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Research Article

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Cytotoxic Studies and the Exploration of Essential oil of *Syzygium cumini* (L.) Skeels

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Abstract

Syzygium cumini growing widely in South India is used for the present study. The leaf extracts showed several cytotoxic effects on onion root tip mitotic cells. The essential oil from the leaves is extracted and found to be of mixed terpenoid category. Many of the chemical constituents are showing anticarcinogenic, antimicrobial, antibacterial and insecticidal properties. Hence the leaf extract can be used for the preparations of anticarcinogenic and biopesticidal products.

Key words: *Syzygium cumini*, Myrtaceae, Cytotoxicity, *Allium cepa*, Essential oil, GC Analysis, Terpenoids

Introduction

Syzygium cumini (Myrtaceae) is a moderately suggested tree commonly called as Jamun or Jambolan. A voucher specimen was deposited in the herbarium of Botany department, Calicut University (CU 88021). In Indian folk medicine, the fruits and other plant parts are used as astringents and to cure blisters in mouth, colic, diabetes, diarrhoea, dysentery, digestion complaints, stomach ache, piles, pimples and cancer [1, 2, 3 4]. Previously isolated constituents in their leaf essential oil consisted of 59% of hydrocarbons and 41% oxygenated derivatives. The major hydrocarbons were myrcene, β–phellandrene, terpinolene, γ–terpinene and β–pinene. The oxygenated derivatives include eugenol, α– terpineol, cumin aldehyde, methyl cinnamate and borneol [5].

Materials and Methods

The leaf extracts of various concentrations, 1%, 2% and 5% were tested for the cytotoxicity on *Allium cepa* root meristem for different time intervals like 2hrs, 4hrs, 6hrs, 12hrs and 24hrs.

1. Cytotoxic studies: The treated root tip cells were squashed to analyse the cytotoxic effects [6].

2. Extraction of essential oil and GC analysis: Shade dried leaves are flaked and powdered. The material was hydrodistilled in a Clevenger Apparatus at 100^0C for 4hrs [7]. GLC were done with the help of Perkin Elmer HS – 40 Autosystem Gas Chromatograph equipped with FID connected with a chromatograph data processor PE Nelson 1022. Carrier gas: Nitrogen, Temperature programme from 80^0C to 220^0C at the rate of 5^0C / m. Injector temperature 200^0C and detector temperature 300^0C.

Results

Reported in Table 1 and Table 2.

Table.1. Consolidated data of cytotoxic effects of leaf extract of *Syzygium cumini*.

Table.2. Details of the GC analysis of the leaf essential oil of *Syzygium cumini*.

No.	Retention Time	Name of compound	Percentage obtained
1	3.765	α - thujene	0.48
2	3.928	β – thujene	1.18
3	4.735	α - phellandrene	0.68
4	4.905	β – pinene	0.99
5	5.272	sabinene	15.92
6	5.598	myrcene	1.52
7	5.888	β – phellandrene	14.62
8	6.165	linalool	6.68
9	6.468	limonene	1.36
10	7.368	α – terpinene	4.23
11	9.392	methyl eugenol	0.67
12	9.758	γ –terpinene	0.79
13	13.858	eugenol	1.44
14	14.665	methyl chavicol	1.45
15	15.935	isoeugenol	4.05
16	16.742	eugenyl acetate	9.38
17	17.782	β – elemene	4.72
18	19.735	β - caryophyllene	2.82
19	20.922	δ – selinene	6.69
20	21.195	isocaryophyllene	6.16
21	22.438	caryophyllene oxide	1.04
22	22.778	β - farnesene	2.01.

Conclusions

The leaf extracts induced mitotic aberrations in all the 5 treatments and the percentage of mitotic indices showed a gradual decrease. Prophase anomalies seem to be very much pronounced. Pulverization, clumping and scattering of chromosomes, stickiness, ball metaphase, bridges, early movement of chromosomes and diagonal orientation were the common cytotoxic effects observed in most of the treatments. Micronuclei were found only in higher concentrations.The leaf essential oil of *S. cumini* was composed of 48.45% monoterpenoids, 23.44% sesquiterpnoids, 16.99% phenolic compounds and 11.12% undetected trace compounds. The herb oil of *S. cumini* belongs to the mixed terpenoid class of essential oils and the probable chemotype is mixed terpenoids. Several chemicals detected were found to be cytotoxic, insecticidal, antimicrobial and anticarcinogenic [8, 9, 10, 11]. The present study reveals the potentialities of the leaf extracts as an anticarcinogenic and a biopesticide.

Treat-ment (%) and time	Total cells counted	Prophase		Metaphase						Anaphase						Telophase			Frequency of abnormal cells (%)	Mitotic Index (%)
		Normal	Abnormal	Normal	Pulverization	Clumping	Ball metaphase	Diagonal	Scattered	Normal	Early movement	Sticky	Bridge formation	Nonsynchronized	Diagonal	Normal	Sticky	Micronuclei		
1% 2hr.	3259	143	8	43	2	3	-	-	4	51	-	2	-	-	-	18	-	-	0.58	8.41
	3418	152	13	34	3	5	2	-	2	28	6	5	2	-	3	6	4	-	1.32	7.75
2% 2hr.	3394	108	29	18	5	5	4	-	3	14	3	7	4	-	2	4	3	-	1.92	6.16
1% 4hr.	3498	32	58	13	16	11	7	1	2	8	4	5	2	-	3	2	3	-	3.20	4.77
	3563	26	43	5	15	6	4	2	1	3	5	8	3	1	2	-	4	1	2.67	3.62
2% 4hr.	3327	13	28	3	19	7	2	1	3	1	3	6	2	2	1	-	2	2	2.35	2.86
1% 6hr.	2988	4	17	2	16	5	3	1	2	1	2	8	1	1	2	1	3	-	2.04	2.31
	3197	2	23	1	8	2	6	-	4	-	3	4	2	1	1	1	2	1	1.78	1.91
2% 6hr.	3424	3	14	-	5	1	3	1	2	1	1	5	-	-	-	-	2	2	1.05	1.17
1% 12hr.	3093	1	8	1	2	3	-	-	1	1	2	3	1	-	-	-	1	-	0.68	0.78
	3478	1	4	-	3	2	1	-	-	-	5	4	-	-	-	-	-	-	0.55	0.58
2% 12hr.	3243	-	2	1	1	4	-	-	2	-	2	2	-	-	-	-	1	-	0.46	0.46
1% 24hr.	3318	-	1	-	-	-	1	-	1	-	-	2	-	-	-	-	2	-	0.21	0.21
	3475	-	-	-	-	-	1	-	-	-	1	-	-	1	-	-	1	-	0.12	0.12
2% 24hr.	3218	-	-	-	-	-	-	-	2	-	-	1	-	-	-	-	-	-	0.09	0.09

Table 1 Consolidated data of cytotoxicity of *S.cumini.*

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