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Botanical control of cultivated plants of *Lippia chevalieri* Moldenke (Verbenaceae)

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In Mali, the Malarial-5 which is an improved traditional medicine (ITM) made partly with the leaves of *Lippia chevalieri* is used to treat symptoms of uncomplicated malaria. One of the issues related to the production of this ITM is the quality of the raw material. The present work aimed to control the quality of the leaves from cultivated plants of *L. chevalieri*. This study was carried out from 2015 to 2016 in Mali. The morphology of the stem, leaves and the flowers of the cultivated plants was determined through their description. In addition, organoleptic and microscopical features of the leaves' powder were examined. The findings revealed the presence of some macroscopic elements, organoleptic features and microscopic characters needful for the botanical control of *L. chevalieri*.

Key words: *Lippia chevalieri* Moldenke, botanical quality control, improved traditional medicine, Mali.

INTRODUCTION

Historically, plants have been used for the treatment and prevention of various illnesses. With the revolution of science, the popularity of herbal medicines has widened. It is estimated that 80% of the world's population use herbal medicines in some capacity within their primary healthcare (Ekor, 2014).

Lippia chevalieri belonging to Verbenaceae family is used to prepare an improved traditional medicine called Malaria-5. Malaria-5 used for treating symptoms of uncomplicated malaria, is registered in the national list of indispensible or essential medicines of Mali (Diarra, 2018).

Quality control of plant-derived products is crucial for ascertaining safety and health benefits (Yao et al, 2018). The present study focused on *L. chevalieri* aimed to determine the botanical control of the cultivated plants.

MATERIALS AND METHODS

Plant material

The plant material consisting of plants and leaves' powder of *L. chevalieri* was obtained from seedling.

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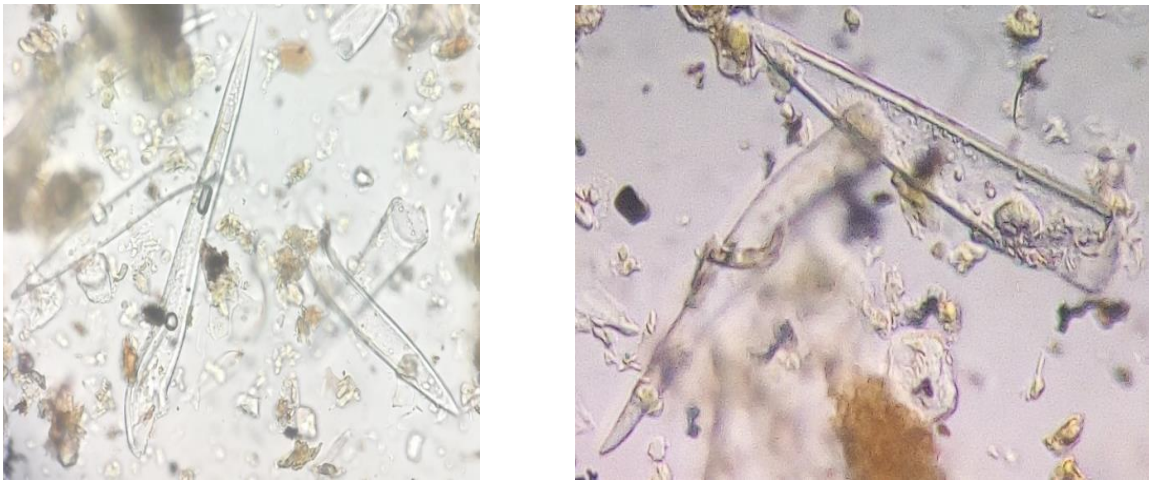
Table 1. Macroscopic description of organs from cultivated plants of *Lippia chevalieri*

	Organ		
	Stem	**Leave**	**Inflorescence**
Description	Branched out more or less smooth. Height of 1.29 m to 2.37 m. The bark is brown-clear, the slice is fibrous greenish-yellow. Twigs are pubescent to scabrous, green, purple, or yellowish.	Whorled, oblong or closely elliptical, 5-20.50 cm on 4.69 to 5.50 cm. Edge of the denticulate limb with below whitish pubescence. Top of the limb acuminate and sharp, base corner. 6 to 11 pairs of secondary veins very or fairly protruding, more or less cutting edge. Parallel and intersecting small ribs at the edge. The petiole is pubescent and scabrous.	Cylindrical terminal glomeruli. Flowers in umbels, pedunculated (5 to 25 cm), long and bearing at the base some elliptical bracts whose top is obtuse and acuminate shortly.



1232x2048 px

3120x4160 px

Figure 1. Non-glandular and unicellular trichomes from leaves' powder of *Lippia chevalieri.*

Methods

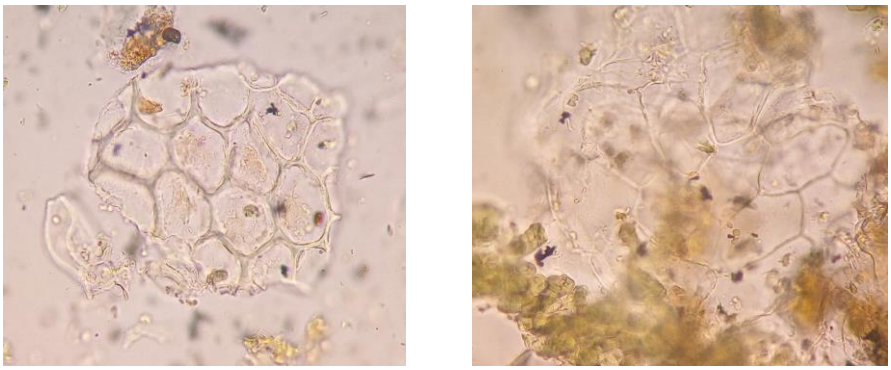
The morphology of the stem, leaves and flowers of the cultivated plants was determined through their description. About the organoleptic characters, the color of the leaves' powder were determined through a small amount of it deposited on a sheet of white paper and then compared with the ones in a dictionary of colors; the texture was determined using fingers; the taste was determined by tasting a small amount of it using the tongue, and the odor was determined by smelling through the nose. Microscopic characters were determined using a binocular electronic microscopy and a small amount of plant powder mounted in Gadzet du Chatelier reagent. Then the microscopic features were observed under the microscope using suitable magnifications (x100 and x400) and photomicrographs were taken using the camera of a mobile phone from Samsung house.

RESULTS AND DISCUSSION

According to our findings there is no macroscopic difference between the stems, leaves and flowers for all cultivated plants of *L. chevalieri* as presented in Table 1. This result is similar to the morphology of these same organs or plant parts previously described in the newly illustrated flora of Sénégal (Mugnier, 2008). Several medicinal plant species like *Vernonia kotschyana*, *Crocus sativus* (Diarra, 2018; Lahmadi et al., 2013) did not show some morphological differences between the stems, leaves and flowers from their cultivated plants.

For the organoleptic characters, the leaves' powder was smooth and greenish (www.code-couleur.com/ dictionnaire/couleur-r.html) without a particular taste and no characteristic odor. In addition there was no difference of organoleptic characters for all plants. A greenish color, a bitter taste and a characteristic odor were noted with the leaves of *Phyla nodiflora* (Bhoomi et al., 2018).

The microscopic analysis revealed some features like non-glandular and unicellular trichomes as seen in Figure 1, parenchyma cells in Figure 2, spiral xylem in Figure 3, bundle of fibers in Figure 4, and fragment of upper epidermis with or without stomata in Figure 5. It was reported that species of Verbenaceae contained glandular trichomes which secrete essential oils (Tozin et



3120x4160 px 3120x4160 px

Figure 2. Parenchyma cells from leaves' powder of *Lippia chevalieri.*

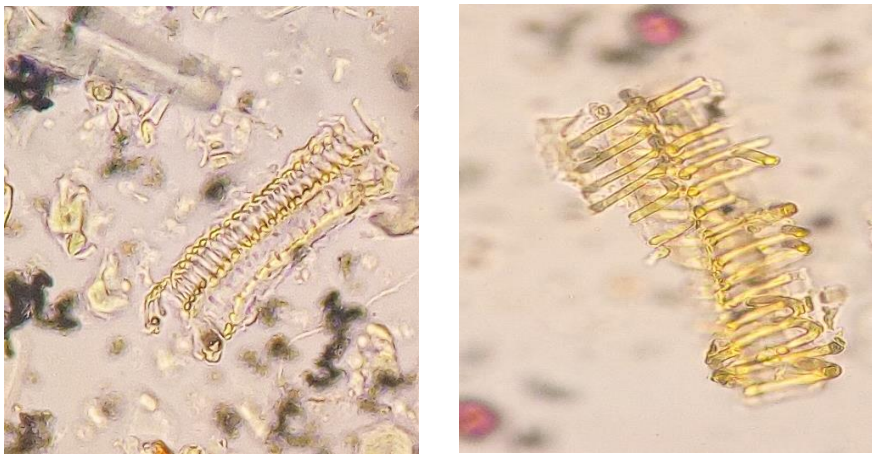


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Figure 3. Spiral xylem from leaves' powder of *Lippia chevalieri.*

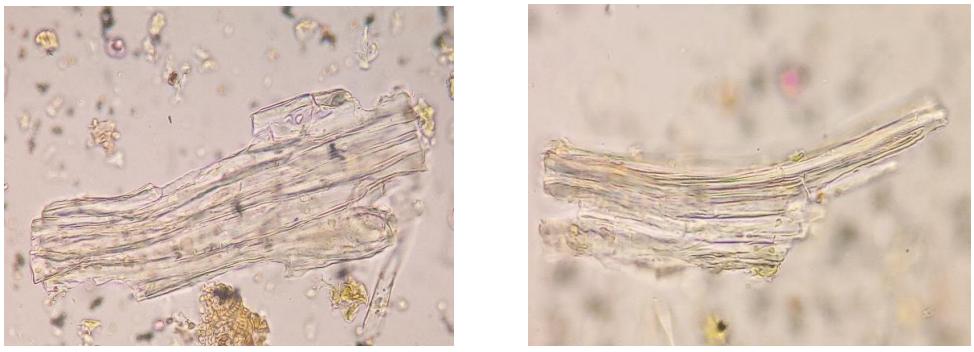

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Figure 4. Bundle of fibers from leaves' powder of *Lippia chevalieri.*

al., 2015). The same authors demonstrated that leaves and floral parts of *Lippia origanoides* contained glandular

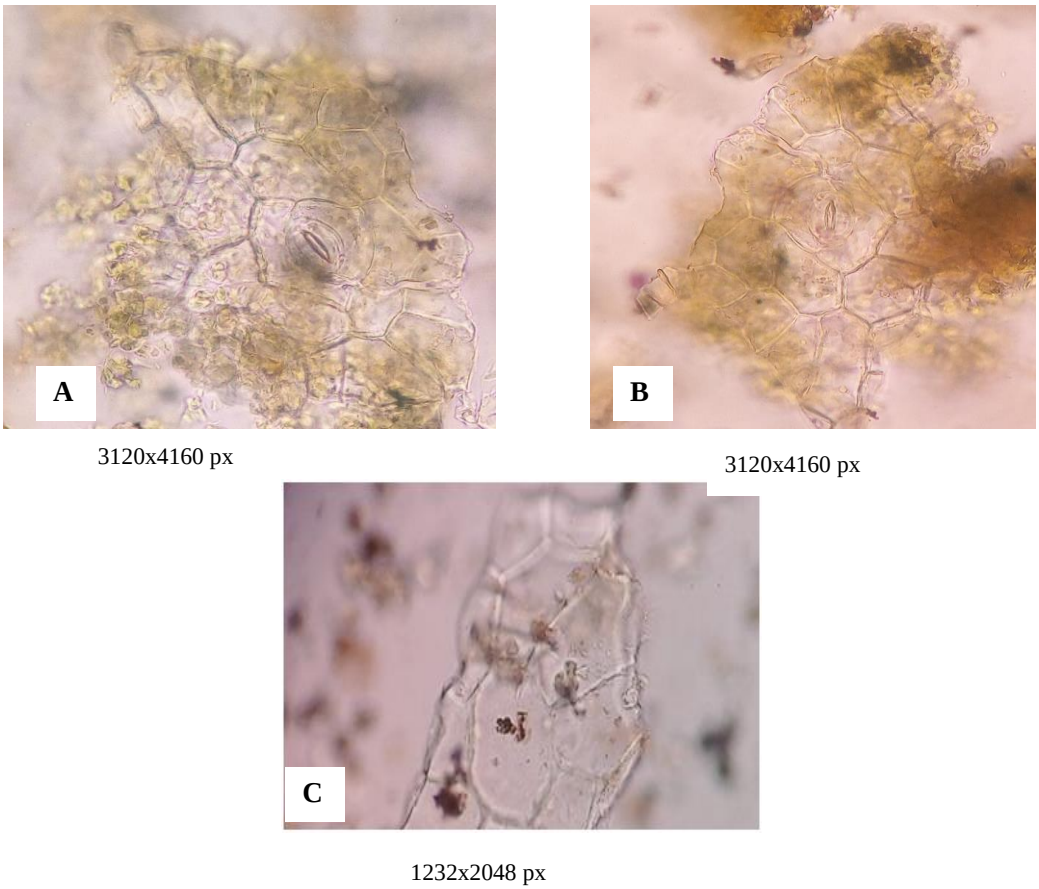

Figure 5. Fragment of upper epidermis with stomata (A, B), without stomata (C) from leaves' powder of *Lippia chevalieri.*

and non-glandular trichomes (Tozin et al., 2015). Some previous work revealed the presence of fibers in the milling of adult leaves of *Lippia multiflora* (Konan et al., 2010). Bracts and sepals of *Lippia origanoides* showed the glandular trichomes in abundance (Tozin et al., 2015). Epidermis cells, multicellular trichomes and stomata were found in the leaves' powder of *Clerodendron polycephalum* (Egharevba et al., 2015). Xylem vessel, parenchyma cells of phloem, epidermis cells with stomata, palisade cells, non-glandular, unicellular and pluricellular trichomes, calcium oxalate prism were present in the leaves' powder of *Stachytarpheta jamaicensis* (Udodeme et al., 2016). Non-glandular and unicellular trichomes, spiral and annular xylem and stomata were found out in the leaves' powder of *Phyla nodiflora* (Bhoomi et al., 2018).

Conclusion

This study showed that cultivated *L. chevalieri* does not present some differences between the plants. Macroscopy, organoleptic aspects and microscopy revealed some important features for the botanical quality control.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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