

PHYTODAY 2019

Le réseau des phytochimistes de la région Grand-Est élargi – 4ème édition

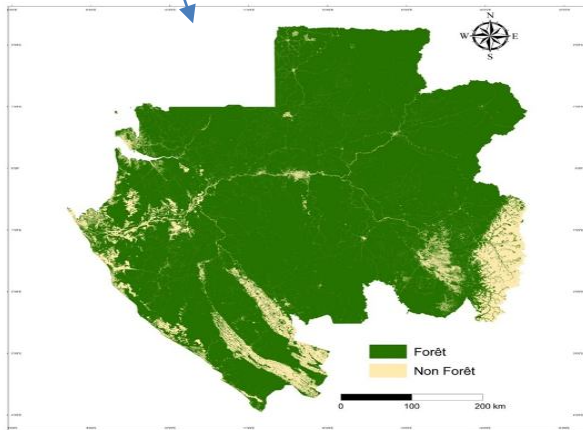
Valorisation of the by-products generated by the primary wood processing industry in gabon

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- 1** Introduction and Context
- 2** Related to primary wood processing
- 3** The role of extractives in wood
- 4** Chemical composition of wood: Azobé and Iroko
- 5** Potential valuation of extractives
- 6** Conclusion and Outlook



Geographical location and context

- *Central African countries**
 - *80% of the territory covered by forest**
 - *Diversity of precious wood species**
 - *Large oil resources**
 - *Miscellaneous minerals etc.**
-

2010

- More log exports**
- Local wood processing**
- Significant production of related products**

primary PROCESSING OF WOOD

-400 wood species that can be used

-Only 80 species are marketed and bear the name of various woods, 10 of which are in the first rank : Padouk, Kévazingo, Moabi, Agba, Bilinga, Iroko, Azobé, Bahia, Beli and Movingui



Extraction in the forest and transport



Machining



Finished products

Under-utilised wood products:

Bark



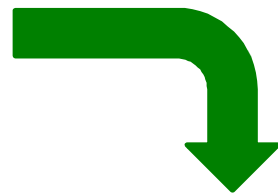
Sapwood and heartwood scraps



Extractables give wood special characteristics:



- Color
- Smell
- Natural durability
- Influence mechanical and acoustic properties



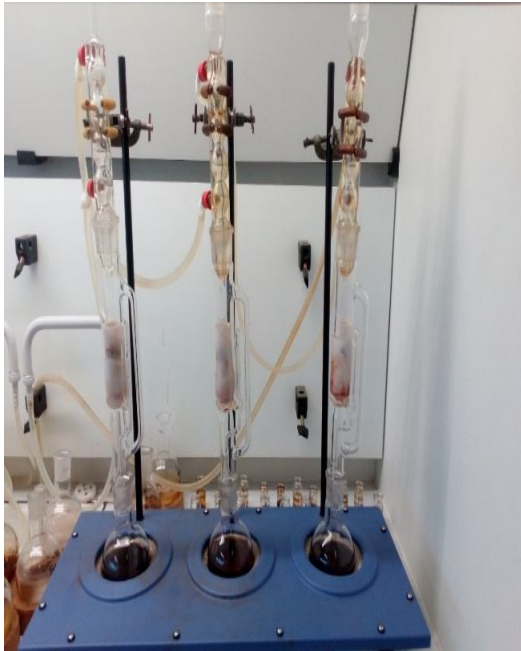
Current use

- Fuelling boilers
- Charcoal manufacturing



QUANTIFICATION of EXTRACTIVES OF AZOBE AND IROKO WOOD

Successive extraction



- 1-Sampling and drying of wood
- 2-Shredding
- 3-Extraction

AZOBE (*Lophira Alata*)

	DMC	acetone	toluene-ethanol	water	Total
bark	3.9±0.05	9.9±0.5	2.4±0.5	14.7±1.5	30.9±2.5
sapwood	1.2±0.1	2.4±0.1	0.8±0.5	6.5±0.8	10.9±1.5
heartwood	3.3±0.05	3.8±0.4	3.6±0.5	7.6±0.2	18.3±1.1

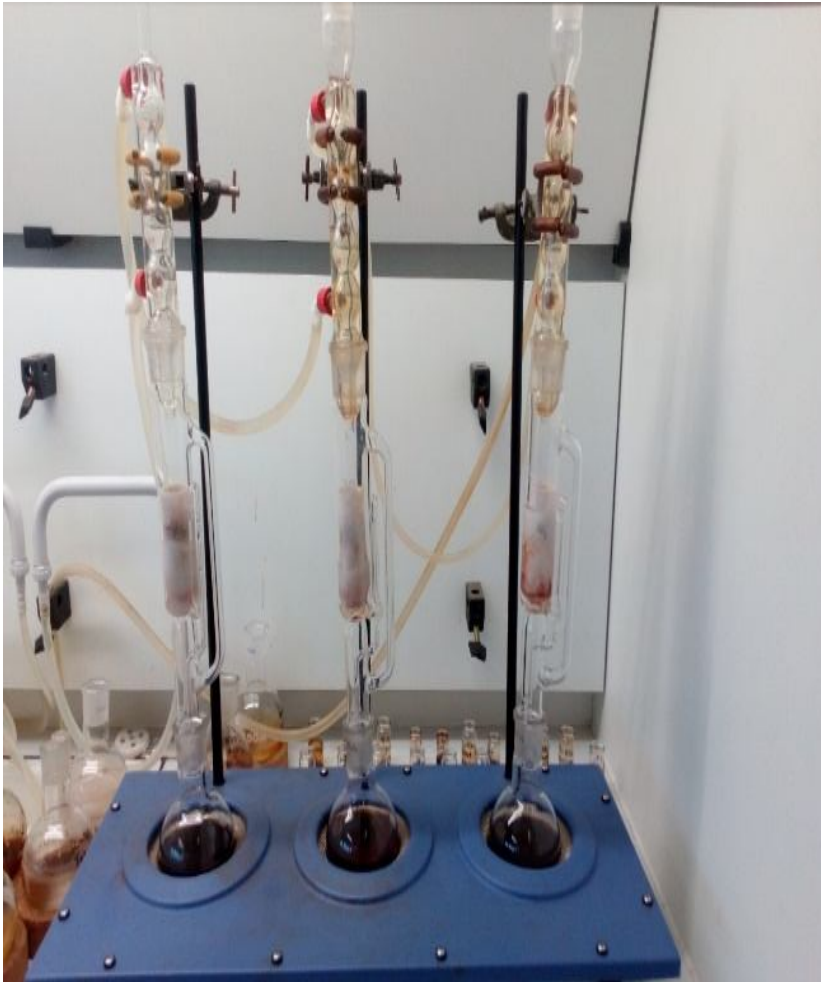
IROKO (*Chlorophora excelsa*)

	DMC	acetone	toluene-ethanol	water	Total
bark	3.4±0.3	3.1±0.4	0.4±0.1	4.5±0.04	11.4±0.8
sapwood	3.7±0.5	5.4±0.9	0.4±0.2	3.3±0.1	12.8±1.5
heartwood	6.4±1.2	8.8±0.8	0.5±0.1	3.8±0.4	19.5±2.5

DMC: Dichloromethane

QUANTIFICATION of EXTRACTIVES OF AZOBE AND IROKO WOOD

Parallel Extraction



AZOBE (*Lophira Alata*)

	ethanol	ethanol/water	Total
bark	23.4±0.9	21.2±0.6	44.6±1.5
sapwood	8.2±0.2	5.5±0.3	13,7±0,5
heartwood	10.8±0.7	19.5±0.9	30.3±1.6

IROKO (*Chlorophora excelsa*)

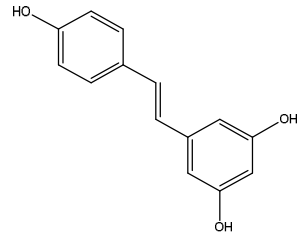
	ethanol	ethanol/water	Total
bark	9.3±0.4	14.2±0.2	23.5±0.6
sapwood	10.8±0.5	8.4±0.7	19.2±1.2
heartwood	12.2±0.6	9.5±0.3	21.7±0.9

GC-MS CHARACTERIZATION

IROKO (*Chlorophora excelsa*)

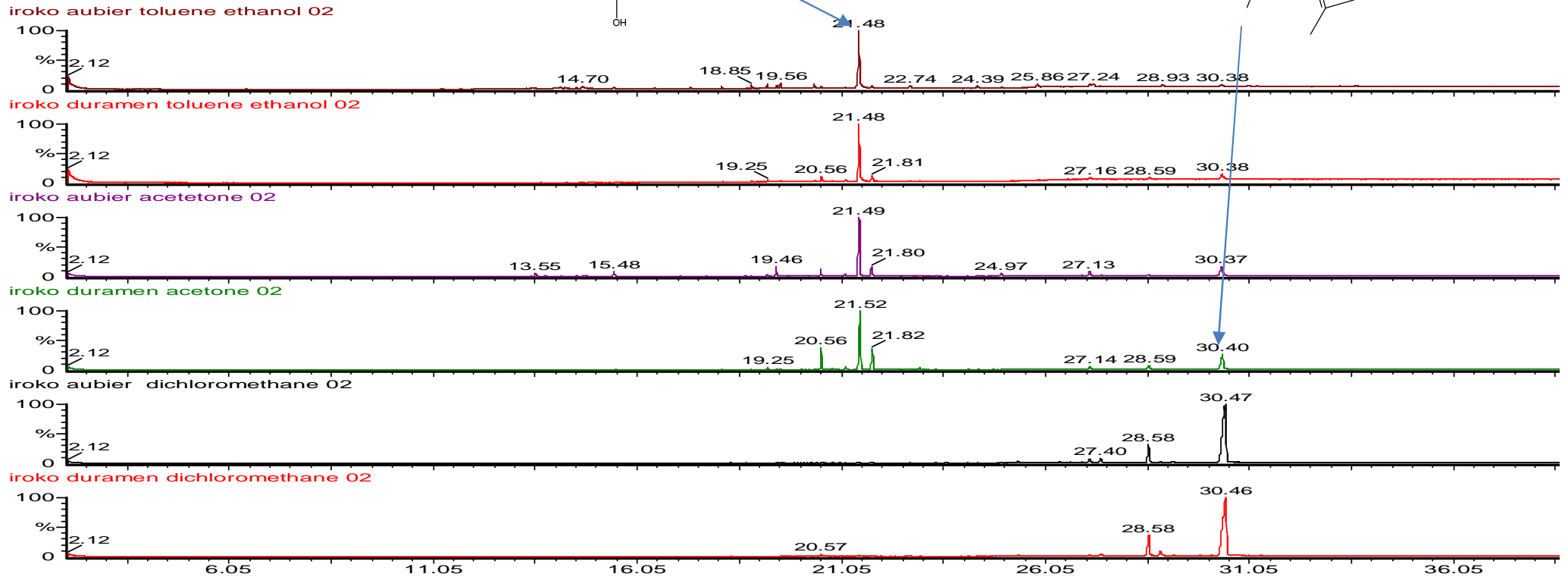
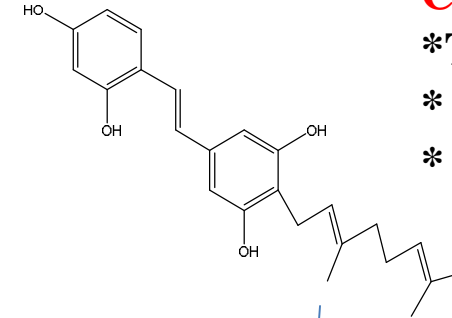
Resveratrol:

- *Antioxidant and UV protective property
- *Increase in cell life
- *Anti-wrinkle action
- *Healing property



Chlorophorin:

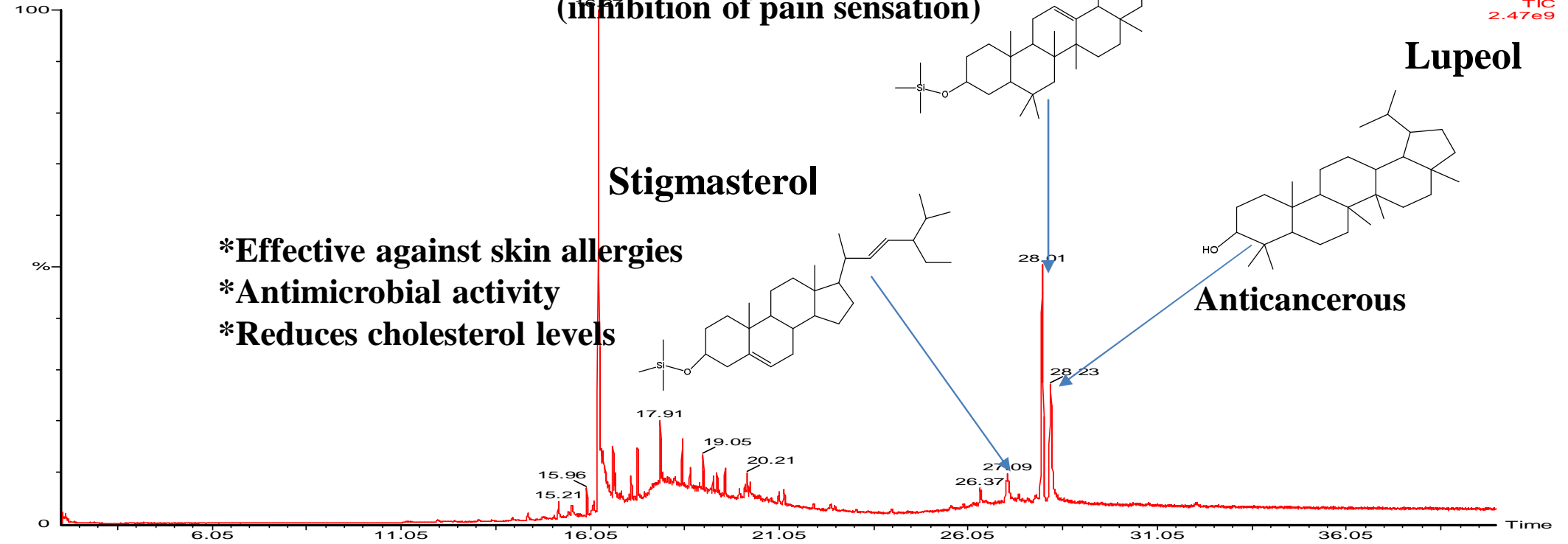
- *Termicide
- *Fungicide
- *conservative



GC-MS CHARACTERIZATION

AZOBE (*Lophira Alata*)

20171113
azobe ecorce dichloromethane dionex 03



POTENTIAL APPLICATION - Gel I inG property

IROKO (*Chlorophora excelsa*)

Getting gel



a) 1ML chloroform

b) 15min Ultrasons



X mg extract

Temperature

Degreasing temperature

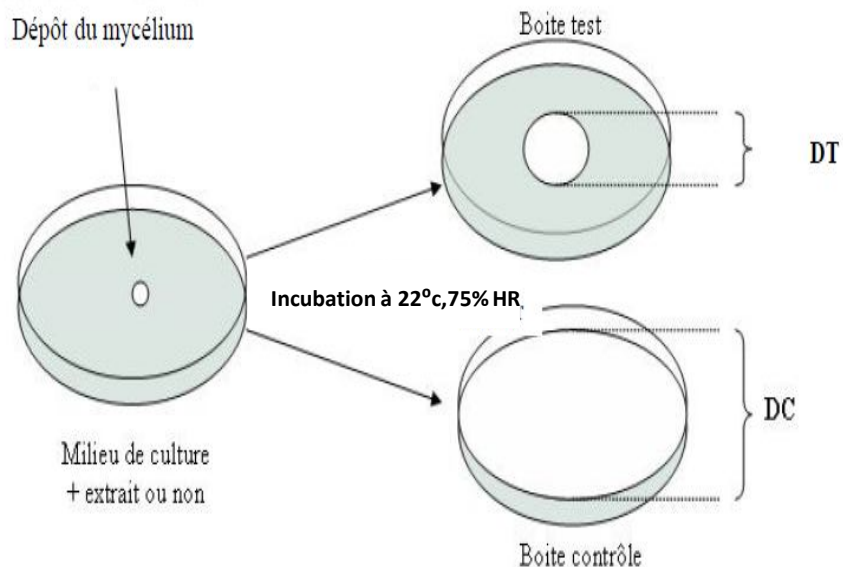


Time

Percentage	results	Degreasing temperature
4	-	-
5	+	45°C
6	+	60°C
7	+	66°C

FUNGICIDAL PROPERTIES

Effect of extractives (500ppm) on fungal growth on malt agar medium



Evaluation of antifungal activity

$$IA (\%) = \frac{DC - DT}{DC} \times 100$$

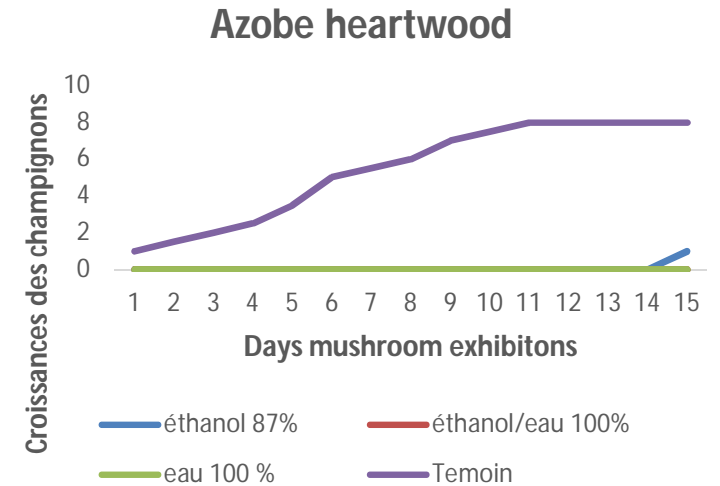
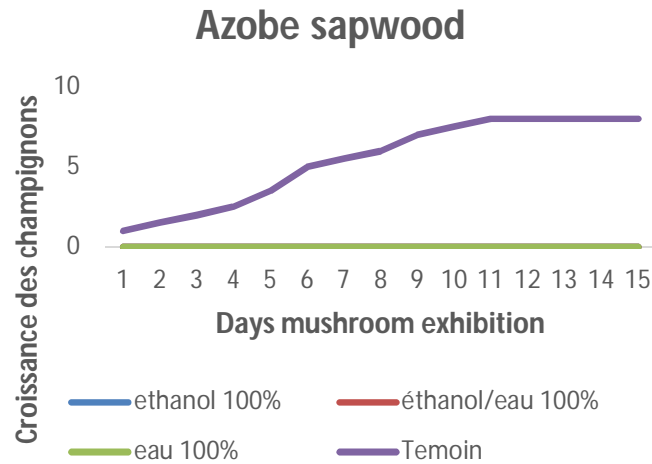
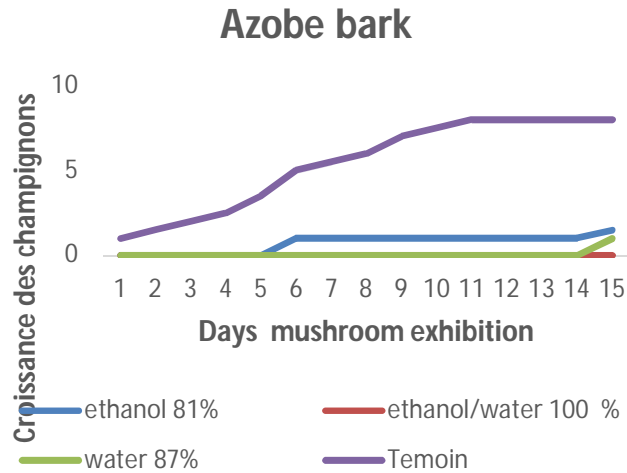
*DT is the diameter (cm) of the growth area in the presence of extractives

*DC is the diameter (cm) of the growth area without extractives

IA: Antifungal index

Higher the value of AI is, higher is the effect of extractives on fungal growth

POTENTIAL APPLICATION - growth inhibitor



Antifungal indicators

100% ethanol/water (heartwood)

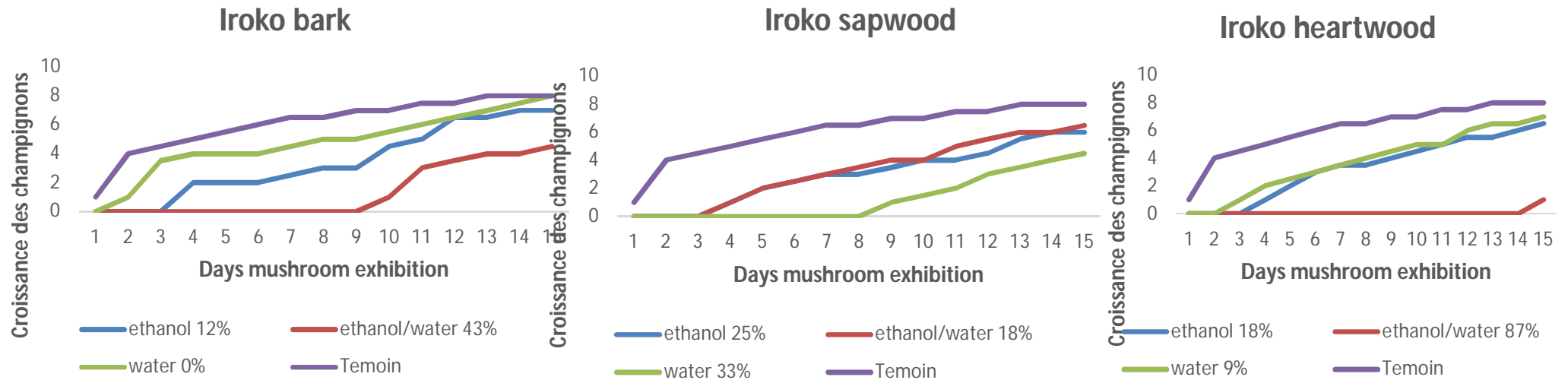
87% ethanol (bark, heartwood)

100% water (sapwood, heartwood)



Coriolus Versicolor after 15 days of incubation

POTENTIAL APPLICATION - growth inhibitor



Antifungal indicators

43% ethanol/water (bark)
33% water (sapwood)
87% ethanol/water (heartwood)



Coriolus Versicolor after 15 days of incubation

NATURAL DYESTUFFS



**200 mL of water
80°C during 2h**



12 g of bark sawdust

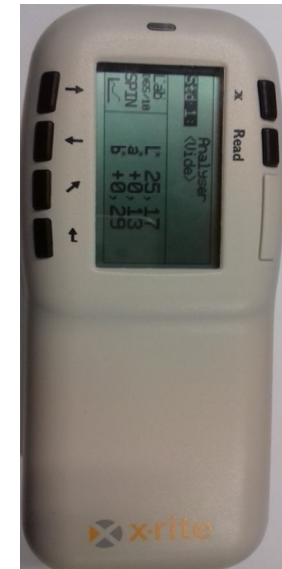
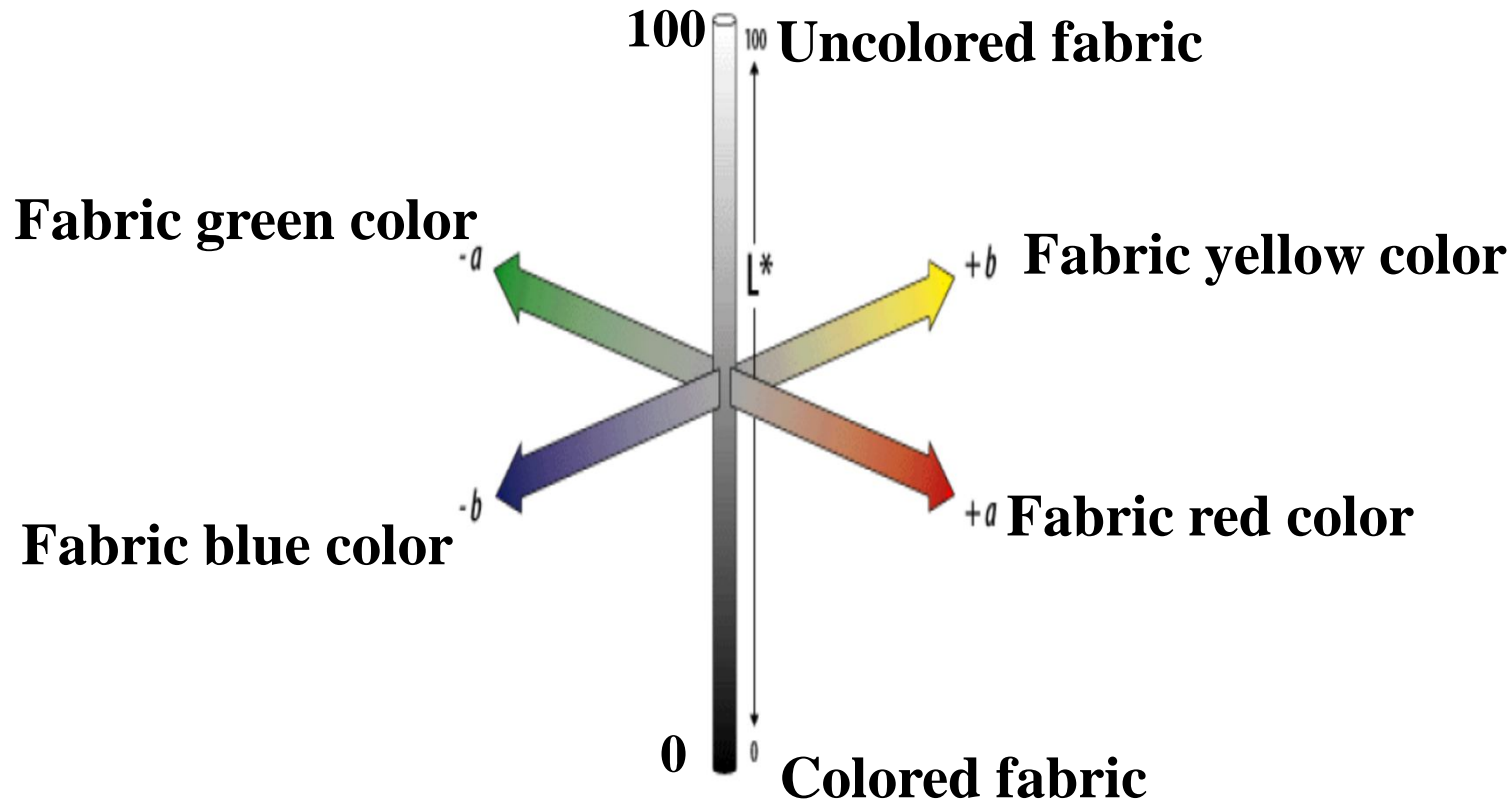


vacuum filtration



**1g of cotton fabric
+ 40 mL of dye
+ 1g of mordanting
80°C during 2h**

POTENTIAL APPLICATION NATurAL dyEsTuffs

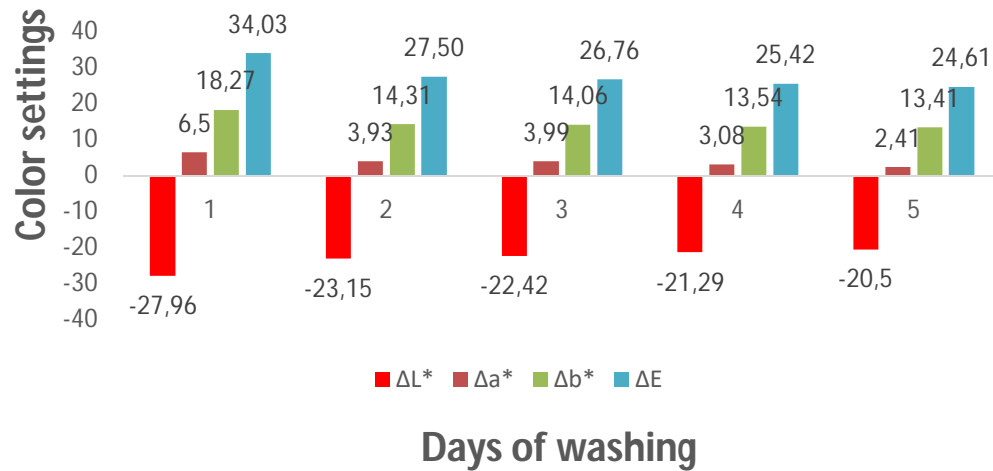


Colorimeter

Colorimetric space of the system CIEL-L*a*b*

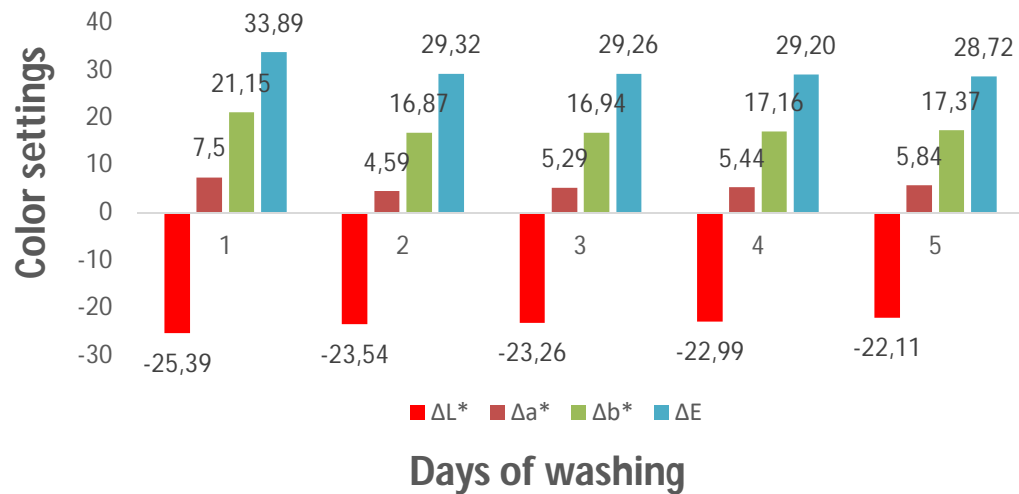
POTENTIAL APPLICATION NATurAL dyestuffs

Water azobe dyed without mordanting



Sample dyed without mordanting

Water azobe dyed with aluminium salt

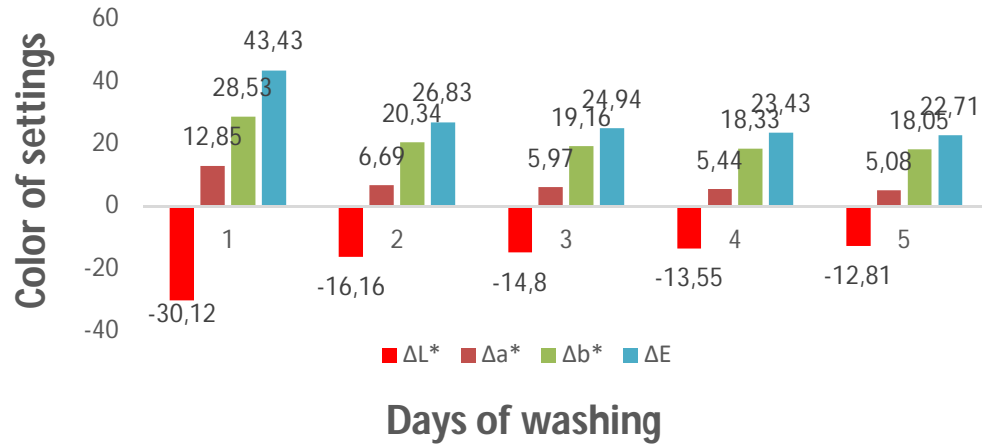


Sample dyed with mordanting

Washing series according to the standard : ISO 105-C10

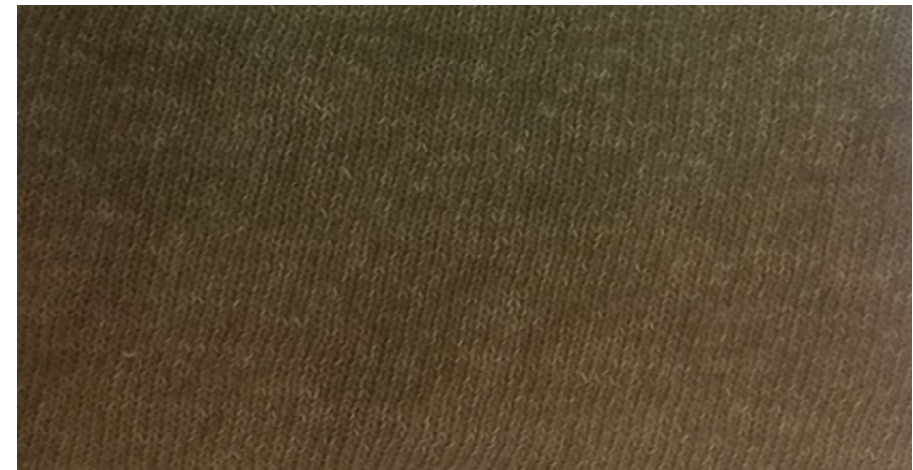
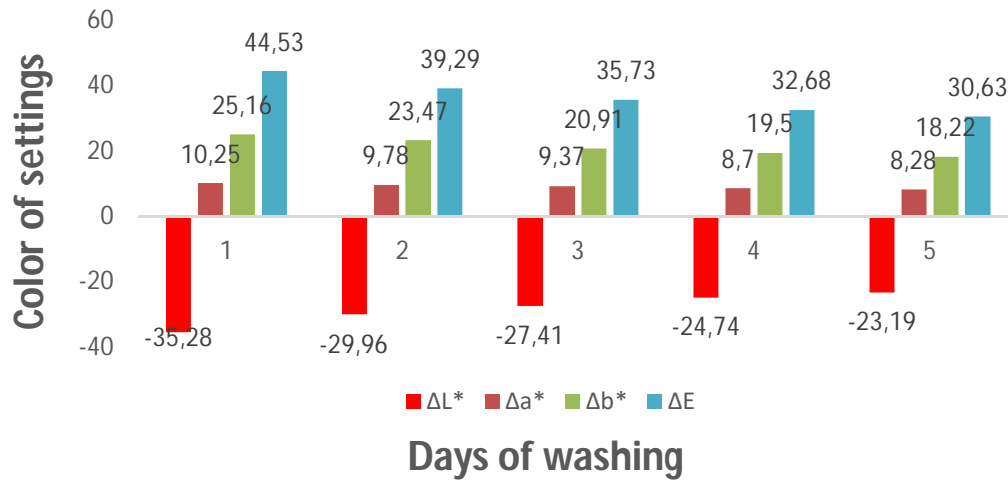
POTENTIAL APPLICATION NATurAL dyEsTuffs

Water iroko dyed without mordanting



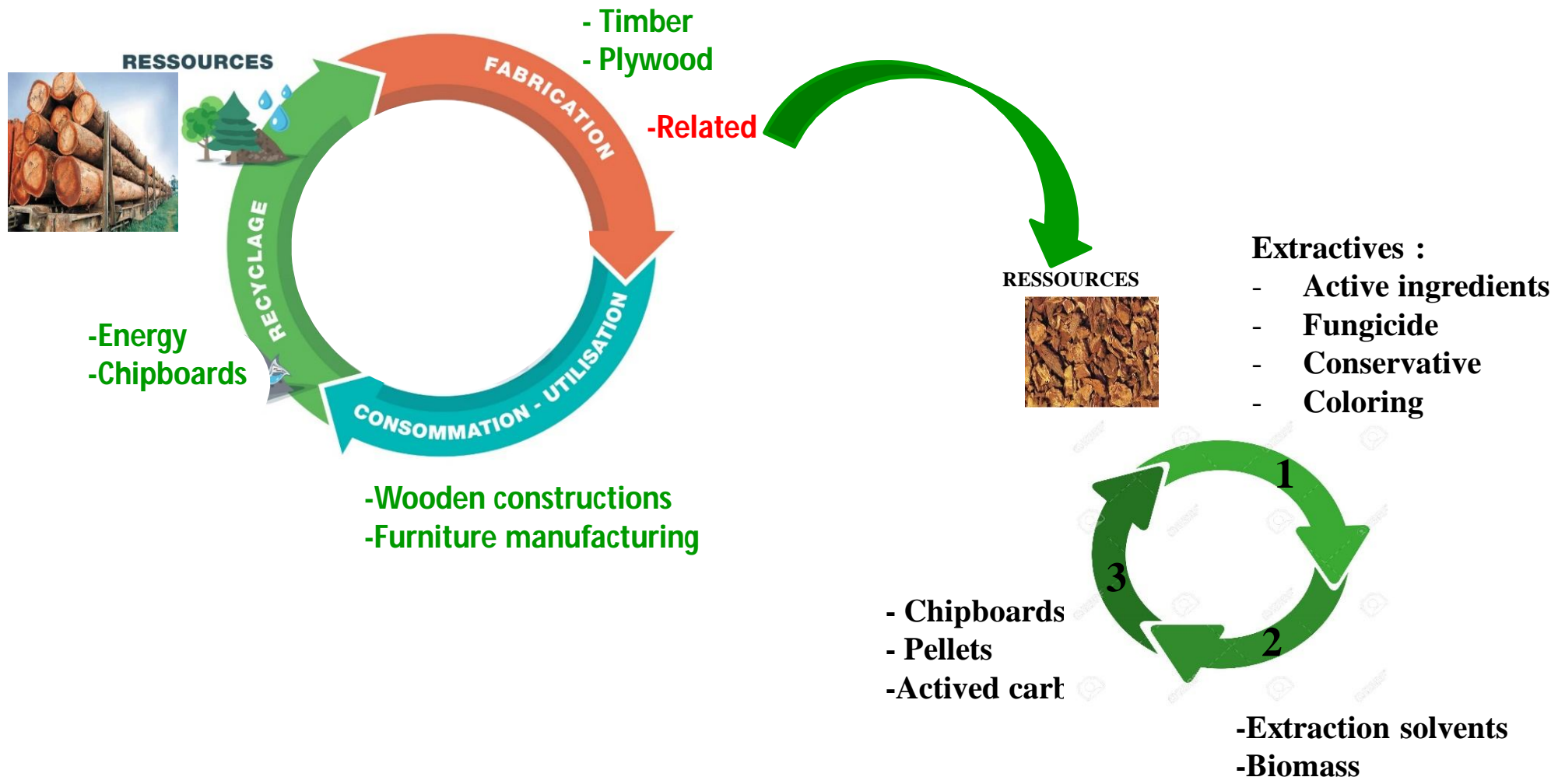
Sample dyed without mordanting

Water iroko dyed with aluminium salt



Sample dyed with mordanting

CONCLUSION



Circular economy: Green industry, green economy, sustainable development

outlooks

- Identify the compound that causes the discoloration obtained with the dyestuffs
- Identify the compounds responsible for the antifungal properties of azobe extractives and of the gelling properties of iroko acetone extracts
- Extend this work to other Gabonese species to improve competitiveness of wood sector



The future is what you do now

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Thank you for your aTTenTion

We must be vigilant because we can see that with the end of the oil era the pressure on the forest is increasing

