Original Article

An optimization of the extraction and the physicochemical proprieties of the essential oil of *Lawsonia inermis* L. cultivated in Biskra (Department of Algeria)

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ABSTRACT

Introduction: The henna plant Lawsonia inermis L.,is one of the oldest cosmetic, medicinal and aromatic plants, well known in the worldwide. **Objective:** This study is the optimization of the extraction of the essential oil from the aerial part of *Lawsonia inermis* L plant. Two methods of extraction were compared; the hydrodistillation and the microwaves extraction, from the leaves, the flowers and the seeds of henna plant. The obtained essential oil was analyzed in laboratory to determine its organoleptic and physicochemical proprieties. **Results:** The main result is that the flowers of henna yielded more essential oil than the leaves and the seeds respectively, the obtained essentials oils by the sited methods of extraction are quantitatively and qualitatively similar with fair differences in yield an chemical proprieties, may due to the extraction times, even that they are conformed to AFNOR norms.

Keywords: Henna, essential oil extraction, hydrodistillation, microwaves, AFNOR norms.

INTRODUCTION

Essential oils have become an integral part of everyday life. They are used in a great variety of ways as in all branches of medicine such as in pharmacy, balneology, massage, and homeopathy.[1] Variations in climatic conditions, type of soil in which the plant was grown etc. will produce natural variations in the relative distribution of components in essential oils.[2]

Moreover, it is also of great importance to highlight that an essential oil chemical profile is closely related to the extraction procedure employed and, hence, the choice of an appropriate extraction method becomes crucial.[3]

Recently henna is subject to intense phyto-chemical analysis It is reported that the plant is reach of secondary metabolites, which are extracted from various parts of henna plant, especially from the leaves, it contain the lawsone (2-hydroxy-1, 4-naphthaquinone) dyestuff,[4,5,6] but also other components are extracted from the others aerial plant parts such as the aromatics oil (terpanoids) extracted from the seeds, leaves and flowers which are used for cosmetic and medicinal purposes.[7,8,9,10]

Even all sited proprieties of henna, this plant is ranked in the list of neglected species and / or underutilized in Algeria (which they have been little or no research) and classified as an industrial plant. It is used only for its dying purpose.[11]

The objective of this study is to extract the essential oils from different parts of henna: leaves, flowers and seeds (*Lawsonia inermis* L.) cultivated under Biskra pedo-climate conditions using two methods of extraction, by hydrodistillation (HD) and by micro waves (MW), than we compared the obtained yields of the extracted essential oil

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and their physicochemical proprieties by referring to AFNOR[12] norms.

MATERIAL AND METHODS

Plant material

The aerial parts of henna plant were collected from the cultivated field based in Zribet el Oued village, Biskra Departement Algeria on 2015, at flowering stage in July to collect the flowers and during fruit ripening in October to collect the leaves and the seeds. The different aerial parts were separately dried under room temperature in the shade. One week was sufficient to decrease the humidity and got dried plant material with green color conserved in dry conditions until use.

Extraction material

Two materials of extraction of essentials oils were tested during our experimentation: the extraction by microwaves (MW), and by hydrodistillation.

Analysis material

Depending on AFNOR norms we notified the organoleptic proprieties of aromatic oil which are aspect, odor and color, for the physicochemical analyzes we used the following instruments: For the pH measurement we used a pH meter; the acid index measuring device; and for the refractive index we used the refractometer.

Methods

The yield is the ratio of the amount of oil collected after distillation to the amount of biomass expressed as a percentage. The quantities of essential oils were obtained by the cumuli of 10 distillations for the seeds and the leaves and after five distillations for the flowers due to the small quantities of the samples. The distillate was dehydrated using anhydrous sodium sulfate.

The time needed for the extraction of essential oils was obtained depending on distillations ending, till the water in the flask of HD is completely evaporated, and until all the ice in the inversed lid is melted and heated.

RESULTS

1. Yield of essential oil:

Different parts of the plant and the two tested methods of extraction give different yields (Table 1).

From those result we can deduce that the flowers yielded more essential oil than the flowers and the seeds respectively. The HD improve the yield extracted from the flowers and the seeds

2. Optimization of the time of extraction of EO

The time of extraction of essential oils using HD was 2 hours to 2 h 30 min with 0.136 ml the average of essential oil quantity, instead the time of extraction using MW methods was 15 to 20 min with 0.126 ml the average of essential oil quantity.

3. Organoleptic and physicochemicals proprieties of EO of Henna's flowers

All there results of the analyzed essential oil extracted from flowers are summarized in Table 2.

From this table we can deduce that the quality of essential oils *Lawsonia inermis* L. is improved by MW extraction, resulting in heavier oil due to higher ester levels and a lower acid number. While the HD gave a rich essential oils because the refractive index is higher than that obtained by MW.

Table 1: yield of EO from the aerial part of henna plant

AFNOR	HD			MW		
	Leaves	Flowers	Seeds	Leaves	Flowers	seeds
0.38 – 1.20	0.66	1.38	0.31	0.66	0.79	0.20

Table 2: The essential oil of henna's flowers proprieties

	Organolepic qualities			Physical and chemical proprieties					
	Aspect	Color	Odor	Acid index	pH	Ester index	Yield	Density	Refractive index
AFNOR norms	Liquid	Yellow to greenish yellow	Rose, menthol	2		30-40	0,38-1,2	0,82-0,99	1,46-1,50
HD	Liquid	clair yellow	Rose, menthol	2,24	5,31	28,05	1,38	0,98	1,92
MW	Liquid	clear yellow	Rose, menthol	1,62	5,98	40,07	0,79	0,78	1,52

DISCUSSIONS

There is no much information about the physicochemical proprieties of henna's aromatic oil, the studied plant parts gives yellowish liquid aromatic oil, from seed[13] and leaves,[4] brown or dark brown color and strong fragrance from the flowers, with 0,01-0,02 % of yield from flowers.[4] The determination of the physicochemical properties is a necessary step but is not sufficient to characterize the HE. It will therefore be essential to determine the Chromatographic profile of aromatic oil.[14]

CONCLUSION

Our present study reveals that the henna plant cultivated in rural areas of Biskra contain in its aerial part an amount of aromatic oils, of good quality referring to AFNOR norms, the two methods tested were either fast and improve the chemical proprieties of essential oil (MW)or slow and improve the yield (HD).

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CONFLICT OF INTEREST

None

ABBREVIATIONS USED

HD: hydrodistillation, MW: microwave, AFNOR; French Agency of Normalization. EO: essetial oil.

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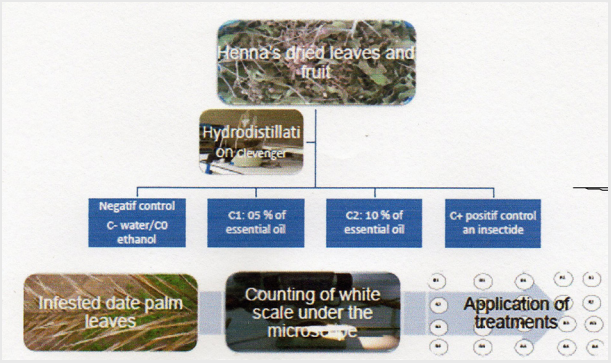
PICTORIAL ABSTRACT



SUMMARY

- Two methods of extraction were compared during this study: the hydroditillation and the extraction by microwave.
- The essential oil yielded from all the plant parts were analyzied in laboratory; the organoleptics and the physicochemical analyzes were compared to AFNOR norms.
- The quality of essential oils of henna is improved by MW extraction, resulting in a heavier oil.
- While the SD improve the quantity, and gave a rich essential oils rich than that obtained by MW.

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