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Essential oil analysis of FT-IR and GC-MS studies of *Jasminum grandiflorum, Jasminum sambac* and *Polianthus tuberosa* flowers

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ABSTRACT

The oils were extracted from the plants and identified, quantified in the differences in both control plants and genetically modified plants of in the experimental plants *Jasminum grandiflorum, Jasminum sambac* and *Polianthus tuberosa*. Jasmine essential oil has a sweet and floral aroma, There are well over 100 constitutes found in Jasmine, the main chemical components and health benefits of Jasmine is briefly given in this study. *Polianthus tuberosa* oil has a slightly spicy, heavy, sweet fragrance. Tuberosa oil is not normally used in aromatherapy but in the perfume industry as a component of good quality perfumes and is said to have narcotic properties. Essential oils were collected and stored in a freezer (4°C) for Perkin Elmer Spectrum One FT-IR and Jeol GC mate II GC-Mass spectrometry studies. Samples and essential oils were analyzed by GC and FT - IR identification of total oil content were carried out on a Agilant coupled with Jeol GC mate – II Mass Spectrometer. Results of the analysis of the essential oil of 3 types of flowers are summarized.

Key words: *J. grandiflorum, J. sambac, P. tuberosa,* Genetically Modified flowers, FT-IR, GC-MS, Essential oil.

INTRODUCTION

Essential oils are the fragrant oils that are present in many plants. Hundreds of plants yield essential oils that are used as perfumes, food flavorings, medicines and as fragrant and antiseptic additives in many common products. Some experts have theorized that essential oils are the lifeblood of a plant, and contain compounds that the plant uses to fight infections and drive away germs and parasites. Scientific research has isolated hundreds of chemicals in essential oils, and has shown many essential oils to have anti-bacterial, anti-fungal, and anti-parasitic properties. Jasmine essential oil is extracted from the flowers of Jasmine, with its scientific names *Jasminum grandiflorum* and *Jasminum sambac*. The main chemical components of jasmine are benzoic acid, benzaldehyde, benzyl acetate, benzyl alcohol, indole, benzyl benzoate, cis-3-hexenyl benzoate, cis-jasmone, ceosol, eugenol, farnesol, geraniol, linalool, methyl anthranilate, P-cresol, nerol, gamma terpineol, nerosidol, isohytol and phytol. The health benefits of Jasmine essential oil can be attributed to its properties like anti-bacterial, anti-depressant, anti-inflammatory, anti-septic, anti-spasmodic, anti-spasmodic, anti-viral, aphrodisiac, astringent, calmative, cicatrisant, cooling, emenagogue, expectorant, galactogogue, hypotensive, nervine analgestic, parturient, sedative and uterine. It is a valuable remedy in cases of severe depression and soothes the nerves, producing of feeling of confidence, optimism and euphoria, while revitalizing and restoring energy. The main chemical

components of *Polianthus tuberosa* are menthyl anthranilate benzyl alcohol, butyric acid, eugenol, nerol, farnesol and geraniol. Tuberosa oil is not normally used in aromatherapy but in the perfume industry as a component of good quality perfumes and is said to have narcotic properties. Therefore the present study aims to analysis the essential oil of *J. grandiflorum, J. sambac* and *P. tuberosa* flowers by FT - IR and GC - MS.

MATERIAL AND METHODS

Plant material

For considering the economic importance of the flower oil *J. grandiflorum*, *J. sambac* and *P. tuberosa* were under taken in our study. In our present experiment we have used the *Agrobacterium tumefaciens* was used for this present study in the above mentioned plants. Induction formations in the experimental plants tumor formation through *A. tumefaciens* mediated transformation were carried out. The present investigation is the continuation work in our laboratory. Control flower buds and genetically modified flower buds of equal age (8 months) were studied for essential oils analysis.

Essential oils analysis of FT-IR and GC-Mass spectrometry

Five gram flower buds were taken along with citric acid. It is grinded with mortar and pestle. Grinding was carrying out for about ½ hour. The pulp mixture was transferred in a beaker. Juice was collected after filtration. Then it is subjected with ether for oil separation. Finally it was stabilized by adding sodium sulphate salts and dried ether by gentle heat (40°C). Essential oils were collected and stored in a freezer (4°C) for Perkin Elmer Spectrum One FT-IR and Jeol GC mate II GC -Mass spectrometry studies. These two experiments were carried in SAIF, IITM, Chennai-36. (Or) The samples were extracted by taking flowers weighed (10gms) and grinded with citric acid finally, essential oils were extracted from the pulp by adding ether and kept the oils at 4°C in a freezer for further analysis. Samples and essential oils were analyzed by GC and FT-IR identification of total oil content were carried out on a Agilant coupled with Jeol GC mate – II Mass Spectrometer. The operating conditions were as follows: Initial column temperature 80°C programmed at a rate of 5°C/min to 280°C: Inlet temperature 250°C. Carrier gas: Helium. Flow rate 30ml/min. Perkin Elemer Spectrum - I, instrument was used to identify chemical constituents of the oils.

RESULTS AND DISSCUSSION

Results of the analysis of the essential oil of 3 types of flowers are summarized in table 1 to 6 and Fig (1 - 6). In the control the difference in essential oil content were lesser in quantity. In the genetically modified flowers these differences were much more significant. In the case of *J. grandiflorum* both control and GM plants were observed five peaks. In the GM peak number five shows highest peak percentage 63.05 the least is peak number three 5.07. In the case of *J. grandiflorum* control plant shows the maximum peak percentage 40.43 in peaks number five, the least were recorded 3.15 in the case of peak number three.

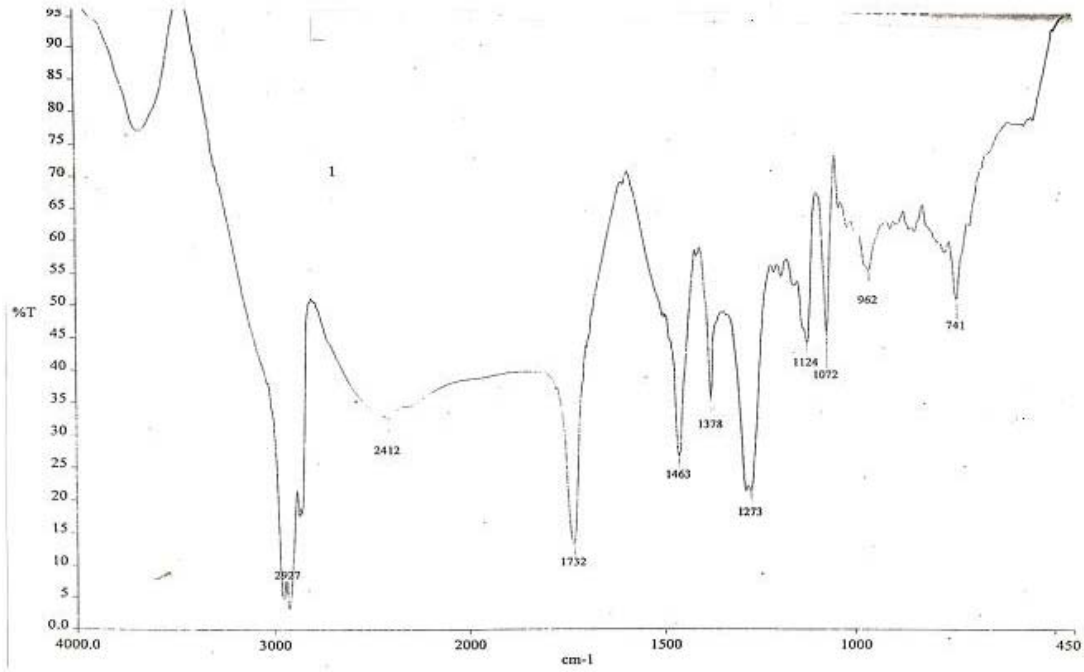
The gas chromatography of the experimental sample were analyzed and the results were recorded and presented in the table 1-6.

Table 1: Gas chromatography of the *Jasminum grandiflorum* control flowers

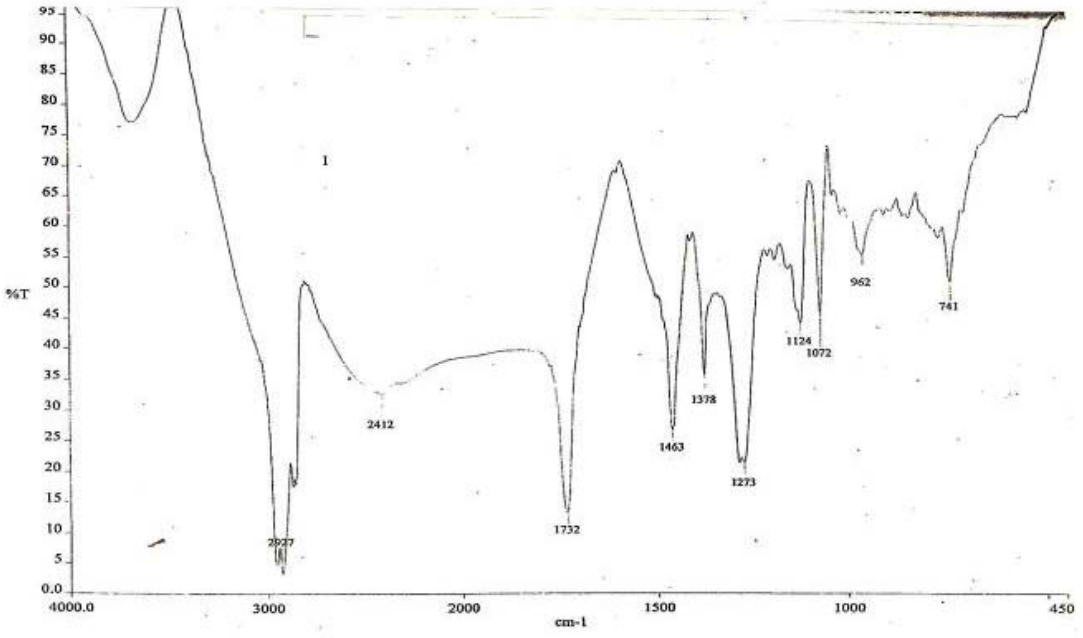
S. No	Retention Time	Peak Area	Peak Percentage
1.	2.2	119142064	25.53
2.	6.95	122503064	26.25
3.	8.75	14718008	3.15
4.	22.78	21599280	4.62
5.	23.25	188707296	40.43

Table 2: Gas chromatography of the *Jasminum grandiflorum* genetically modified flowers

S. No	Retention Time	Peak Area	Peak Percentage
1.	2.35	29060712	12.32
2.	6.98	27387984	11.61
3.	8.77	11956800	5.07
4.	22.78	18729552	7.94
5.	23.25	148689632	63.05

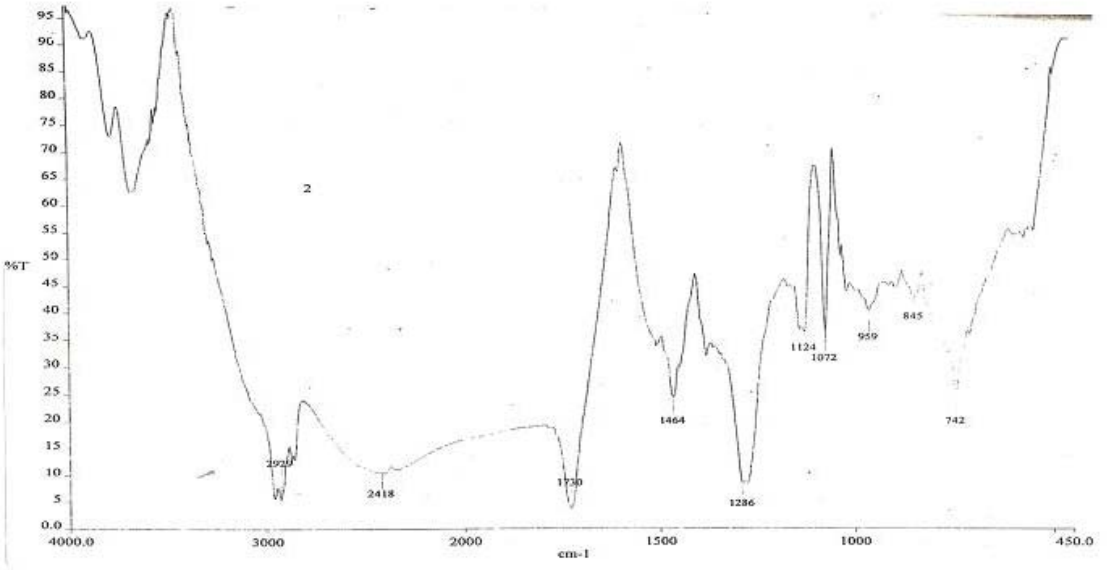


FT-IR Spectrum of *Jasminum grandiflorum* – Control flowers

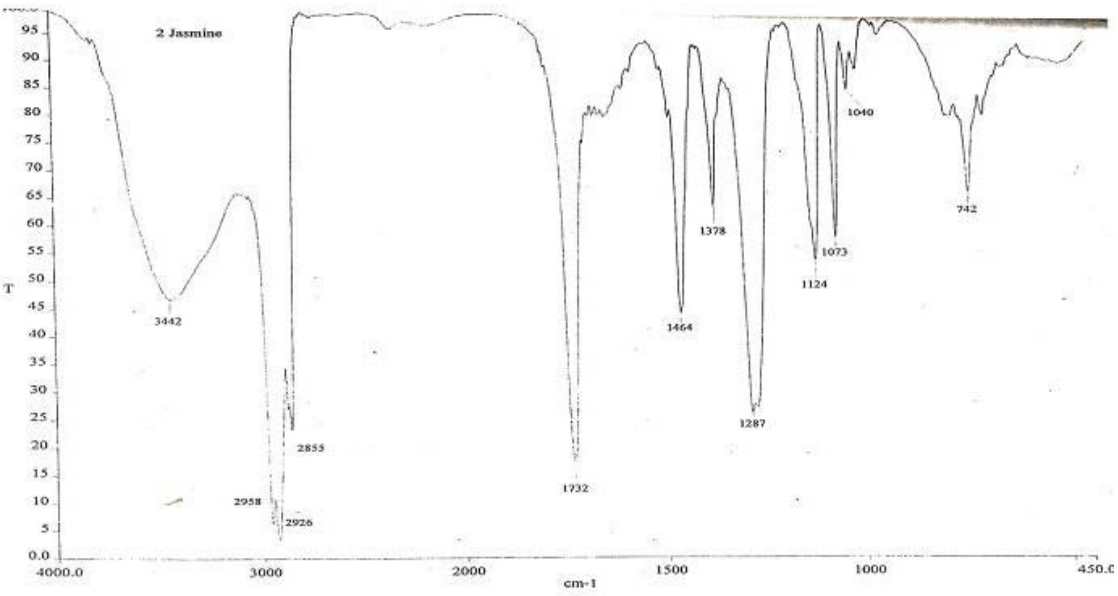


FT-IR spectrum of *Jasminum grandiflorum* – Genetically Modified flowers

Fig. 1.

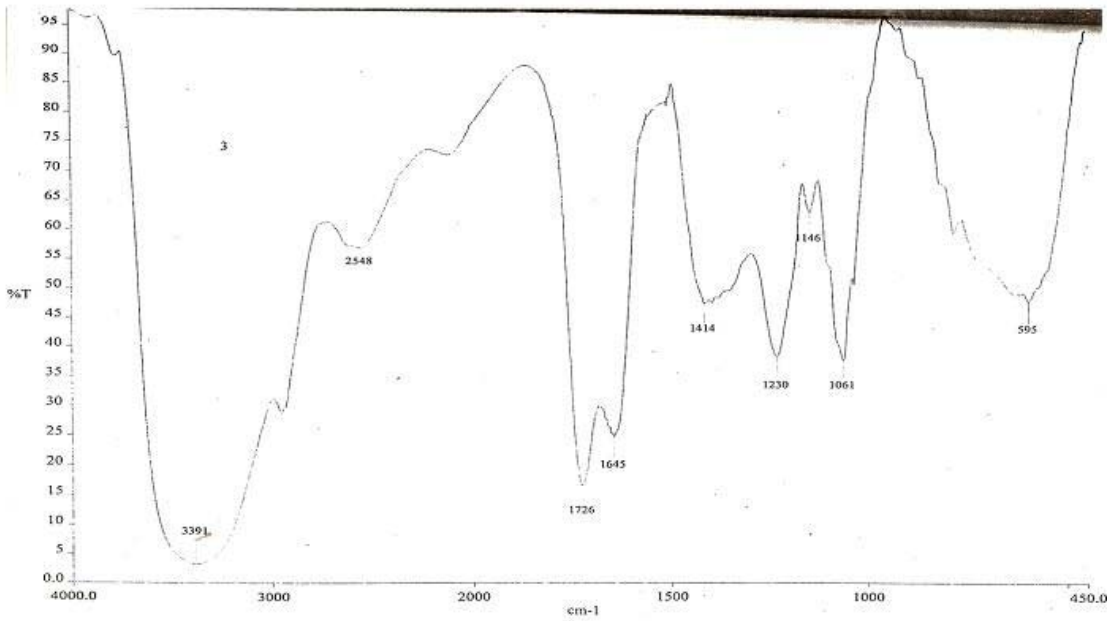


FT-IR Spectrum of *Jasminum sambac* – Control flowers

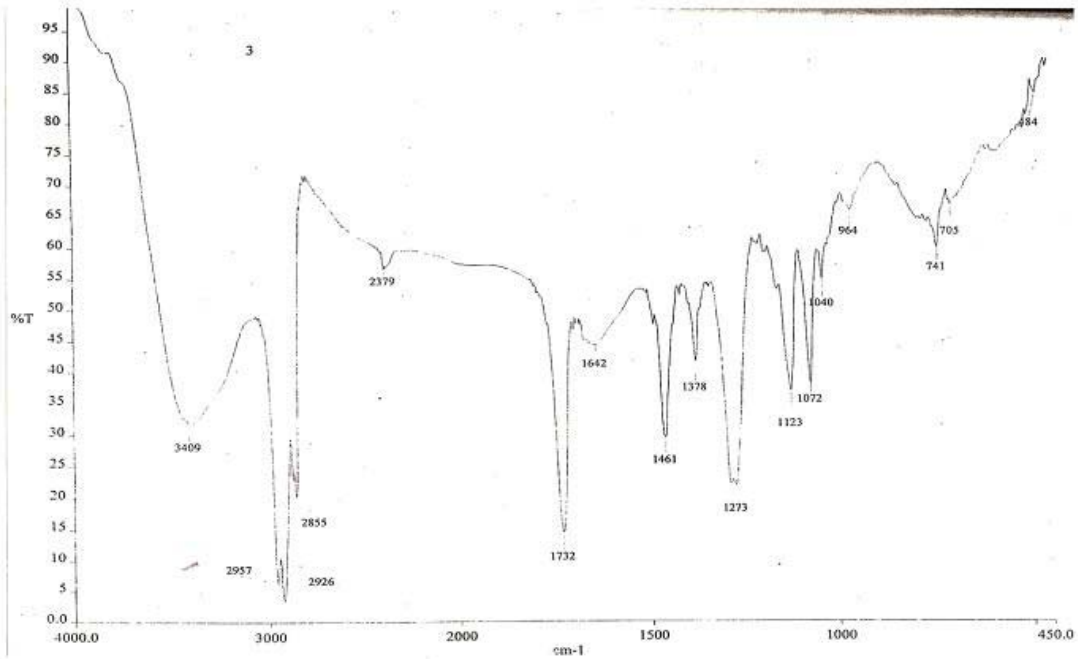


FT-IR Spectrum of *Jasminum sambac* – Genetically Modified flower

Fig. 2.

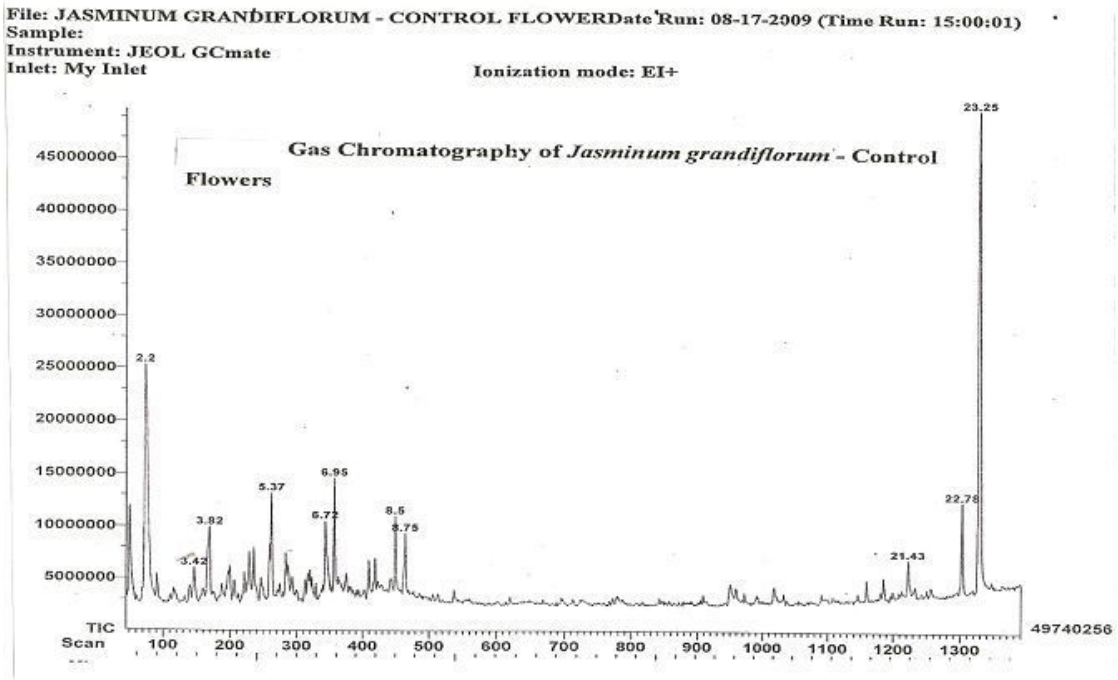


FT-IR Spectrum of *Polyanthus tuberosa* – Control flowers



FT-IR Spectrum of *Poliantlus tuberosa* – Genetically Modified Flowers

Fig. 3.


File: JASMINUM GRANDIFLORUM - CONTROL FLOWERDate Run: 08-17-2009 (Time Run: 15:00:01)
Sample:
Instrument: JEOL GCmate
Inlet: My Inlet
Ionization mode: EI+
Gas Chromatography of Jasminum grandiflorum - Control Flowers
TIC
Scan
Min.
49740256

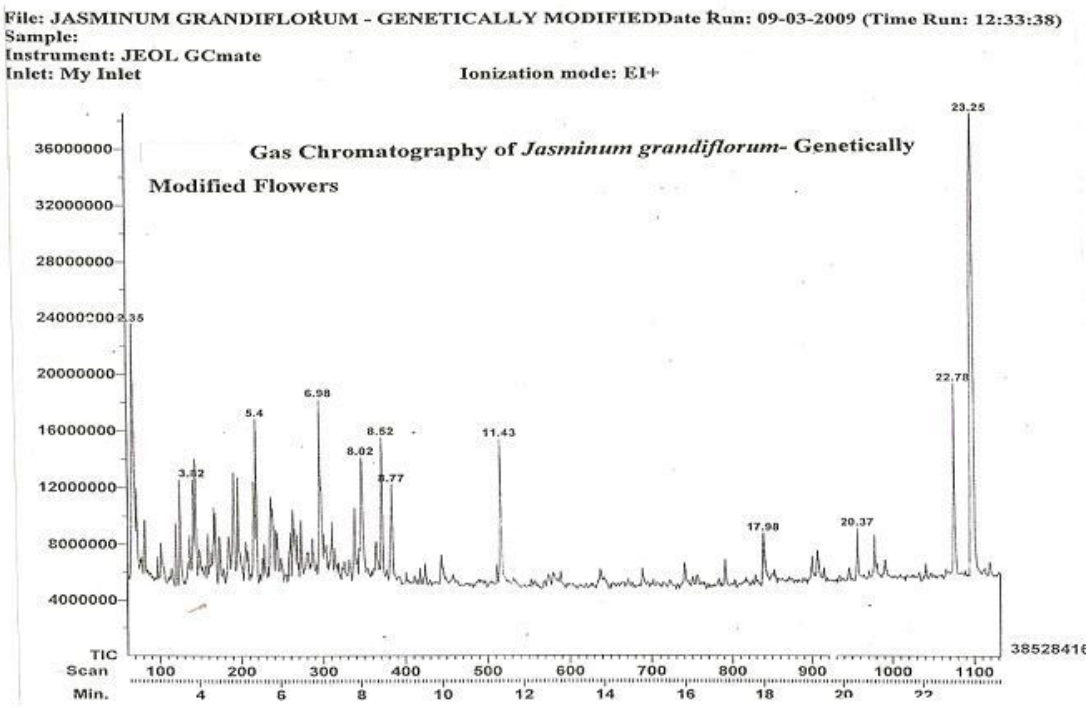
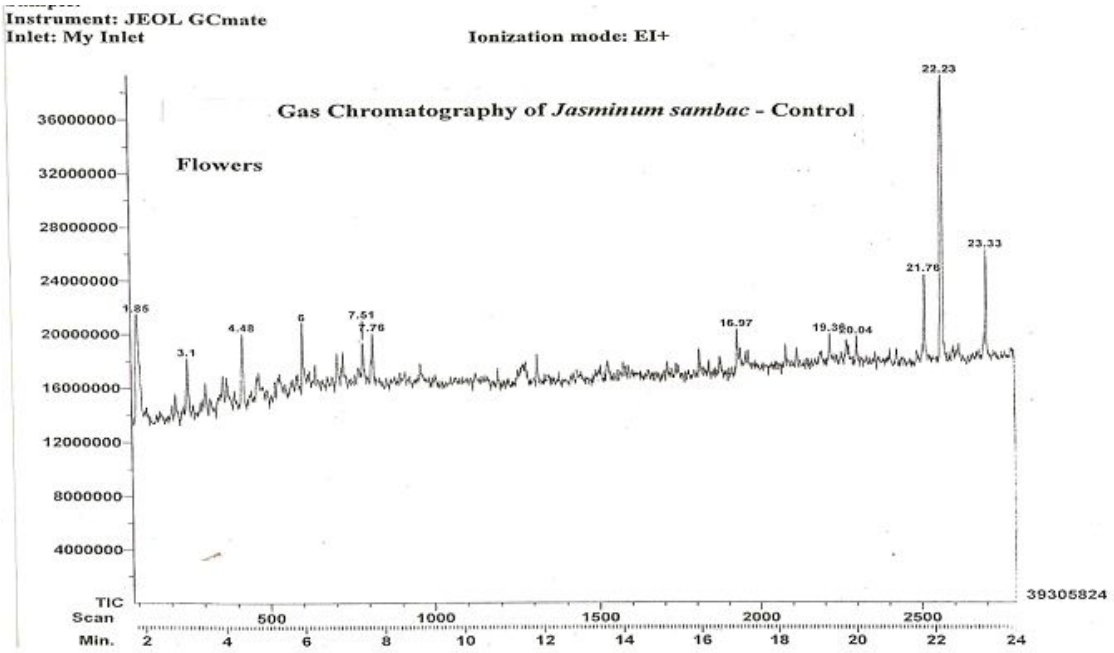

File: JASMINUM GRANDIFLORUM - GENETICALLY MODIFIEDDate Run: 09-03-2009 (Time Run: 12:33:38)
Sample:
Instrument: JEOL GCmate
Inlet: My Inlet
Ionization mode: EI+
Gas Chromatography of Jasminum grandiflorum- Genetically Modified Flowers
TIC
Scan
Min.
38528416

Fig. 4.


Instrument: JEOL GCmate
Inlet: My Inlet
Ionization mode: EI+
Gas Chromatography of *Jasminum sambac* - Control
Flowers
22.23
23.33
21.76
1.86
4.48
7.51
7.76
3.1
16.97
19.38
20.04
36000000
32000000
28000000
24000000
20000000
16000000
12000000
8000000
4000000
TIC
39305824
Scan
500
1000
1500
2000
2500
Min.
2
4
6
8
10
12
14
16
18
20
22
24

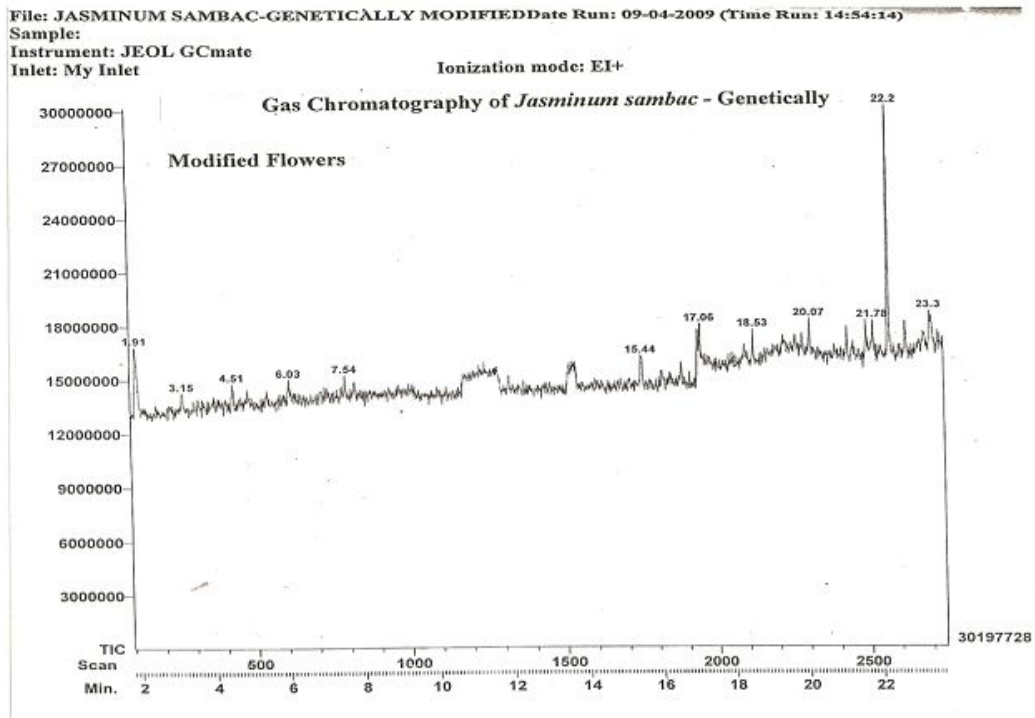
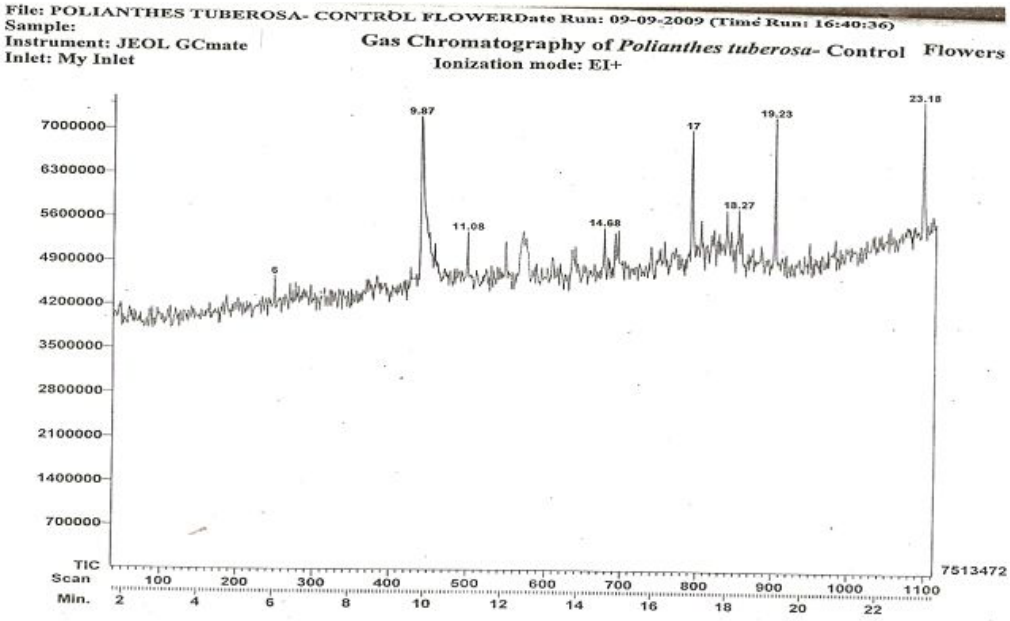

File: JASMINUM SAMBAC-GENETICALLY MODIFIEDDate Run: 09-04-2009 (Time Run: 14:54:14)
Sample:
Instrument: JEOL GCmate
Inlet: My Inlet
Ionization mode: EI+
Gas Chromatography of *Jasminum sambac* - Genetically
Modified Flowers
22.2
23.3
21.78
20.07
18.53
17.06
15.44
1.91
3.15
4.51
6.03
7.54
30000000
27000000
24000000
21000000
18000000
15000000
12000000
9000000
6000000
3000000
TIC
30197728
Scan
500
1000
1500
2000
2500
Min.
2
4
6
8
10
12
14
16
18
20
22

Fig. 5.


File: POLIANTHES TUBEROSA- CONTROL FLOWERDate Run: 09-09-2009 (Time Run: 16:40:36)
Sample:
Instrument: JEOL GCmate
Inlet: My Inlet
Gas Chromatography of Polianthes tuberosa- Control Flowers
Ionization mode: EI+
9.87
11.08
14.68
17
18.27
19.23
23.18
7513472
TIC
Scan
Min.

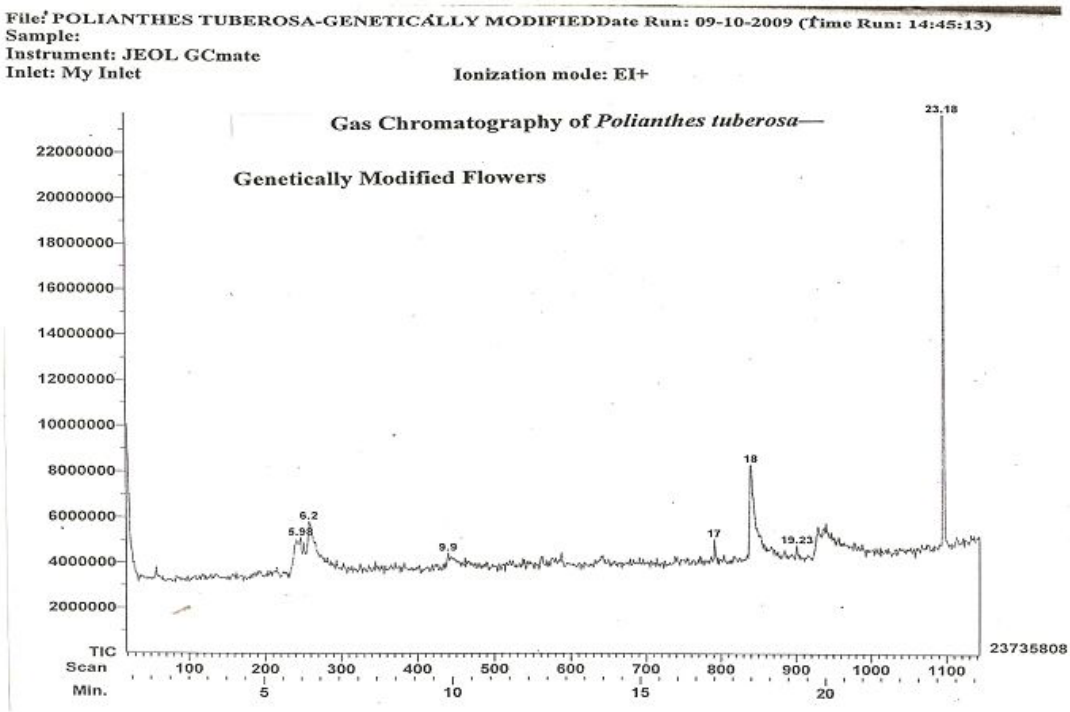

File: POLIANTHES TUBEROSA-GENETICALLY MODIFIEDDate Run: 09-10-2009 (Time Run: 14:45:13)
Sample:
Instrument: JEOL GCmate
Inlet: My Inlet
Ionization mode: EI+
Gas Chromatography of Polianthes tuberosa—
Genetically Modified Flowers
5.98
6.2
9.9
17
18
19.23
23.18
23735808
TIC
Scan
Min.

Fig. 6.

Table 3: Gas chromatography of the *Jasminum sambac* control flowers

S. No	Retention Time	Peak Area	Peak Percentage
1.	1.85	66410992	20.79
2.	7.51	20316264	6.36
3.	21.76	31905384	9.99
4.	22.23	167392312	52.42
5.	23.33	33261160	10.41

Table 4: Gas chromatography of the *Jasminum sambac* genetically modified flower

S. No	Retention Time	Peak Area	Peak Percentage
1.	1.91	21917520	20.82
2.	7.54	7193296	6.83
3.	21.78	2990712	2.84
4.	22.2	68733208	65.30
5.	23.33	4421744	4.20

Table 5: Gas chromatography of the *polianthes tuberosa* control flowers

S. No	Retention Time	Peak Area	Peak Percentage
1.	9.87	7204024	37.67
2.	17.00	5778584	30.22
3.	19.23	2742640	14.34
4.	23.18	3394888	17.74

Table 6: Gas chromatography of the *Polianthes tuberosa* genetically modified flowers

S. No	Retention Time	Peak Area	Peak Percentage
1.	9.9	2180760	4.86
2.	17.00	2180760	4.86
3.	19.23	1760800	3.92
4.	23.18	38688640	86.33

In the second flower *J. sambac* both control and GM plants GC were recorded five peaks of each. In the case of GM plants the highest peak percentage (65.03) was observed in peak number four. The least peak percentage (2.84) was recorded in the case of peak number three. In control plant the highest peak percentage (52.42) were observe in peak number four, and least peak percentage (6.36) were recorded in the case of peak number two.

The third flower *Polianthus tuberose* studies were observed four peaks of each in GM and control plants. In the case of GM plant the highest peak percentage (86.33) were observed in peak number four. The least peak percentage (3.92) were recorded in peak number three. In the case of control plant the highest peak percentage (37.67) in peak number one and the least peak percentage (17.75) were observed in the case of peak number four.

In our present investigation there are major differences in the essential oil constituents between control and GM plants of all the three experimental plants. *J. grandiflorum, J. sambac and P. tuberosa.*

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