

ORIGINAL RESEARCH ARTICLE FOR VARIETY REGISTRATION

A geraniol rich variety of lemongrass (*Cymbopogon flexuosus* (Steud.) Wats.): CIM-Atal

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ABSTRACT

A new geraniol-rich variety of lemongrass, named as CIM-Atal, has been developed by CSIR-CIMAP through directed breeding approach. Before releasing the superiority of the clone 14-3 was checked in different trials over the years. It has a mean oil content of 1.85-2.10 percent, which is higher than that of the best check variety Krishna that has oil content of 1.50-1.80 percent. This variety gave more oil yield (300-325 kg/ha/y) and less herb yield (250-275 q/ha/y) compared to variety Krishna (250-280 kg/ha/y and 280-300 q/ha/y respectively).

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INTRODUCTION

Lemongrass is an important member of the grass family poaceae, grown mostly as a source of citral in its oil as a culinary ingredient in herbal teas and aroma industry. It is one of the important aromatic plants which grows in many parts of tropical and subtropical South East Asia and Africa. In India, the crop is under commercial cultivation in Tamil Nadu, Uttar Pradesh, Arunachal Pradesh, Assam, Kerala, Maharashtra and Sikkim. Currently the global lemongrass production is around 1400-1500 mt/annum. The citral content in its essential oil varies from 44–91.4% in different genotypes (Kuriakose, 1995; Kulkarni and Ramesh, 1987). Chemovariants of lemongrass containing geraniol as major constituents instead of citral have been developed in the present study. Geraniol, a monoterpene alcohol is the most popularly used

chemical component in soaps, detergents and cosmetics. The major source of geraniol is palmarosa. Industrial demand of geraniol is increasing vastly and to meet out the demand, it is required to extend its production in rain fed as well as irrigated lands. Considering this requirement, alternate sources of geraniol have been explored and a new variety of lemongrass, rich in geraniol has been developed. The new variety CIM-Atal has the potential of giving more profit to the farmers as well as industries.

Origin and breeding history of the variety

In any breeding programme, genetic variability is foremost important for development of high yielding varieties. For this purpose CSIR-CIMAP, Research Centre, Bangalore developed different populations of lemongrass which were rich in citral,

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Table 1: Performance of Lemongrass in IVT (2012-13 and 2013-14)

Harvest	Herb Yield (Kg/plot)**				Oil Content (%) **				Geraniol		Citral		Geraniol	Citral	Geraniol	Citral
	I	II	III	IV	I	II	III	IV	I	II	III	IV				
OD-19	18.125	16.475	9.950	18.250	0.51	0.61	0.66	0.50	0.8	88.68	2.2	86.90	1.4	88.23	2.3	87.75
Krishna	15.400	17.900	8.525	15.875	1.53	1.60	2.03	1.49	2.6	86.08	6.3	81.28	3.5	85.38	2.5	86.68
C27	11.825	10.050	4.775	9.925	1.24	1.29	1.51	1.30	1.3	90.78	2.1	89.48	2.2	90.28	2.5	89.50
C-9	9.000	8.400	6.225	10.600	2.21	2.20	2.58	2.08	3.6	84.68	9.9	78.48	3.4	86.08	2.8	86.10
CIM-Atal (C14-3)	10.675	13.580	7.400	11.375	2.04	2.05	2.43	2.00	89.43	2.2	87.93	1.8	87.85	1.5	90.98	1.5
CD at 5%				0.87				0.047								0.99

** Herb yield and oil yield are estimated yields

Table 2: Mean performance of selected clones in Advance varietal trial (2014-15)

Varieties	Herb Yield (Kg/plot)	Herb Yield (t/ha)	Oil Content (%)	Oil Yield kg/ha	Geraniol (%)	Citral (%)
OD-19	17.616	45	0.62	167	2.2	87.775
Krishna	16.39	43.5	1.76	280	6.3	84.68
C-27	10.600	27.30	1.38	197	2.1	89.92
C-9	9.333	25.65	2.35	233	9.9	83.08
CIM-Atal (C14-3)	11.876	32	2.10	300	89.44	2.2
CD (5%)		1.24		0.065		1.03

** Herb yield and oil yield are estimated yields

Table 3: Mean performance of Selected clones in Advance varietal trial (2014-15)

Varieties	Herb Yield (kg/plot)	Oil Content (%)	Citral (%)	Geraniol (%)
C-29	11.81	1.79	86.53	2.20
C-33	11.70	1.63	81.68	1.80
Krishna	15.35	1.66	84.15	1.20
Nima	13.56	0.95	83.98	2.34
Suwarna	12.29	0.93	86.20	2.10
CIM-Atal (C14-3)	12.01	1.93	2.10	87.63
CD (5%)	0.98	0.08		2.13

** Herb yield and oil yield are estimated yields

Table 4: Mean performance of CIM-Atal in Bench Scale trial

Attributes	Citral (%)	Geraniol (%)	Geraniol acetate (%)	Oil content (%)
Field Distillation with stem (100 kg unit)	1.4	85.5	0.6	1.30
Field Distillation only leaves	1.5	86.00	0.4	1.50
Lab distillation with stem	2.8	88.2	0.2	2.00
Lab distillation only leaves	1.4	90.5		2.40
Herb yield (kg/plot)		190kg		2.85 kg

high herb yield and oil content. These populations were evaluated for different traits for selecting yielding clones. While evaluating populations, we found one clone (C3-23) recorded high herb yield, oil yield and low citral content in the population C-3.

Further, seeds of clone (C3-23) were treated with EMS (0.2%) and M_1 generation planted in the field for evaluation. In M_2 generation, three plants

with high oil content, high herb yield and low citral than C3-23 were identified. These clones were backcross with high citral parent in polycross block. After two successive backcross, seeds were harvested and about 700 plants were raised during the year-2010. Among 700 plants, 60 phenotypically similar plants with comparable herb yield and oil content more than the parent clone C3-23 were selected for further evaluation. Among these 60 clones, clone 14-3 showed the highest oil content (> 2.00%) and geraniol content (> 85%).

Initial Evaluation

In the year 2012-13 and 2013-14, selected clones were evaluated along with check varieties in initial varietal trial. The experiment was layout in a RCBD with plot size of 3.25 m x 3.25 m with a spacing of 45 cm x 45 cm. Two harvests were taken. The data in Table 1 shows the superiority of clone 14-3 (CIM-Atal) over other checks.

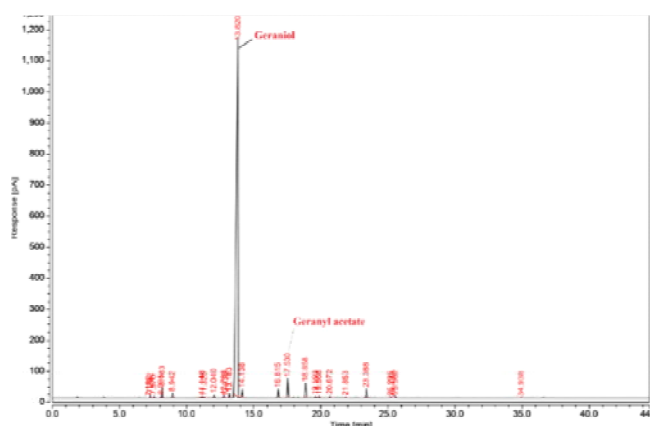


Figure1: GC Profile of CIM-Atal

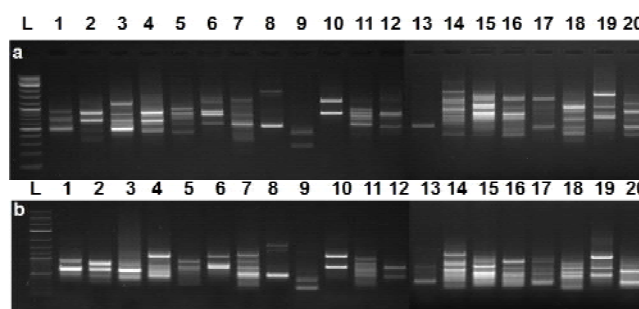


Figure 3: RAPD Profile of Krishna (a) and CIM -Atal (b) with OPE Series



CIM-ATAL



KRISHNA

Figure 2: Comparative FIELD view of CIM-Atal and Krishna

Second stage evaluation

Bench Scale trial and advanced varietal trial were conducted in the year 2014-15 which included three entries and two check varieties. The clones were evaluated in RCBD with 4 replication and plot size of 3.25 m x 3.25 m with a spacing of 45 cm x 45 cm. The superior clone 14-3 always maintained its superiority over the existing check variety Krishna for estimated oil content (Tables 2, 3 and 4). Since clone 14-3 performed well in terms of herb yield, oil yield and oil quality, it was finally selected for formal release as a new variety.

Statement of distinction

This variety has a highly vigorous erect growth nature compared to other varieties. It has light green with semi erect leaves and light brown stem. The strain has the following DUS (distinctiveness, uniformity and stability) characteristics (Fig. 1, 2 and 3).

1. The strain is morphologically distinct from other Lemongrass varieties and clearly identifiable by its erect growth habit with light green colour (as shown in Fig. 1).
2. Geraniol content was 89.6% and essential oil content was 2.10%.

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NOTE

CIM-Atal was released for commercial cultivation on the occasion of CSIR-CIMAP Kisan Mela on 31 January, 2019.

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