

VARIETY REGISTRATION

CIM-Utkrisht: A high essential oil yielding variety of patchouli (*Pogostemon cablin* (Blanco) Benth) with a unique aroma suitable for cultivation under North Indian conditions

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ABSTRACT

Patchouli (*Pogostemon cablin* (Blanco) Benth) is an aromatic bushy herb of the Family- Lamiaceae, commonly called the, "Mint or deadnettle family". The crop is mainly cultivated for its oil used in the manufacture of perfumes, cosmetics, medicines, beverages and in bakery. The oil is a perfume by itself and is highly valued in perfumes, soaps, cosmetics and flavour industries. It is also used as a scent in products like paper towels, laundry detergents, and air fresheners. The new variety CIM-Utkrisht of Patchouli has been developed by CSIR-CIMAP through intensive breeding efforts for improved herb and essential oil yield coupled with high patchouli alcohol (110 litre oil./ha v/s 56 lit/ha and patchouli alcohol 43 % v/s 41% in the check). The variety has consistently recorded a higher biomass and oil yield with high patchouli alcohol content in the oil in the field evaluation trials. The potential dry leaves yield of this new variety is 63 q/ha and oil yield is 110 Lit/ha. This new variety also satisfies DUS criteria as it is morphologically distinct from other patchouli varieties and clearly identifiable by its broad, big, dark green to light purple leaves with γ -curcumene (21-26%) and ar-curcumene (8 %) as unique aromatic constituents in the essential oil.

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INTRODUCTION

Patchouli (*Pogostemon cablin* (Blanco) Benth) is an aromatic bushy herb that belongs to the Family- Lamiaceae. The crop is mainly cultivated for its oil used in the manufacturing of perfumes,

cosmetics, medicines, beverages and bakery. The name patchouli derives from the Tamil word 'Patchai' (green leaf). *Pogostemon cablin*, *P. commosum*, *P. hortensis*, *P. heyneanus* and *P. plectranthoides* are all cultivated for their oil and all are known as 'patchouli', but *P. cablin* is considered superior. Patchouli essential oil is one of the best fixatives for heavy perfumes which impart strength, character, alluring notes and

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lasting qualities. It is a perfume by itself and is highly valued in perfumes, soaps, cosmetics and flavour industries. Patchouli is also an important ingredient in East Asian incense. It is also used as a scent in products like paper towels, laundry detergents, and air fresheners. Two important components of the essential oil are patchoulol and norpatchoulol. In several countries, such as Japan and Malaysia, patchouli is also used as an antidote for venomous snakebites. The plant and oil have a number of claimed health benefits in herbal folklore, and its scent is used with the aim of inducing relaxation. Chinese medicine uses the herb to treat headaches, colds, nausea, diarrhoea and abdominal pain. Western pharmacies and alternative therapy sources it as aroma therapy oil. It has also been used as a hair conditioner for dreadlocks.

Patchouli oil is an essential ingredient and used as a 'base' material in perfumery industry. There is no synthetic substitute for patchouli oil, which increases its value and demand in the perfumery market. Consumption of Patchouli oil in the world is estimated to be around 2000 tonnes per annum. In India due to an increase in the chewing tobacco and pan masala industries, consumption has gone up to about 300 tonnes per annum while the production is below 50t. Hence, the country mostly depends on imports, mainly from Indonesia. As per the report, Indonesia produces approx. 1200 tonnes per year of this patchouli with a value of 70 to 100 million US\$ (IFEAT, Socio-Economic Impact Study on Patchouli, April 2016).

World-wide research activities on patchouli are aimed at improving the plant quality through various plant breeding tools. Till now very limited research has been carried out in the development of superior patchouli cultivars. Two old varieties of patchouli CIM Shrestha and CIM Samarth developed by CSIR-CIMAP are under cultivation in India. Other local landraces/exotic cultivars of patchouli like Singapore, Indonesian, Java, Johar, etc. has made a small, quiet, fragrant movement in Siddapur, Western Ghat region of northern Karnataka. Though there are many reports on cultivation of patchouli, either they have restricted their study only

to one or few exotic cultivars. Hence very limited variability is available in patchouli; since its non flowering crop and diversity does not come through hybridization. Hence, only two options are left, either to create variability by germplasm collection and evaluation or apply tools of mutation breeding for genetic improvement of patchouli in terms of development of superior high yielding varieties with unique aroma.

In India the present price of the essential oil is Rs. 4500-5000 per kg which can be helpful for both farmers and entrepreneurs in increasing their earning. It is under cultivation in the states of Karnataka, Kerala, Tamil Nadu, Arunachal Pradesh, Manipur and Assam etc. [1, 2, 3, 4]. As there is no synthetic substitute available to replace the oil of patchouli, its value and position in the perfumery market are further enhanced. Till date very few indigenous/exotic cultivars are available for commercial cultivation. Low production of patchouli is mainly due to old/non superior varieties. It is highly desirable to evolve high biomass and essential oil yielding varieties. In view of above, fourteen Johar lines were collected from Assam and selection was done with the objectives to identify the high yielding line of patchouli with unique aroma which would be helpful in doubling the net income of farmers of India.

MATERIALS AND METHODS

Origin of the variety

Under germplasm collection, evaluation and genetic improvement programme at CSIR CIMAP, Lucknow, the 14 plants of Johar patchouli were collected from Assam and multiplied. These 14 lines (Pat-1 to Pat -14) were primarily evaluated (plot size= 3m single row × 0.5 m plant to plant spacing) for their performance against variety CIM Samarth and also multiplied. All these 14 lines (Pat-1 to Pat -14) were further evaluated in Bench Scale Trial with check variety CIM Samarth (BST, Ent-15, RBD, Rep. 3, plot size, =3 m²). In the BST the best promising line namely, Pat-9 (CIM-Utkrisht) selected on the basis of herb and oil yield was then placed in a Pilot Scale Trial (PST, plot size 100 m²) Lucknow and RC Pantnagar plot size 512 m² along

Table 1. Primary performance in evaluation of 14 lines of patchouli

S. No.	Entries	Plant Height (cm)	Fresh herb yield /plant (g)	Dry leaf/plant (g)	Essential oil content (%)	Essential oil/plant (g)
1.	Pat-1	52.5	700	176	1.20	2.11
2.	Pat-2	48.5	550	150	1.00	1.50
3.	Pat-3	80.6	800	180	1.20	2.16
4.	Pat-4	54.0	380	170	1.50	1.80
5.	Pat-5	53.5	340	90	1.00	0.90
6.	Pat-6	42.5	500	130	0.60	0.78
7.	Pat-7	46.3	250	70	0.90	0.63
8.	Pat-8	52.5	600	140	1.50	2.10
9.	Pat-9	90.0	900	250	1.70	3.50
10.	Pat-10	50.5	450	140	1.60	2.24
11.	Pat-11	38.5	750	190	1.20	2.28
12.	Pat-12	60.5	750	170	1.50	2.55
13.	Pat-13	42.1	780	150	1.60	2.56
14.	Pat-14	52.5	790	185	1.50	2.78
Check	CIM Samarth	46.5	580	116	1.80	2.08
Range		38.50-90.00	250.00-900.00	70.00-250.00	0.600-1.80	0.630-3.500
SE		3.60	50.07	11.28	0.009	0.202
SD		13.95	193.92	43.70	0.34	0.78
t ₍₁₄₎ df		15.0*	12.14*	13.630*	15.10*	9.91*

*P<0.01

**Figure 1: Variety CIM-Utkrisht very vigorous in growth with comparison to check variety CIM Samarth of Patchouli****Figure 2: Field view of variety CIM-Utkrisht and check variety CIM Samarth (Check) of Patchouli****Figure 3: Field view of variety CIM-Utkrisht of Patchouli at CSIR-CIMAP, Lucknow**

with check variety CIM Samarth. The line, PAT-9 (CIM-Utkrisht) always maintained its superiority over the check for high oil at both locations (Table 1-7; Figures 1-3). The elite strain PAT-9 is now released as a variety CIM-Utkrisht for commercial cultivation.

Statement of distinction/ Breeder's claim

Variety CIM-Utkrisht is a tall (90 cm), very vigorous in growth with dark green with big, light purple leaves and light green colour stem genotype. The variety CIM-Utkrisht has the following DUS

Table 2. Bench scale trial of 15 lines; RBD=3; Plot size =3m². (2013-14)

S. No.	Entries	Plant Height (cm)	Fresh herb yield /plot (g)	Dry leaf/plot (g)	Essential oil content (%)	Essential oil yield /plot (g)
1.	Pat-1	51.97	750	178.67	1.23	2.20
2.	Pat-2	50.00	567	148.67	1.03	1.54
3.	Pat-3	83.37	783	178.33	1.22	2.17
4.	Pat-4	55.27	360	133.33	1.52	2.02
5.	Pat-5	45.83	350	91.67	1.07	0.97
6.	Pat-6	51.17	533	133.33	0.63	0.91
7.	Pat-7	48.00	267	75.00	0.93	0.70
8.	Pat-8	53.83	617	146.67	1.53	2.25
9.	Pat-9	95.70	933	190.00	1.75	3.32
10.	Pat-10	51.83	467	146.63	1.62	2.37
11.	Pat-11	39.50	725	189.67	1.23	2.43
12.	Pat-12	58.17	760	176.65	1.53	2.71
13.	Pat-13	47.67	743	170.00	1.62	2.74
14.	Pat-14	60.17	773	188.33	1.50	2.83
15.	CIM Samarth	48.33	593	125.67	1.87	2.35
CD (5%)	-	3.67	50.01	14.93	0.096	0.253
CD (1%)	-	4.94	67.33	20.09	0.129	0.341

Table 3. Pilot scale trial (Lucknow); Plot size = 100 m²

S. No.	Parameters	Pat-9	CIM Samarth
1.	Plant height (cm)	90.50	68.50
2.	Dry wt. (ql/ha)	63.50	25.23
3.	Oil content (dry wt) %	1.80	1.90
4.	Oil yield on dry wt (Kg/ha)	114.30	47.94
8.	ar-curcumine*	1.40	nd
	ar-curcumine**	8.864	
9.	γ-curcumine*	26.80	nd
	γ-curcumine**	0.058	
10.	Patchouli alcohol*	21.50	41.60
	Patchouli alcohol**	43.295	
11.	Nor-patchoulenol*	0.4	0.60
	Nor-patchoulenol**	0.6	
12.	Pogostol*	1.90	3.80
	Pogostol**	0.30	

* Completion of distillation 7 days at room temperature; ** 42 days stored at room temperature, nd= not detected

Table 4. Pilot scale trial at RC Pantnagar 2017-18; Plot size = 512 m²

S. No.	Parameters	Pat-9	CIM Samarth
1.	Plant height (cm)	89.50	67.70
2.	Dry wt. (ql/ha)	62.50	33.80
3.	Oil content (dry wt) %	1.60-1.70	1.80-2.00
4.	Oil yield on dry wt (Kg/ha)	106.25	64.22
5.	ar-curcumine*	1.35	nd
	ar-curcumine**	8.80	
6.	γ-curcumine*	25.50	nd
	γ-curcumine**	0.050	
7.	Patchouli alcohol*	21.40	41.10
	Patchouli alcohol**	43.15	
8.	Nor-patchoulenol*	0.42	0.51
	Nor-patchoulenol**	0.56	
9.	Pogostol*	1.85	3.10
	Pogostol**	0.25	

* Completion of distillation 7 days at room temperature; ** 42 days stored at room temperature; nd= not detected

Table 5. Mean performance of two locations in Pilot scale trial (Lucknow and RC Pantnagar)

S. No.	Parameters	Pat-9	CIM Samarth
1.	Plant height (cm)	90.00	68.10
2.	Dry wt. (ql/ha)	63.05	29.52
3.	Oil content (dry wt) %	1.70	1.90
4.	Oil yield on dry wt (Kg/ha)	110.28	56.08
5.	ar-curcumine*	1.38	nd
	ar-curcumine**	8.832	
6.	γ -curcumine*	26.15	nd
	γ -curcumine**	0.054	
7.	Patchouli alcohol*	21.45	41.20
	Patchouli alcohol**	43.22	
8.	Nor-patchoulenol*	0.41	0.56
	Nor-patchoulenol**	0.58	
9.	Pogostol*	1.88	3.45
	Pogostol**	0.27	

*=Completion of distillation 7 days at room temperature; +=42 days stored at room temperature; nd= not detected

Table 6. Description of the CIM-Utkrisht

S.No.	Attributes	CIM-Utkrisht	CIM Samarth
1.	Growth habit	Bushy. Very vigorous	Open
2.	Plant height (cm)	85-90	65-70
3.	Plant canopy (cm ²)	5100	4092
5.	Colour of leaf	Dark green with light purple tinged	Light green
6.	Branches/plant	8.00	4.00
7.	Dry wt. (ql/ha)	63	30
8.	Oil content (dry wt) %**	1.70	1.90
9.	Potential Oil yield on dry wt (Kg/ha)	110	56
10.	ar-curcumine *	1.38	nd
	ar-curcumine **	8.832	
11.	γ -curcumine*	26.15	nd
	γ -curcumine **	0.054	
12.	Patchouli alcohol*	21.45	41.20
	Patchouli alcohol**	43.22	
13.	Nor-patchoulenol*	0.41	0.56
	Nor-patchoulenol**	0.58	
14.	Pogostol*	1.88	3.45
	Pogostol**	0.27	
15.	Rotation at 20° C	(-) 13.984	+58.2293
16.	Refractive Index at 20°C	1.50373	1.50923
17.	Relative density@ 20°C	0.9445	0.9709

** - Based on oil content data obtained through from Clevenger apparatus; *=Completion of distillation 7 days at room temperature; +=42 days stored at room temperature; nd=not detectable

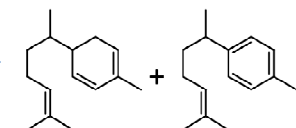
Table 7. Recommended cultivation schedules for the of CIM-Utkrisht

S.No.	Practices/	Suitable time
1.	Cuttings preparations	February or July
2.	Transplanting in field	Last week of March or July/ August
3.	Harvesting for oil	Six months of planting

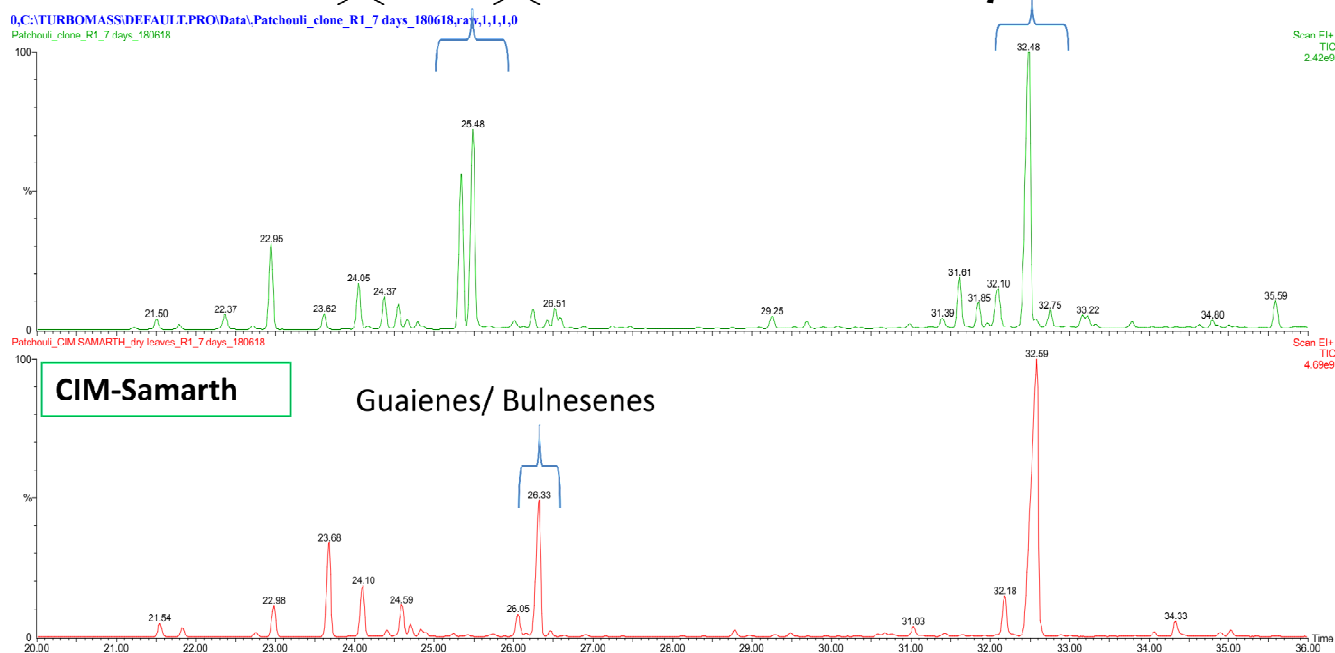
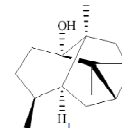
Patchouli : Comparison of Essential Oil profile with CIM-Samarth

Pat-9 Selection

Curcumene
as UNIQUE
feature



Patchouli alcohol (>23-45%)



DNA MARKER PROFILE

ISSR 2 ISSR 9

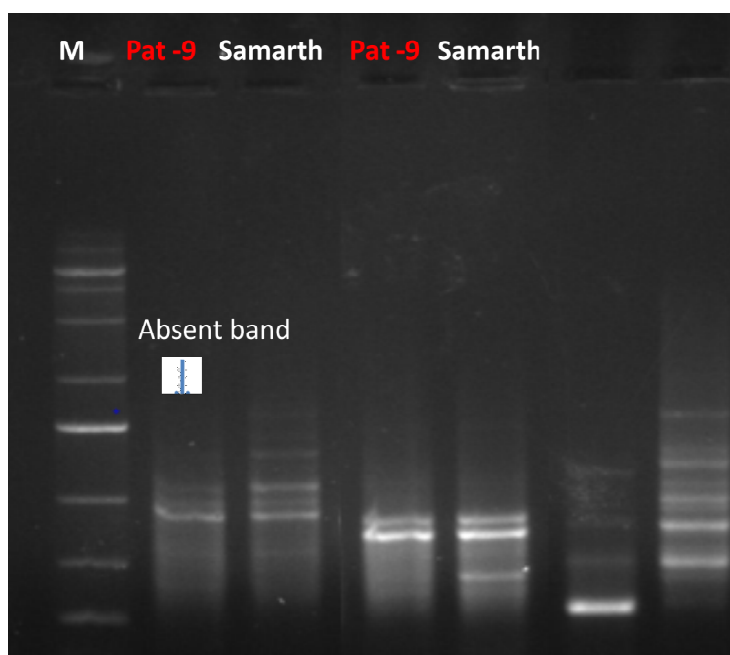


Figure 4: DNA profiling of strain CIM-Utkrisht and check variety CIM Samarth

(distinctiveness, uniformity and stability) characteristics.

1. The variety CIM-Utkrisht is morphologically distinct from other patchouli varieties and clearly identifiable by its broad, dark green with big, light purple leaves. (Figure 1).
2. It has light green stem.
4. Very vigorous/rapid growth.
5. Curcumine (γ and α) is a unique feature/aroma 21-26% and 8% in the essential oil of this variety.

The other distinguishing morphological features of this variety are described in the Table 6.

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