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Profiling of Bioactive Compound in Convolvulus Cneorum Essential Oil by Gas Chromatography/Mass Spectrometry Analysis

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A B S T R A C T

Convolvulus cneorum essential oil is packed with bioactive chemistry, its leaves harbors molecules that protects pain, reduces inflammation, reduces oxidative stress, neutralize free radicals, microbial infections and restores vitality in the body. Its unique spectrum of bioactive compounds also provides broad-spectrum antimicrobial, antifungal, antiviral, antidiabetic, hepato-protective, antidiarrheal, anticancer, anti-tumor, hypo-lipidemic activity amongst others. The herbal plant stands as a bridge between traditional and modern pharmacology. GC/MS analysis of Convolvulus cneorum essential oil revealed the presence of 39 bioactive compounds and the predominant compounds includes; Alpha--murolene (18.96 %), α-terpinene (18.07 %), 1,8-cineole (10.44 %) and β-caryophyllene (10.04 %). The synergy between other compounds in the oil forms a medicinal library that can also be used to curb the increasing cases of antimicrobial resistance. In conclusion, Convolvulus cneorum essential oil remains a living example of validated pharmacological medicinal plant with measurable anti-inflammatory and antioxidant therapy

INTRODUCTION

Convolvulus cneorum a medicinal plant which belongs to the family Convolvulaceae contains a unique spectrum of bioactive compounds rarely found in other herbal trees (Amrati et al., 2021). It has over 20 species which are widely distributed in most parts of the world (Chen et al., 2018). Every part of the tree holds a therapeutic value because it contains different phytochemicals such as, tannins, saponins, alkaloids, flavonoids, steroids, phenolic compounds and fatty acids (Ashraf et al., 2018). Its bark addresses skin infection, gastro-intestinal disorder, urinary tract infection and detoxification (Elzaawel and Tawata, 2012; Alagbe, 2025). The leaf decoction acts as blood purifier, detoxification of toxins from the liver, heart, kidney and stomach (Azman et al., 2012; Boulos, 2000), strengthening circulation, digestion and other overall vitality (Arora and Malhotra, 2011). Roots infusion has been used traditionally for the treatment of pile, pyrexia, sores, sexually transmitted disease, arthritis and dental antiseptic (Kaur and Kalia, 2010; Alagbe, 2025).

Essential oils from Convolvulus cneorum are known for relaxing smooth muscles and supporting open and easier breathing (Saleem et al., 2014). It carries numerous bioactive compounds which has strong antimicrobial activity especially against bacteria and yeast that contributes to respiratory infection and its monoterpenes show expectorant properties (Hassan, 2012). They have also demonstrate potent anti-inflammatory action by suppressing nitric oxide and key cytokines which are responsible for chronic inflammatory disorders (Salamatullah et al., 2022). Scientific studies has shown that ethanolic and aqueous extract from Convolvulus cneorum leaves significantly reduced markers of liver inflammation, protects hepatocytes, neutralize reactive oxygen species, stabilize cell membrane and modulate immune activities coordinating defense against oxidative damage (Hassine et al., 2014; Omokore and Alagbe, 2019). It has also been shown to slow the release of sugar into the blood, regulate cholesterol and forms a protective gel in the stomach and intestine of animals in order to inhibit the proliferation of pathogenic organisms (Luo et al., 2014; Mishra et al., 2010).

Inside Convolvulus cneorum is a medicinal profile that works on multiple system at once. Its leaves, stem, root and essential oil contributes to a layered chemistry. However, each part shows considerable variation in their chemical composition depending on their specie, age of part, part of plant used, processing method, climatic conditions as well as storage conditions (Alagbe, 2022; Inikpi et al., 2014). Therefore, this research was designed to examine the bioactive compounds in Convolvulus cneorum essential oil by GC/MS analysis.

LITERATURE REVIEW

Site of the Study, Collection and Processing of Convolvulus Cneorum Essential Oil

The experiment was undertaken at the Department of Animal Nutrition and Biochemistry, Gandhi College of Agriculture in the month of August to October, 2025 located between longitude 23o 03′ to 30o 12′ North and latitude 69o 30′ and 78o 17′ East.

Fresh leaves of Convolvulus cneorum were harvested from the medicinal plant unit at Gandhi college of Agriculture, Rajasthan and sent to the Taxonomy department of the institution for proper identification and authentication before it was assigned a voucher number HF09/2025YH. Collected leaf sample was sorted and rinsed in clean water to remove dirt's before it was spread in a plastic sieve for 15 minutes to drain excess water. Samples were later air dried for 10 days, grounded into powder and kept in a labeled polythene bag under room temperature. Essential oil from Convolvulus cneorum leaf was obtained by steam distillation technique using Clavenger apparatus according to the method outlined by Alagbe (2025). Distilled oil was collected from the condenser after cooling, steam and oil mixture was separated via the separatory funnel before it was stored in vials, kept in the refrigerator at 4℃℃ before it was taken to the laboratory for further analysis.

Gas Chromatography–Mass Spectrometry (GC-MS) Analysis of Convolvulus Cneorum Essential Oil

The GC-MS analysis was carried with Alaudor quadrupole GC-MS (model 28001XC, China), 0.2 ml of Convolvulus cneorum essential oil was injected into the chromatograph after the power switch was put on. The gas chromatograph contained split less inlet, helium was used as a carrier gas at a constant flow rate of 0.8 mL/min and it was adjusted to a temperature of 35℃, humidity (20 – 80 %), column head pressure (100 psi), cooling speed of 50 ℃ and flow range of 0 – 200 ml/minutes. The mass-spectrometry section was maintained at mass range of 1.50 – 1100 amu, mass stability (0.1 amu), emission current (10 – 320 µA) and ionization energy (150 – 320 ℃).

The bioactive components of Convolvulus cneorum essential oil were identified on the basis of their retention indices. Identification confirmation was carried out by comparing of their mass spectra with published spectra and those of reference compounds from the Library of National Institute of Standard and Technology (NIST, 2011) database.

METHODOLOGY

Table 1: Profiling of Bioactive Compounds in Convolvulus Cneorum Essential Oil

s/n	Compounds	Molecular weight (g/mol)	Molecular formula	Concentration (%)	Retention time (min)
1	9,12-Octadecadienoic acid	310.5	$C_{20}H_{36}O_2$	7.15	
2	Bis(2-ethylhexyl) phthalate	390.6	$C_{24}H_{38}O_4$	0.91	
3	9-Oxabicyclo-6.1.0,nonane,	127.1	$C_8H_{14}O$	0.39	

4	4-Trifluoroacetoxytetradecane	424.4	$C_{16}H_{29}F_3O_2$	0.04	
5	2-methyl-Glutaric acid	146.1	$C_6H_{10}O_4$	0.11	
6	1-Hexadecanol	242.4	$C_{16}H_{34}O$	0.35	
7	Humulene	204.3	$C_{15}H_{24}$	6.07	
8	gamma.-Terpinene-3-Carene	136.3	$C_{10}H_{16}$	1.11	
9	Benzene,1,4-dichloro	147.0	$C_6H_4Cl_2$	0.58	
10	Methylene chloride	84.93	CH_2Cl_2	1.24	
11	Trichloroacetic acid, 3-tetradecyl Ester	345.7	$C_{15}H_{27}Cl_3O_2$	0.40	
12	Phytol	296	$C_{22}H_{42}O_2$	0.72	
13	Ethyl 9-hexadecenoate	282.2	$C_{18}H_{34}O_2$	0.03	
14	Tritetracontane	605.15	$C_{43}H_{88}$	2.22	
15	Ethyl ricinoleate	326.5	$C_{20}H_{38}0_3$	0.35	
16	Hexahydrofarnesyl acetone	268.5	$C_{18}H_{36}O_{11}$	0.01	
17	Chloromethyl 7-chlorododecanoate	227.13	$C_9H_{16}Cl_2O_2$	0.04	
18	Neophytadiene	278.5	$C_{20}H_{38}$	0.74	
19	2,3-Dibromopentane	229.8	$C_5H_{10}Br$	3.55	
20	Heptadecane, 2,6,dimethyl	268.5	$C_{19}H_{40}$	0.11	
21	Ledol	222.37	$C_{15}H_{26}0$	0.35	
22	Undecane, 2,10-dimethyl	184.3	$C_{13}H_{28}$	0.17	
23	α-murolene	204.35	$C_{15}H_{24}$	18.96	
24	Palmitoleic acid	254.41	$C_{16}H_{30}O_2$	2.96	
25	Isopulegol	154.25	$C_{10}H_{18}O$	0.56	
26	Butyl tetratriacontyl ether	314.47	$C_{18}H_{34}O_4$	0.07	
27	Methyl stearate	298.5	$C_{19}H_{38}O_2$	0.31	
28	(Z)-β-ocimene	136.23	$C_{10}H_{16}$	1.06	
29	Myrcene	136.23	$C_{10}H_{16}$	1.82	
30	Isopulegol	154.25	$C_{10}H_{18}O$	0.56	
31	Terpinen-4-ol	154	$C_{10}H_{18}O$	0.01	
32	(E)- β-ocimene	134	$C_{10}H_{14}$	0.84	
33	Gamma terpinolene	136.23	$C_{10}H_{16}$	0.52	
34	α-terpinene	136.23	$C_{10}H_{16}$	18.07	
35	β–pinene	136	$C_{10}H_{16}$	0.11	
36	1,8-cineole	154	$C_{10}H_{18}O$	10.44	
37	Linalool	154	$C_{10}H_{18}O$	0.56	
38	β-caryophyllene	204.35	$C_{15}H_{24}$	10.04	
39	α-pinene	136	$C_{10}H_{16}$	0.81	

	Total			94.34	

RESULTS AND *DISCUSSION*

Result obtained in this study revealed that Convolvulus cneorum essential oil contains bioactive compounds that go far beyond nutrition (Alagbe, 2025). Its versatility made it a trusted companion in traditional medicine (John, 2024a; Musa et al., 2020). Inside the essential oil lies a biochemical network built for metabolic balance and vitality (John, 2024b; Daniel et al., 2023). Alpha--murolene (18.96 %), α-terpinene (18.07 %), 1,8-cineole (10.44 %) and β-caryophyllene (10.04 %), predominant compounds have been well documented to reduce inflammation, reduce cardio-vascular health (John, 2024c) and slow cancer growth shown to cause tumor to self-disrupt (Adewale et al., 2021).

β-caryophyllene has been previously associated with broad-spectrum antimicrobial activity, helping the body fight off bacteria and fungi (Alagbe, 2025; Singh et al., 2022). According to Emile et al (2019); Mayada (2024), Convolvulus cneorum oil contained Gamma terpinolene (19.11 %) and Linalool (11.28 %) were reported as their major bioactive compound. The difference in outcome could be as a result of genetic variation, extraction procedure, harvesting method as well as geographical location (Ojediran et al., 2024a; Ojediran et al., 2024b).

However, all these compounds have multiple pharmacological roles and are also generally used to curb the dangers of antimicrobial resistance in both human beings and animals (Shittu and Alagbe, 2021). 9, 12-Octadecadienoic acid (7.15 %) and Humulene (6.07 %) are powerful agents for pain relief, kidney support and cellular repair (John, 2024d). They also help to flush toxins and support detoxification while boosting immune response (John, 2024d). Phytol, linalool, α-pinene, β–pinene, gamma terpinolene and Terpinen-4-ol protects blood vessels and fights free radicals (Singh et al., 2021; Singh et al., 2022). Myrcene (1.82 %), Isopulegol (0.56 %), Methyl stearate (0.31 %) recorded in this study was lower than 0.02 %, 0.45 % and 0.06 % for myrcene, Isopulegol and methyl stearate reported by Hanoch and Healthy (2016).

Gamma-Terpinene-3-Carene, 2-methyl-Glutaric acid, Isopulegol and Butyl tetratriacontyl ether have all been confirmed to lower blood sugar, reduce cytokines, stabilizes cell membrane and protects the body against chronic disease (Alagbe, 2022; Alagbe et al., 2022). They also protect stomach lining and promote smoother digestion in the gastrointestinal tract (Shittu et al., 2024; Oluwafemi et al., 2021). Scientific evidences have confirmed the antidiarrheal effects of ethyl 9-hexadecenoate, Tritetracontane and Ethyl ricinoleate (Amrati et al., 2021). Emile et al. (2019) reported that the concentration of phytol in Convolvulus arvensis acetone aerial parts extract is 0.14 %. Hanoch and Healthy (2014) recorded that the chemical composition of bark essential oils of Cinnamomun culilawan contained α-pinene (0.01 %), β-pinene (0.63 %), Linalool (0.82 %) and 4-terpineol (0.35 %). These values were less than those reported in this study, variation in result could be as a result plant parts used, climatic condition as well as harvest or storage conditions (Muritala et al., 2022; Shittu and Alagbe, 2020). They can also improve glucose metabolism and regulate insulin response (Chen et al.,

2018). Collectively, the bioactive compounds in Convolvulus cneorum essential oil recorded in this study offers incredible healing power.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, Convolvulus cneorum essential oil holds different kinds of medicine which protects the body. It also forms an ally for detoxification and restores vitality in the body making it a potential natural aid for coughs, fever, skin infections, sores, gastro intestinal infections, urinary diseases amongst others because of the presence of bioactive compounds which possess multiple pharmacological activities like, anti-inflammatory, antiviral, immune-modulatory, gastro-protective, anti-helminthic, antidiabetic, cytotoxic, anticancer, anti-tumor, cadio-protective and hepato-protective.

FURTHER STUDY

This research still has limitations, so further research is needed related to the topic of Profiling of Bioactive Compounds in Convolvulus Cneorum Essential Oil by Gas Chromatography/Mass Spectrometry Analysis in order to perfect this research and increase insight for readers.

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