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Research Article

Identity of Authentic and Market Samples of 'Kala Haldi' and Comment on Potential Use of Curcuma caesia

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Abstract

India, one of the 17 identified mega-diverse countries of the world, which is home to 11.80% of plant species where practice of herbal remedies in the recognized alternative systems, i.e., Ayurveda, Siddha, Homoeopathy, Unani, etc. to treat wide range of ailments dates back to many centuries. A time of trend reversal is seen world over, to use herbal remedies to treat health problems. Plants have been one of the important aspects of the world health. Curcuma caesia Roxb., a critically endangered plant (claimed to be useful in piles, leprosy and infertility, etc by traditional healers in India) is one such plant.

The present paper deals with the identification of authentic sample of 'Kala Haldi' collected from natural habitat as well as the samples of 'Kala Haldi' obtained from traditional market at Nashik, Maharashtra. Headspace GCMS analysis of leaves of Curcuma caesia Roxb. suggests its use as substitute of another rare medicinal and aromatic plant namely, Hedychium spicatum Buch.- Ham. which is becoming rare due to over exploitation.

Keywords: *Identification, Kala Haldi, Curcuma caesia.*

Introduction

The authentic sample of 'Kala Haldi' is identified as *Curcuma caesia* Roxb. (authentic 'Kala haldi'), a critically endangered species [1] *from Bengal.* It is a rhizomatous herb; the rhizome is strongly aromatic, blue within. The plant height is about 1.2 m. and leaves 30–60 by 12.5–15 cm.; broadly lanceolate or oblong, upper surface dark green, slightly rough while the lower surface is ligher gerrn, glabrous; with a deep ferruginous purple cloud down the middle, which penetrates to the lower surface. Petiole and sheath about as long as blade. Spikes (appearing before the leaves), about 30 cm. high with the peduncle. Flowering bracts are green with a ferruginous tinge. Coma deep bright red, tending to crimson. Flowers pale yellow, reddish at outer border, and rather shorter than their bracts. Stomatal index is 9. The rhizome is aromatic & is used as carminative, expectorant, against rheumatic pain & headache.

Figure 1

The market sample of 'Kala Haldi' procured from Nashik is *Curcuma aeruginosa* Roxb. and is a native of Myanmar which is also found wild in South India. The plant height is about 70-100cm. and leaves 75–100 by 15–20 cm, oblong- lanceolate, glabrous, with a deep ferruginous purple cloud down the middle, which penetrates to the lower surface. Petiole and sheath about as long as blade. Stomatal index is 5. We haven't noticed flowering in this species. The rhizomes are widely used in South India for the extraction of East Indian Arrowroots or Travancore Starch [2].

Figure 1: *Curcuma caesia* Roxb. – Authentic sample from West Bengal (CCNB).

Figure 2: "Kala haldi'- Market sample from Nashik (*C. aeruginosa* Roxb.)(CCNS).

Material & Method

Rhizome of *Curcuma caesia* Roxb.(CCNB) was collected from Darjeeling District, West Bengal; the same grown at Virmata Jeejabai Bhonsle Udyan, Byculla, Mumbai. where the plants were separately treated with Cowdung as manure & Sufala (NPK) as fertilizer. Market sample of 'Kala Haldi' (CCNS) was procured from Nashik market (near Ganga) for further study (enlisted below).

Interpretation of analysis of rhizome of authentic sample and market sample of 'Kala Haldi'

Both, the authentic sample as well as the market sample of 'Kala Haldi' do not belong to the same species. The authentic sample is *Curcuma caesia* Roxb. which is a critically endangered species whereas [3], the market sample of 'Kala Haldi' is *Curcuma aeruginosa* Roxb. **Morphologically, *Curcuma aeruginosa* Roxb. is more robust than *C. caesia* Roxb.**

The stomatal index of *C. caesia* is 9 while that of *C. aeruginosa* is 5.

HPTLC analysis of both the above-mentioned materials were

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Sr. No	Parameter	Reason	Place or Work	Duration
1	Morphological analysis	Identity of the study materials	Botanical garden and Bio lab, R.D. National College, Bandra	7 days
2	HPTLC and U.V Visible Spectrometry	Confirmation of the identity of the study materials & Curcumin content in the rhizome	Natural products division, Piramal Healthcare. Goregaon	1 month
3	Distillation of oil and Head space GCMS of oil from Curcuma caesia Roxb. Dried leaves.	To find out the oil constituents in the leaf of Curcuma caesia Roxb.	Scientific Research Laboratory, S.H. Kelkar Industry, Mullund	15 days
4	Interpretation of data generated by above experiments		R.D. National college.	15 days

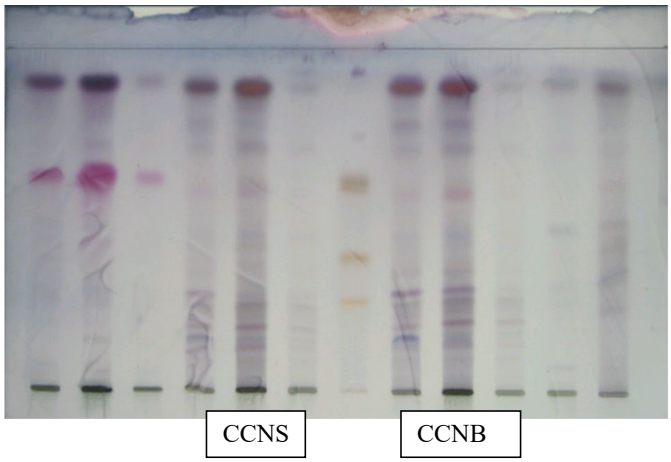

Figure 3: HPTLC analysis of Curcuma caesia and the market sample of Kala haldi and its comparison with other *Curcuma* sp, standard curcumin, *Hedychium spicatum* .

conducted and it was found that:

There is difference in the Rf values of both the samples

The oil content in both the samples are very high.

The yield of curcumin (which is one of the chief constituents of *Curcuma and* medicinally important) in both the samples are very negligible (ca 0.01%)

Hence, it is concluded that it cannot be utilized for its curcumin content [4]. The oil of the same is already exploited (by earlier authors) and is in practice [5]. It is not considered for further analysis (for the purpose of this paper).

After analyzing both the materials, namely, Market sample (from Nashik) as well as authentic sample of 'Kala Haldi' (*Curcuma caesia* Roxb. procured from West Bengal), it is understood that **both the sample belong to different species** and show variation in the characteristics morphologically as well as with the help of HPTLC.

Curcuma caesia Roxb. is a critically endangered species [6]. Literature search for detailed study of *Curcuma caesia* Roxb. revealed that the leaf does not have any significant use.

It was observed that the fresh as well as dried leaves of *Curcuma caesia* Roxb**.** shows a lot of oil glands containing volatile oil which is generally **wasted**.

Present study is carried out with the **aim to find out potentiality of the leaves from industry point of view and** to understand the **difference in constituents** of active principles due to change in **climatic and edaphic** factors.

Oil distillation

Mature leaves were collected from plants & dried under shade

Leaves are cut into small pieces

Subjected to hydrodistillation in Clevenger type apparatus for 6 hours

Dark yellow colour oil with high viscosity was obtained

Dehydrated with anhydrous sodium sulphate

Stored in air tight container away from sun light

Analysis

Head Space GCMS analysis was carried out in **5% molar capillary gas chromatograph**.

Carbowax of 50 m X 0.25 mm; Film thickness 0.254 um.

Mass spectroscopy detector, digital computer DEG station fed with Turbochrome – 3 software & nitrogen as carrier gas.

Samples of the oils were analysed by temperature programming of Head Space at 120 °C.

The vapour were injected in GCMS for 75 minutes at 160 °C.

Major volatile constituents were identified on Mass Spectrometry by comparing their retention times with molecular structure.

The composition of the oils obtained from the three above mentioned materials of *Curcuma caesia* Roxb. is tabulated in the following Table 1. In total approximately 135 compounds were obtained from each of the materials. But, currently we have considered only the significant ones.

Figure 4-6

Interpretation of analysis of dried leaves of C. caesia Roxb:

The **yield in all the three materials** is **more** than the earlier reported yield which was only 0.8%.

Table 1: Analysis of Leaves from West Bengal & Mumbai treated with Cowdung and NPK respectively.

Compounds	**Leaves from West Bengal with Cowdung**	**Leaves From Mumbai with Cowdung**	**Leaves From Mumbai with NPK**
Eucalyptol	10.46	8.50	8.95
Beta- pinene	1.31	1.30	1.45
Camphene	2.08	2.10	2.00
Linalool	1.03	3.06	2.00
Isoborneol	1.12	1.01	1.20
Camphor	4.92	5.91	4.50
Borneol	0.66	0.53	0.50
Iso borneol acetate	1.28	1.51	1.30
Terpinyl acetate	2.72	3.47	3.90
Beta- elemene	12.33	19.55	14.10
Beta-caryophyllene	5.75	6.74	6.75
Farnesene	17.82	18.00	17.96
Germocrone D	**3.68**	**nil**	**1.07**
Germacrene B	2.56	1.03	1.55
Beta - bisabolene	0.40	13.16	11.00
Cedrol	0.57	3.19	1.90
Isolongefolene	0.35	0.61	0.59
Curzerene	**5.88**	**1.19**	**3.42**
Eudesmol	0.90	0.45	0.53
5- chloro- 2 Phenyl pyridine	**0.8**	**nil**	**nil**

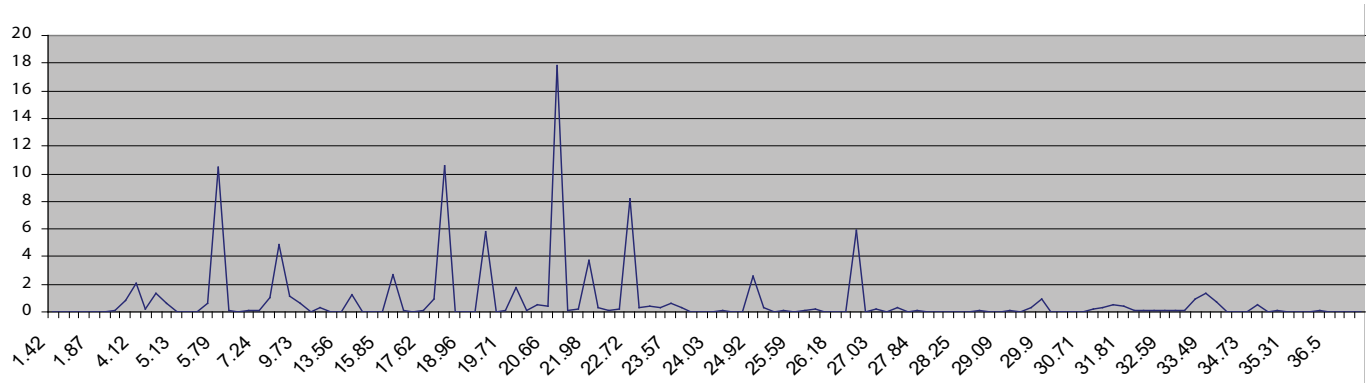

Figure 4: Leaves from West Bengal treated with cowdung, Yield – 1. 2%, X axis – Retention time, Y axis - % of constituents

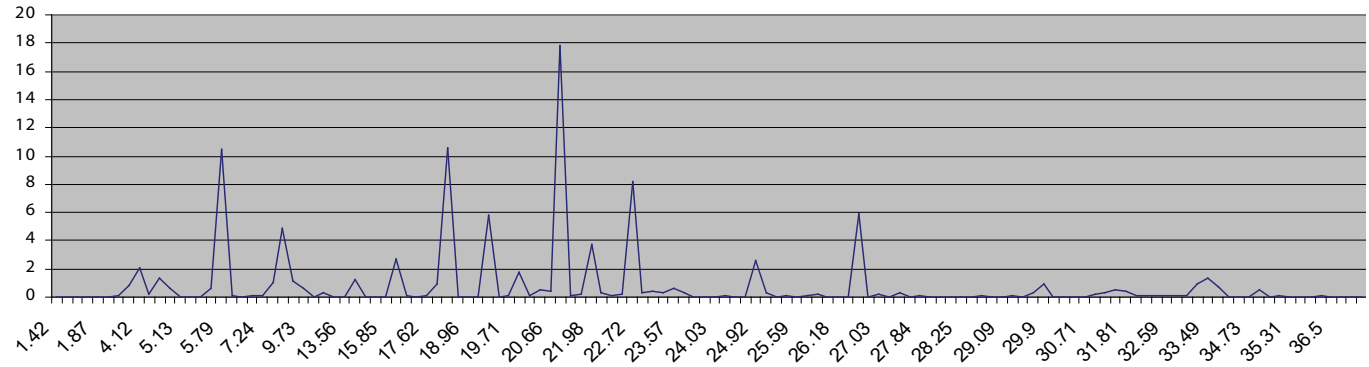

Figure 5: Leaves from Mumbai with Cowdung, Yield – 0.96%, X axis – Retention time, Y axis - % of constituents

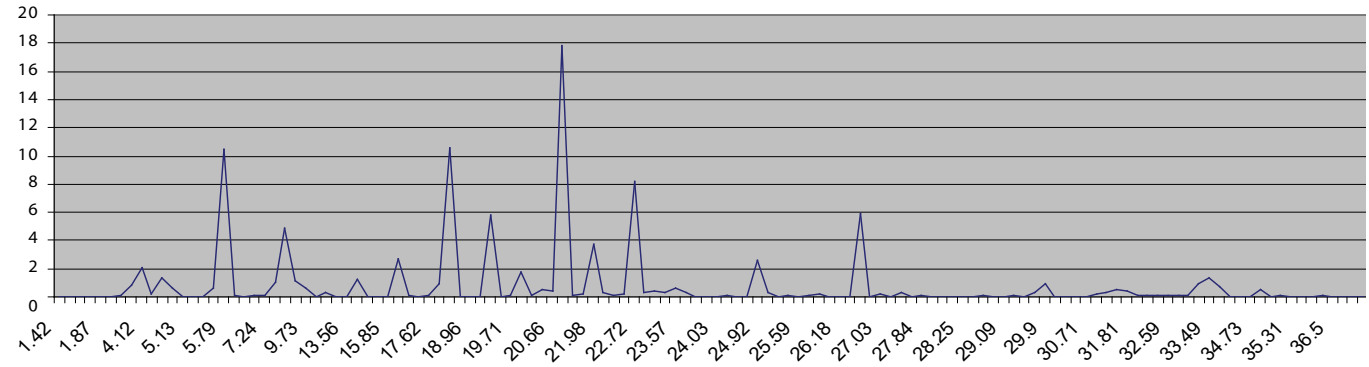

Figure 6: Leaves from Mumbai with NPK (Sufala & Urea), Yield – 1.12%, X axis – Retention time, Y axis - % of constituents

The **aroma** of the leaf of *Curcuma caesia* is a **mixture** of **Kapurkachri oil, Ginger oil, Cardamom oil, Turmeric oil & a trace of Nagormotha oil.**

In all the three materials, there are **138 compounds** & out of these, **18 are major compounds** (acc. To earlier report done by other scientists the number of constituents are not more then 30).

The first material, i.e., the one from West Bengal has one compound (**5- chloro- 2 Phenyl pyridine)** which none of the others have.

The other two significant constituents are Germocrone D & Curzerene which are present in all the leaves except the one grown in Mumbai with application of cowdung

The depth of the aroma is the best in **leaves from plant collected from West Bengal followed by the leaves from plants collected from Mumbai which are treated with NPK (Sufala & Urea)**

Conclusion

Oil from leaves of ***Curcuma caesia* Roxb**. can be used for the **reconstituting** the oil obtained from **rhizome of Kapur Kachri** (*Hedychium spicatum* Buch.- Ham.) [7]. More studies field trial and clinical trial are required for establishing the commercial viability of *Curcuma caesia* oil

Hedychium spicatum Buch.- Ham.(Kapur-Kachri), a near endemic threatened plant which is exploited for its rhizome (a source of Kapur kachri oil). Instead, the dried leaves of *Curcuma caesia* Roxb [8]. that is otherwise wasted (not used anywhere) can be exploited for its essential oil. This in turn will ensure the **conservation of both these species**.

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