



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

International Journal of Recent Scientific Research
Vol. 7, Issue, 11, pp. 14307-14311, November, 2016

**International Journal of
Recent Scientific
Research**

Research Article

ANALYSIS OF BIOACTIVE COMPOUNDS IN NAVARA (NJAVA) RICE BY GCMS

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ARTICLE INFO

Article History:

Received 16th August, 2016
Received in revised form 25th
September, 2016
Accepted 23rd October, 2016
Published online 28th November, 2016

Key Words:

Navara, GCMS, Bioactive Compounds,
Pharmacological Activities

ABSTRACT

In this study, the bioactive components of *Njavara* (*Navara*) have been evaluated using GC/MS. The study revealed the twenty one compounds were identified which possessing more pharmacological activity such as hepato protective activity, antispasmodic, anti rheumatic, Anti inflammatory, Hypocholesterolemic, Cancer preventive, Nematicide, Insectifuge Antihistaminic, Antiarthritic, Anticoronary, Antieczemic, Antiacne, and 5-Alpha reductase inhibitor and Antiandrogenic activities.

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INTRODUCTION

“Food as a Medicine, Medicine as a food”. The functionality of the food is attributed by its nutritional richness, minerals, vitamins and bioactive compounds possessing Antioxidant, Anti cancer and other pharmacological activities. Rice is an important cereal food for people for longevity. Generally Asia other continents consumes it as a staple food for about 90% of world population. There are more than 4000 rice varieties have been identified in India. *Oryza sativa* is a predominant species which is cultivated across the world. *O glaberrima* is grown in Africa on limited scale.

Njavara (*Navara*) is a rice variety endemic to Kerala used in Ayurvedic medicine to treat Rheumatoid Arthritis as a paste called Navarakazhi. It also used for to treat neuro disorders, eye disorder, body pain, digestion and respiratory related problems. It also increases lactation for feeding mother (Balachandran 2008). Hence the present study was done to analyse the bioactive compounds in order to analyse their pharmacological activity.

MATERIALS AND METHODS

Gas Chromatography-Mass Spectrometry (GC-MS) analysis The GC-MS analysis of the sample was performed using a Shimadzu GCMS-QP2010 gas chromatograph mass spectrometer interfaced with a Turbo Mass quadrupole mass spectrometer, fitted with an Rtx-5 fused silica capillary column (30 X 0.25 mm, with 1 Cm film thickness). The oven

temperature was programmed from 100°C to 320°C at 100°C/min and a hold for 10 min. Helium was used as carrier gas at flow 1.0 mL/min. The injector temperature was 250 °C, injection size 1 µL neat, with split ratio 1:10. The interface and MS ion source were maintained at 320°C and 200°C respectively and the mass spectra were taken at 70eV with a mass scan range of 40-700 amu (atomic mass unit). Data handling was done using GCMS solution software. Identification of Compounds Interpretation of mass spectrum of GC-MS was conducted using the mass spectral database of National Institute of Standard and Technology (NIST) having more than 62,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained.

RESULT AND DISCUSSION

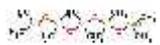
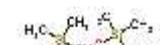
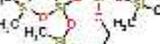
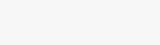
Identification of Bio -Active Compounds in Rice by Gas Chromatography – Mass Spectrometry

The phytochemical composition of the selected *Navara* (*Njavara*) rice variety was studied using Gas Chromatography coupled with triple quadrupole mass spectrometer (GC-MS/MS). The spectrum of the unknown components of the sample was compared with the spectrum of the known components stored in the NIST library. The name, molecular weight, structure and Pharmacological activity of the components were ascertained.

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Table 1 Identification of Bioactive Compounds in Navara (Njavara) Rice

SN	Name of the compound	RT	Compound Nature	Mol.formula	Structure	Biological Activity
1.	1,1,3,3,5,5,7,7-Octamethyl-7-(2-methylpropoxy)teta siloxan-1-ol	5.96	Alkaloid	C ₁₀ H ₃₂ O ₄ Si ₅		Anti oxidant and Antimicrobial (Avci and Dik, 2014)
2.	1,3,6-Octatriene, 3,7-dimethyl-, (Z)-	6.28	Essential oil	C ₁₀ H ₁₆		Anti complement Activity (Chung <i>et al.</i> , 2011)
3.	cis-11-Eicosenoic acid	7.89	<u>Monounsaturated omega-9 fatty acid</u>	C ₂₀ H ₃₈ O ₂		Antioxidant, antiarthritic, anticoronary and Anti-inflammatory Effect (Vasthi Gnana Rani and K. Murugaiah 2015)
4.	Benzoic acid, 2,6-bis[(trimethylsilyloxy)-, trimethylsilyl ester	8.31	Phenolic	C ₁₆ H ₃₀ O ₄ Si ₃		No Activity Reported
5.	1 Dodecene	8.92	Aromatic Hydrocarbon	C ₁₂ H ₂₄		Anti-bacterial activity (Yogeswari <i>et al.</i> , 2012)
6.	Cyclohexasiloxane, dodecamethyl-	10.75	-	C ₁₂ H ₃₆ O ₆ Si ₆		antioxidant, antifungal, antibacterial and antiinflammatory properties (Shalini and Srivastava, 2009)
7.	3-Tetradecene, (Z)-	11.68	-	C ₁₄ H ₂₈		No Activity reported
8.	3-Butoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tris(trimethylsilyloxy)tetrasiloxane	12.98	-	C ₁₉ H ₅₄ O ₇ Si ₇		No Activity Reported
9.	Hexadecen-1-ol, trans 9-	14.16	Fatty alcohol	C ₁₆ H ₃₂ O		Antioxidant and Anti tumour (Huang <i>et al.</i> , 2009)
10.	Octasiloxane 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl	14.98	Volatile organic Compound	C ₁₆ H ₅₀ O ₇ Si ₈		Antimicrobial (kumaradevan <i>et al.</i> , 2015)
11.	5-Octadecene, (E)-	16.40	Fatty acids	C ₁₈ H ₃₆		Stronger sexual characters (Hsouna <i>et al.</i> , 2011)
12.	Tetracosamethyl-cyclododecasiloxane	16.70	-	C ₂₄ H ₇₂ O ₁₂ Si ₁₂		Antagonistic activity (Neda Ghebleh and Nafiseh Sadat Naghavi 2014)
13.	Cyclododecasiloxane, eicosamethyl	18.23	Volatile compounds	C ₂₀ H ₆₀ O ₁₀ Si ₁₀		Antimicrobial Activity (Agrawal Shelly, <i>et al.</i> , 2015)
14.	2-Hexadecanol	18.42	Fatty alcoholol	C ₁₆ H ₃₄ O		No Activity Reported
15.	Tetracosamethyl-cyclododecasiloxane	20.94	Polyterpenes	C ₂₄ H ₇₂ O ₁₂ Si ₁₂		hepatoprotective activity, antispasmodic, anti-rheumatic, anti-sporific baths, insecticides for mosquito control, appetizing agent, to combat indigestion, stomach pain, nausea and infection of the gall bladder (Babalola <i>et al.</i> , 2011).
16.	Phthalic acid, di(2-propylpentyl) ester	22.27	Ester	C ₂₄ H ₃₈ O ₄		Antimicrobial (Shubhangi Nagorao Ingole 2016)

17.	Methylenebis(2,4,6-triisopropylphenylphosphine	23.62	-	$C_{31}H_{50}$		No Activity Reported
18.	9,12,15-Octadecatrienoic acid	24.21	Fatty acid ester	$C_{18}H_{30}O_2$		Antiinflammatory, Hypocholesterolemic, Cancer preventive, Hepatoprotective, Nematicide, Insectifuge Antihistaminic, Antiarthritic, Anticoronary, Antieczemic, Antiacne, and 5-Alpha reductase inhibitor Antiandrogenic (sermakkani and Thangapandian 2012)
19.	1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethy	24.29	Volatile organic Compound	$C_{16}H_{50}O_7Si_8$		Antimicrobial (Kumaradevan <i>et al.</i> , 2015)
20.	trans-13-Docosenamide	25.13	Alkyl amides	$C_{22}H_{43}NO$		No Activity reported
21.	Cyclodecasiloxane, eicosamethyl	25.45	Volatile Organic compound	$C_{20}H_{60}O_{10}Si_{10}$		Antimicrobial (Senthil <i>et al.</i> , 2016)
22.	1,6,10,14,18,22-Tetracosahexaen-3-ol	25.51	Titerpenoid	$C_{30}H_{50}O$		Anti inflammatory, antiarthritic antimicrobial, anti tumor, antiprotozoal and chemo preventive (Uthayakumari and Mohan)
23.	1,1'-[(1-methyl-1,2-ethanediyl)bis(oxy)]bis	26.13				
24.	Androst-7-ene-6,17-dione, 2,3,14-trihydroxy-, (2 α ,3 α ,5 α)-	30.60	Steriods		-	No Activity Reported
25.	Psi Psi Carotene	31.07	Carotene	$C_{40}H_{56}$		Anti oxidant, Cancer Preventive and Treatment for cardiovascular diseases.

The name, molecular weight and structure and Pharmacological activity of the components were ascertained.

Pigmented rice possesses diverse functional properties such as, protection against cytotoxicity (Chen *et al.*, 2008), antineuro degenerative activity, inhibition of glycogen phosphorylase (Jakobs *et al.*, 2006), and possessing antioxidant and scavenging activity higher than white rices and hybrid rice varieties (Oki *et al.*, 2005).

Bioactive compounds in Njavara Rice

The GCMS study also revealed the presence of various medically important bioactive compounds such as 1,3,6-Octatriene, 3,7-dimethyl- possessing (Z)- Anti Complement activity (Chung *et al.*, 2011), 1,1,3,3,5,5,7,7-Octamethyl-7-(2-methylpropoxy)teta siloxan-1-ol, cis-11-Eicosenoic acid, 1 Dodecene, Cyclohexasiloxane, dodecamethyl-, Hexadecen-1-ol, trans 9-, Octasiloxane 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl, Tetracosamethyl-cyclododecasiloxane,

9,12,15-Octadecatrienoic acid and Tetracosamethyl-cyclododecasiloxane which possessing hepato protective activity, antispasmodic, anti rheumatic, Anti inflammatory, Hypocholesterolemic, Cancer preventive, Nematicide, Insectifuge Antihistaminic, Antiarthritic, Anticoronary, Antieczemic, Antiacne, and 5-Alpha reductase inhibitor Antiandrogenic activities (Table 1 and Fig 1).

The study suggests that medicinal rice is rich sources of potential medicinal activity which used for the preparation of drug for various diseases and also used for the development of Nutraceuticals product. The further study will be carried out for the Anti Diabetic activity of *Navara (Njavara)* Rice.

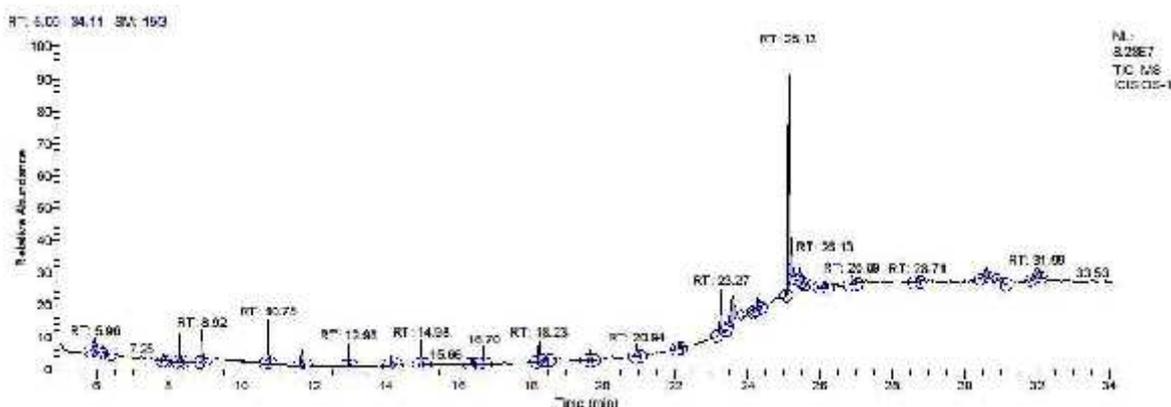


Fig 1 GCMS Chromatogram of Navara (Njavara)

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How to cite this article:

Boominathan M and Bakiyalakshmi S. V.2016, Analysis of Bioactive Compounds In Navara (Njavara) Rice By Gcms. *Int J Recent Sci Res*. 7(11), pp. 14307-14311.