabrics	Yellow	Leaves		26,97%
<i>Cochlospermum tinctoria</i>	Cochospermaceae	Sôasga ndribala	Fabrics	Yellow	Roots		7,87%
<i>Hibiscus sabdariffa</i>	Malvaceae	Wègda dâ	Food	Red	Calyces (flowers)		5,62%
<i>Indigofera tinctoria</i>	Fabaceae	Garga gara	Fabrics	Blue or green	Stembarks		33,71%
<i>Kaya senegalensis</i>	Meliaceae	Kouka diara	Fabrics	Yellow	Stembarks		5,62%
<i>Lannea acida</i>	Anacardiaceae	Sab – touga bembé	Pots	Black	Stembarks		13,48%
<i>Lannea microcarpa</i>	Anacardiaceae	Sabga pekou	Fabrics, fibers of masks,	Red	Stembarks		15,73%
<i>Mitragyna inermis</i>	Rubiaceae	Yliga diu	Fabrics	Black	Stembarks		6,74%
<i>Parkia biglobosa</i>	Mimosaceae	Rôga néré	Pots	bright red	husk		20,22%
<i>Sclerocarya birrea</i>	Anacardiaceae	Nobga kouna	Pots	Black	Barks		5,62%
<i>Sorghum bicolor</i>	Potaceae	Ca-zinga	Skins, fibres of masks	Red	Seeds, sheaths of the Leaves		3,37%
<i>Tamarindus indica</i>	Cesalpiniaceae	Pousga tomi	Food	Pink Red	Leaves, Fruits		4,49%
<i>Terminalia avicennioides</i>	Combretaceae	Kondré wèrèba	Fabrics	Yellow	Leavess, roots		4,49%
<i>Terminalia will laxiflora</i>	Combretaceae	Kondre-poko wèrèba	Fabrics	Yellow	Leaves, roots		4,49%
<i>Vigna subterranea</i>	Fabaceae	Benga	Fabrics	Green	Leaves + potash		2,25%
<i>Vittelaria paradoxa</i>	Sapotaceae	Taaga	Leather	Chestnut	Wood		2,25%
<i>Ximenia americana</i>	Olacaceae	Leenga koimba	Leather	Tanning of the skin	Stem		2,25%

**Table 2: medicinal uses of the listed dye plants**

Species (Latin binomial)	Diseases	Parts used	Extraction and mode of use
<i>Acacia nilotica</i>	Mycosis, hemorrhoids, eye diseases, wounds, diarrhea, constipation, toothaches	Pod, sheets, fresh sheets, fruits (juice)	Decoction, infusion, orally, cataplasm, sitz-bath
<i>Acacia senegal</i>	Ulcers, stomach aches	Bark	Decoction, orally
<i>Acacia seyal</i>	Dysentery, diarrhea, stomach aches, whitlow	Sheets, bark, gum	Decoction, orally, cataplasm
<i>Anogeissus leiocarpus</i>	Jaundice, stomach aches, malaria, cough, bronchitis, absence of menstruation, wounds, skin diseases, fever	Sheets, bark, roots	Decoction, infusion, orally
<i>Cochlospermum tinctoria</i>	Malaria, hemorrhoids, fever	Roots	Decoction, orally, bath
<i>Hibiscus sabdariffa</i>	Headaches, wounds, fever, malaria,	Leafy stems, stems, roots, pulp	Decoction, bath, inhalation, orally ,
<i>Indigofera tinctoria</i>	Mycosis, wounds, snakebite, liver diseases, malaria, whitlow	Leaves, whole plant	Decoction, cataplasm, orally, sitz-bath
<i>Kaya senegalensis</i>	Jaundice, stomachaches, wounds, ulcers, sterility	Roots, leaves	Decoction, bath, cataplasm, orally
<i>Lannea acida</i>	Mycosis, stomach aches, diarrhea, hemorrhoids	Bark	Decoction, infusion, orally, sitz- bath
<i>Lannea microcarpa</i>	Jaundice, paludism, constipation	Bark	Decoction, infusion, orally, sitz-bath
<i>Mitragyna inermis</i>	Paludism, constipation	Leaves, roots	Decoction, infusion, orally
<i>Parkia biglobosa</i>	Mycosis, sleeping pill, snakebite, hemorrhoids	Ripe thimbles, barks, fruits	Decoction, infusion, orally, cataplasm, sitz-bath
<i>Sclerocarya birrea</i>	Cough, snakebite	Bark	Decoction, calcination, orally
<i>Sorghum bicolor</i>	Increase milk production for nursing women	Sheaths	Infusion, orally
<i>Tamarindus indica</i>	Constipation, nausea	Pods, leaves	Decoction, infusion, orally
<i>Terminalia avicennaoides</i>	Jaundice, cough, nausea	Barks, leaves, stems	Decoction, calcination, orally
<i>Terminalia laxiflora</i>	Jaundice, diarrhea, hemorrhoids, dysentery	Leafy stems, roots	Decoction, infusion, orally, bath
<i>Vigna subterranea</i>	Diarrhea, dysentery	Roots	Decoction, infusion, orally
<i>Vittelaria paradoxa</i>	Mycosis, fever, chicken pox, malaria	Bark, leaves	Decoction, bath, sitz-bath, orally
<i>Ximenia americana</i>	Snakebitebite	Bark, roots	Decoction, cataplasm, bath, orally

### 3.4. Dyeing and Medicinal Uses:

Most plants used for dye extraction are classified as medicinal plants (Siva, 2007). For example, plants containing betalains are involved in the treatment of malaria in infants (Hilou, 2006). Indigo from the *Indigofera* species has hepatoprotective properties (Singh et al., 2001) and indirubin is used to treat chronic leukemia (Han, 1994). Yellow natural dyes (flavones and isoflavones) are potent antiseptics that revitalize the skin (Mahanta et al., 2005). Lycopene, the carotenoid pigment responsible for the red color of tomatoes, watermelon or carrots, reduces the risk of some cancer diseases, such as prostate cancer (Clinton et al., 1998, Rao et al. 1999, Giovannucci et al., 1999). Naphthoquinones, such as Lawson from *Lawsonia inermis* L. (Lythraceae), have antibacterial and antifungal activities (Gerson et al., 1975, Wagner et al., 1989). The antibacterial activities on *Staphylococcus aureus*, *E. coli* and *Salmonella* Sp. of 15 dye plants have also been highlighted (John, 2007). Different organs (stems, roots, leaves and fruits) of the plants of the Mouhoun region are used to extract dyes and medicinal components. There are some plants that are fully used. Previous studies have shown similar medicinal uses for the above-mentioned dyeing plants. In the province of Kourittenga in Burkina Faso, the following plants have medicinal properties: *Acacia nilotica* is used to treat ulcers; *Anogeissus leiocarpus* is used for the treatment of malaria, diarrhea and fever; *Cochlospermum tinctorium* is used against anemia, diarrhea and malaria; and *Khaya senegalensis* extracts are used to treat malaria and hemorrhoids (Pascal, 2011). In the Kadiogo province of Burkina Faso, leaves of *Indigofera tinctoria* and *Tamarindus indica* are used in the traditional treatment of wounds, abscesses and boils. Additionally, the bark of *Parkia biglobosa*, like that of *Sclerocarya birrea*, is used to treat constipation, malaria, nausea and diabetes (Nacoulma, 1996). On the Ivory Coast, the stems, roots and leaves of *Lannea acida* have been shown to be effective against diarrhea, rheumatism and respiratory diseases (Koné, 2004).

### 3.5. Review of Literature on the Six Most Commonly Used Plants:

The survey results demonstrated the frequent use of the following six plants, which are also dyeing and medicinal plants: *Indigofera tinctoria* (33.71%), *Anogeissus leiocarpus* (26.97%), *Parkia biglobosa* (20.22%), *Acacia nilotica* (13.48%), *Lannea microcarpa* (15.73%) and *Lannea acida* (13.48%).

Indigo, a dye and bioactive compound, obtained by petroleum ether fractionation of the aerial parts of *Indigofera tinctoria*, showed dose-dependent hepato-protective activity against liver damage caused by chemicals (CCl<sub>4</sub>) in rats. In the same study, alcohol extracts were also observed to improve the antioxidant defense system of the livers of rodents during acute hepatitis induced by endotoxin D-galactosamine (Malarvannan et al., 2003). *Indigofera tinctoria* contains rotenoids (isoflavones), which exhibit very high toxicity against the larvae of *Anopheles stephensi* (a mosquito) and adults of *Callosobruchus chinensis*, a bruchid (Kamal et al. 1993). This plant contains a variable amount of red dye (indirubin), isomers of isoindirubin (also red compounds) and isoindigo (a brown compound) (PROTA 3, 2005).

Acetone, methanol or chloroform extracts of *Anogeissus leiocarpus* were observed to exhibit antibacterial activity by strongly inhibiting the growth of *Streptococcus mutans*, *Staphylococcus saprophyticus*, *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* (Adejumobi et al., 2008, Mann et al. 2008). Some of these extracts were also observed to inhibit the *in vitro* growth of chloroquine-resistant *Plasmodium falciparum* strains. The antibacterial activity of *Parkia biglobosa* extracts against *Staphylococcus aureus*, *Samonella thyphi*, *E. coli* and *Pseudomonas aeruginosa* has already been confirmed (Udobi et al. 2008). This activity is attributed to the high content of flavonoids, tannins and saponins, and leaves and pods of this species are traditionally used for antidiarrheal activity or for antiseptic action. Analgesic and anti-inflammatory tests on mice showed beneficial effects from the stembark extracts of *Parkia biglobosa*. The fraction of leaves containing flavonoid aglycones exhibited spasmolytic action on smooth muscles and a vasodilatory effect. Additionally, coumarin derivatives from these leaf extracts displayed anticoagulant action (Udobi et al. 2008; Bukar et al., 2010).

Phytochemical screening of the *Acacia nilotica* stembark showed the presence of terpenoids, alkaloids, saponins and glycosides (Banso, 2009). A polygalloyltannin (the 1,3,6-digalloyl-2,4-monogalloyltannin) was isolated from the methanol extract of the *Acacia nilotica* plant root (Ali et al., 2010). Gallotannins are well-known for their antidiarrheal, hemostatic and antihemorrhoid activities (Pauyonen-pimi, 2004). The diterpene

niloticane isolated from the ethyl acetate extract of the plant stem bark showed growth-inhibitory activity of *Staphylococcus aureus*, *Bacillus subtilis*, anti-inflammatory activity of cyclooxygenases (1 and 2) and anticholinesterase activity (Eldeen et al., 2010). These results could justify the use of *Acacia nilotica* in the treatment of microbial, inflammatory and central nervous system diseases. Using the DPPH method, the radical scavenging activities of *Lannea microcarpa* and *Lannea acida* stem bark were determined to be  $40.07 \pm 0.05$  g / ml and  $345.72 \pm 7.76$  g / ml, respectively. A high content of phenolics and tannins is present throughout all parts of these two plants. These compounds are known for their antioxidant and antibacterial activities. Tannins, such as gallic acid derivatives, in these plants are known to react with the iron-rich mud used in the bogolan dyeing technique (Ouattara et al., 2011). Two anthocyanins (glycosides) were isolated from the fruit extracts of *Lannea microcarpa* (Palé, 1998).

#### 4. Conclusions:

This study revealed a strong tradition of dyeing using *Indigofera tinctoria*, *Anogeissus leiocarpus*, *Acacia nilotica* and *Parkia biglobosa* in the region of Mouhoun. These plants are also commonly used for ethnomedicinal purposes to treat various infectious diseases in this region. The molecules responsible for the dyeing properties of these plants and those probably involved in the pharmacological activities belong to the same phytochemical families, which contain phenolics, flavonoids, quinones, alkaloids etc... These results also show that there is interesting traditional knowledge on medicinal plants commonly used in the Mouhoun region for dyeing and food coloring. These plants are also sometimes used for mystics, such as making masks and hunting. For example, "Bogolan" dyeing is used to protect hunters against the evil spirits of animals. Laboratory screening of extracts from the most frequently used plants obtained during this investigation may reveal interesting results that could increase the value of these plant species, thereby helping to fight against their mass destruction.

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#### References:

- 1) Adeel, S., Ali, S., Bhatti, I. A. And Zsila, F. (2009). Dyeing Of Cotton Fabric Using Pomegranate (*Punica Granatum*) Aqueous Extract. *Asian J. Chem.*, 21(5): 3493-3499.
- 2) Adembega, P., Boussoum, I. J., Nikiema, J. B., Poli, F., Antognoni, F. (2011). Medicinal plants in Baskoure, Kourittenga Province, Burkina Faso: An ethnobotanical study. *Journal of Ethnopharmacology*, 133, 378–395.
- 3) Ali A. J., Helmina O. A., Bukar E. N. D. and Okogun J. O. (2010). Polygalloyltannin isolated from the roots of *Acacia nilotica* Del. (Leguminosae) is effective against *Plasmodium berghei* in mice. *Journal of Medicinal Plants Research*, 4(12), 1169-1175.
- 4) Banso A., 2009. Phytochemical and antibacterial investigation of bark extracts of *Acacia nilotica*. *Journal of Medicinal Plants Research*, 3(2), 082-085.
- 5) Bukar, A., Uba, A. and Oyeyi, T.I. (2010). Phytochemical Analysis and Antimicrobial Activity of *Parkia Biglobosa* (Jacq.) Benth. Extracts Against Some Food – Borne Microorganisms: *Adv. Environ. Biol.*, 4(1), 74-79.
- 6) Clinton, S. K. (1998). Lycopene: Chemistry, biology, and implications for human health and disease. *Nutr. Rev.*, 56, 35–51.
- 7) Eldeena, I. M. S., Van H. F. R., Van S. J. (2010). In vitro biological activities of niloticane, a new bioactive cassane diterpene from the bark of *Acacia nilotica* subsp. *Kraussiana*. *Journal of Ethnopharmacology*, 128, 555–560.
- 8) Gerson, H. (1975). Fungi toxicity of 1,4-naphthoquinones to *Candida albicans* and *Trichophyton mentagrophytes*. *Can. J. Microbiol.*, 21, 197–205.
- 9) Giovannucci, E. (1999). Tomatoes, tomato-based products, lycopene and cancer: Review of the epidemiologic literature. *J. Natl. Cancer Inst.*, 91, 317–331.
- 10) Han, (1994). Highlight on the studies of anticancer drugs derived from plants in China, *Stem Cells*, 12(1), 53-63.
- 11) Hilou, A. (2006). Etude phytochimique et activités biologiques d'extraits de deux Caryophyllales à betalaines ; *Amaranthus spinosus* (Amaranthaceae) et *Boerhaavia erecta* (Nyctagynaceae), plantes médicinales du Burkina Faso. Ph. D. Thesis Submitted to University of Ouagadougou, 176p.

- 12) Koné, W. M., Kamanzi, A. K., Terreaux, C., Hostettmann, K., Traoré, D., Dosso, M. (2004). Traditional medicine in North Côte-d'Ivoire: screening of 50 medicinal plants for antibacterial activity. *Journal of Ethnopharmacology*, 93, 43–49.
- 13) Nacoulma, O.G. (1996). Plantes médicinales et pratiques médicales traditionnelles au Burkina Faso. Cas du plateau central. Thèse d'état. Ph. D. Thesis Submitted to University of Ouagadougou, Tome I, 320pp, Tome II, 261pp.
- 14) Nacro, M., Millogo, R.J. (1993). Plantes tinctoriales et plantes à tanins du Burkina Faso. *Editions Scientifik A, Amiens, France*, 152pp.
- 15) Ouattara L., Koudou j., Zongo C., Barro N., Sawadogo A., Bassolé I. H. N., Ouattara A. S. et Alfred A. T. (2011). Antioxydant and antibacterial activities of three species of *Lannea* from Burkina Faso. *Journal of Applied Sciences*, 11 (1), 157-162.
- 16) Palé, E., Nacro, M. et Kouda-Bonafas, M. (1998). Anthocyanins from fruits of *Lannea microcarpa*. *Tropical Science* 38(1): 20–24.
- 17) Padma SV, Rakhi S (2007). Dyeing wool and silk with *Hibiscus mutabilis* (Gulzuba). *Dyes Pigments*, 74(2): 464-469.
- 18) Purohit A, Mallick S, Nayak A, Das NB, Nanda B, Sakio, S. (2007). Developing multiple natural dyes from flower parts of Gulmohur. *Curr. Sci.*, 92(2): 168-682.
- 19) Rao, A. V. et Agarwal, S. (1999). Role of lycopene as antioxidant carotenoid in the prevention of chronic diseases. *Nutr. Res.*, 19, 305–323.
- 20) Singh B, Saxena A. K., Chandan B. K., Bhardwaj V, Gupta V. N, Suri O. P, Handa S.S. (2001). Hepatoprotective activity of indigotine-a bioactive fraction from *Indigofera tinctoria* L. *Phytother. Res.*, 15(4), 294-297.
- 21) Samanta, AK, Agarwal, P. (2009). Application of Natural Dyes on Textiles. *Ind. J. Fibre and Textile Res.*, 34:384-399.
- 22) Singh, R., Jain, A., Panwan, S., Gupta, D. et Khare, S. K. (2005). Antimicrobial activity of natural dyes. *Dyes Pigm.*, 66, 99–102.
- 23) Siva, R. (2007). Status of natural dyes and dye-yielding plants in India. *CURRENT SCIENCE*, 92(7), 916-925.
- 24) Udobi, C. E., Onalapo, J. A. and Agunu, A. (2008). Antibacterial activities and bioactive components of the aqueous fraction of the stem bark of *parkia biglobosa* (jacq) (mimosaceae). *Nig. Journ. Pharm. Sci.*, March, 7(1), 49 – 55.
- 25) Wanyama, P. A. G., Kiremire, B. T., Ogwok P. and Murumu, J. S. (2011). Indigenous plants in Uganda as potential sources of textile dyes. *African Journal of Plant Science* Vol. 5 (1), pp. 28-39.
- 26) Wagner, H., Kreher, B., Lotter, H., Hamburger, M. O. and Cordell, G. A. (1989). Structure determination of new isomeric naphthol [2,3,-b]furan-4,9-diones from *Tabebuia avellanadae* by the selective INEPT technique. *Helv. Chim. Acta*, 72, 659-667.