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PHYTOCHEMICAL PROFILE OF JUTE MALLOW(*CORCHORUS OLITORIUS*) AND WHITE JUTE (*CORCHORUS CAPSULARIS*) LEAF USING GC-MS ANALYSIS

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ABSTRACT

Jute mallow and White mallow are leafy vegetables belong to family Malvaceae. These plants are widely consumed in Africa and some part of Asia for their rich nutritional and medicinal properties. This research was carried out to identify phytochemical profile of Jute mallow and White mallow leaf at Central Advance Scientific Laboratory Centre Usmanu Danfodiyo University Sokoto. The plant samples were collected from Hayin Gulbin Tullukawa area Gusau, Zamfara State Nigeria. The leaves were shade dried and prepared into powder using mechanical blender. Centrifuging machine was used for preparation of extract and methanol as solvent for phytochemical extractions. The identification of Phytochemicals was done using GC-MS machine. The results of GC-MS phytochemicals analysis showed that, *C. olitorius* leaf had twenty one (21) different classes of alkaloid, and *C. capsularis* leaf had seven (7). The *C. olitorius* leaf had eight (8) different fatty acids, while *C. capsularis* leaf had only five (5). Phenol and Saponin were present in *C. capsularis* leaf but absent in *C. olitorius* leaf. *C. capsularis* leaf had seven (7) different classes of tannin while *C. olitorius* leaf had four (4). It has been concluded that, *C. olitorius* leaf had high alkaloid and fatty acids content but low tannin content. The *C. capsularis* had high tannin content. Therefore, further research. is recommended on nutritional and anti-nutritional content of *C. capsularis* and *C. olitorius*.

Keywords: Phytochemical, Jute mallow, White mallow, GC-MS

1.0 INTRODUCTION

The phytochemicals are naturally occurring compound in many plants which impart colour, aroma, and flavour and provide protection from infection and predators to plant**.** Phytochemical are not essential like vitamins, or Minerals, but they play important role in reducing the risk of chronic diseases like cancer, diabetes, heart diseases and boost immune system(Dansi *et al.,* 2020).

Corchorus capsularis and *Corchorus olitorius* leaves contain polysaccharides, flavonoids, phenolics, cardiac glycosides, sterols, fatty acids and carotenoid (Adesina, *et al* ., 2022) *C. capsularis* and *C. olitorius,* are grown as vegetables for the viscosity and mucilage they produced in their leaves and widely consumed in Africa and some part of Asia for their rich nutritional and medicinal properties (Benor *et al*., 2010). The phytochemical screening of the leaves of *C. capsularis* showed the presence of flavonoids, saponins, tannins, steroids and triterpenes. It is also rich in vitamin, carotenoid, calcium, potassium and dietary fiber. *C. capsularis* leaves contain two functional compounds; phytol, (3,7,11,15-tetramethyl-2-hexadecen-1-ol)and monogalactosyldiacylglycerol (1,2-di-O-α-linolenoyl-3-β-D-galactopyranosyl-glycerol). (Habtamu *et al*., 2021) *C. capsularis* also contains capsin, a glycoside, which is responsible for the major bitter taste of the leaves of *C. capsularis*. ;Another

glycoside (capsugenin-30-O-β glucopyranoside) was also isolated from the leaves of *C. capsularis*. .(Ashok *et al*., 2022).Leaves of *C. capsularis* and *C. olitorius* possessed an abundance of antioxidants compounds associated with various biological properties, which include diuretic, analgesic, antipyretic, antimicrobial activities, antitumor, it also give protection from chronic diseases such as heart disease, cancer, diabetes, and hypertension as well as other medical conditions (Biswas *et al.,* 2020). Numerous preparations from the genus *Corchorus* have demonstrated anti-inflammatory, antioxidant, hepatoprotective, immune stimulant, anticancer, antibacterial, antidiabetic, analgesic, wound-healing, and cardio-protective characteristics.(Marwa *et al*., 2022). In West Africa, *C. olitorius* is used to treat malaria, typhoid fever, female infertility, heart failure, and ulcers. In addition, it is used as a therapy for fevers, colds, constipation, and tumors. *C. olitorius* is also reported to have antiobesity anti-inflammatory, antimicrobial, and gastro-protective properties along with antidiabetic effects. (Rebecca *et al* ., 2022). Young leaves and shoots of *C. capsularis* and *C. olitorius* are eaten as healthful vegetables and have long been used as traditional medicines for fever, ascites, algesia, liver problems, piles, and tumors in many cultures (Biswas , *et al*., 2022). Genus *Corchorus* used in traditional medicine as well as in modern medicine for treatment of diseases such as diabetes, dysentery, typhoid, especially in Nigeria. (Panche *et al.,* 2019). Glycosides are one of the most significant class of phytochemicals in plant due to their chemical diversity, biological activity and therapeutic potentials it provide essential protection and support to plants and serve as hormones or signaling molecule. (Badri *et al.,* 2010).Saponin-rich foods are important in human diets to control plasma cholesterol, preventing peptic ulcer, osteoporosis and to reduce the risk of heart disease (Yang, *et al.,* 2018). Some alkaloids are used as flavoring agents in the food industry. For example, caffeine, an alkaloid found in coffee and tea, is added to many beverages for its stimulant and flavor - enhancing properties, in the cosmetic industry, alkaloids can be incorporated into creams, lotions, and other cosmetic products Kiliobas *et al*., 2023). Tannin, is phenolic compounds in woody flowering plants that are important deterrents to herbivores and have a number of industrial applications it hinder the absorption of essential minerals, vitamins, and proteins, reducing the overall nutritional value of foods. (Sunayana., 2023). Tannins are often regarded as having a dual role in health and nutrition, offering both beneficial and potentially adverse effects (Amalesh *et al.,* 2021)

2.0 MATERIALS AND METHODS

This research was carried out at Central Advance Scientific Laboratory Centre Usmanu Danfodiyo University Sokoto in march, 2024. The plant samples were collected from Hayin Gulbin Tullukawa area Gusau, Zamfara State Nigeria. Zamfara climate condition is tropical with temperatures rising up to 38 °C (100.4 °F) and above between March and May. Rainy season starts in late May to October (Mamman *et al.,* 2020).

2.1 SAMPLE COLLECTION AND PREPARATION

Matured healthy leaves which are free from insect diseases or mechanical damage were collected in the morning by hand picking and air dried for 2 days. The dried sample were grounded into fine powder by using a mortar and pestle, and with the help of electric blender. The grounded powder was sieved with 2.0 mm sieve and kept in separate clean plastic screw cap container and labeled before analysis.

2.2 PHYTOCHEMICAL EXTRACTION

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One gram (1g) of the samples were measured using a digital weight balance and added into 100ml conical flask. Ten mill (10ml) of methanolic solvent were measured using a micropipette and added into each samples and foil paper were used to cover the mouth of the conical flask. The samples were transferred into a centrifuging machine tube and run at 4000rmp for five minutes. After five minute the samples allowed to settle, and then transferred into labeled 100ml conical flask and allowed to evaporate. Fifty microliter (50µl) of the extract were added into GC-MS extraction bottle using micropipette.

2.3 PHYTOCHEMICAL IDENTIFICATION

GC-MS Analysis was performed to identified phytochemicals using Agilent Intuvo 9000 GC system coupled with detector system 5977B MSD with split/split less injector. Inlet temperature was set at 300˚C, MS Source at 230˚C and MS Quad at 150˚C. The oven temperature was programmed at 50˚C for 4 minutes, increased to 250°C at 20°C and hold for 2 minutes and then increased to 300˚C at 20˚C min^{-1} [a] and hold for 3 minutes. The phytochemical of interest was identified and quantified by comparing retention times and peak areas to standard. The identification of compounds was done by matching spectra with National Institute of Standards and Technology database library (NIST107.LIB). Retention time (RT) for GC was used to determine components, and MS fragment interpretation was done by comparison with the NIST107.LIB database.

3.0 RESULTS

The results of GC-MS phytochemicals analysis showed that, *C. olitorius* leaf had twenty one (21) different classes of alkaloid, and *C. capsularis* leaf had seven (7). The *C. olitorius* leaf had eight (8) different fatty acids, while *C. capsularis* leaf had only five (5). Phenol and Saponin were present in *C. capsularis* leaf but absent in *C. olitorius* leaf. *C. capsularis* leaf had seven (7) different classes of tannin while *C. olitorius* leaf had four (4). The result is presented in (Fig.1 and Fig. 2 and Table 1 and 2)

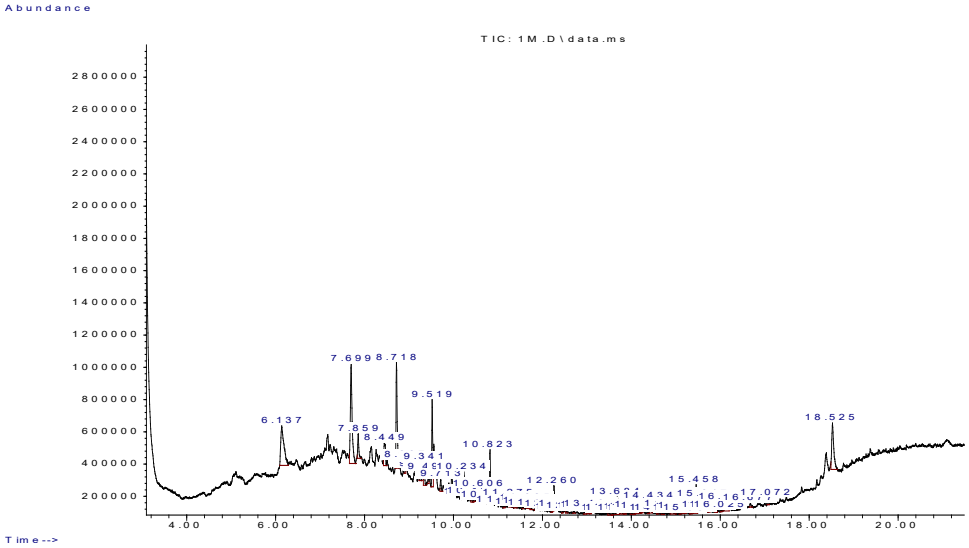

Fig.1: GC-MS chromatogram of *C. olitorius* leaf

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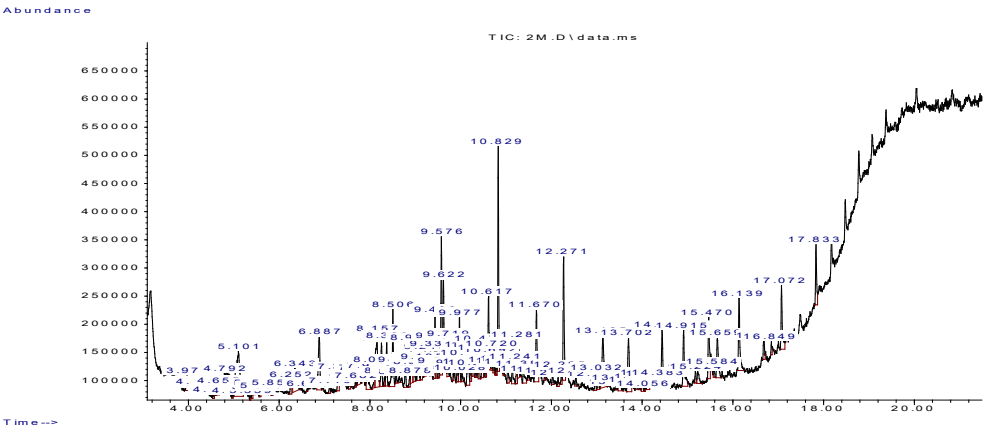

Fig.2: GC-MS chromatogram of *C. capsularis* leaf

Table 1: Identified phytochemicals of *C. capsularis* leaf Using GC-MS

SN	RT	A P %	Compound name	Phytochemical
1	8.449	3.21	2-Piperidinone, N-[4-bromo-n-butyl	Alkaloid
2	12.706	0.28	1-Octadecanesulphonyl chloride	Alkaloid
3	14.583	0.09	Ethanone, 1-(2,2-dimethylcyclopentyl)-	Alkaloid
4	14.686	0.17	4-Benzyl-5-imino-1-phenyl-1,2,4-triazol-3-amine	Alkaloid
5	15.756	0.13	Corydaldine	Alkaloid
6	15.928	0.15	1H-Indole, 5-methyl-2-phenyl-	Alkaloid
7	16.025	0.14	1-Benzenesulfonyl-1H-pyrrole	Alkaloid
8	11.132	0.26	Tricosanoic acid	Fatty acid
9	11.733	0.28	Heneicosanoic acid, 20-oxo-, methyl ester	Fatty acid
10	13.684	2.45	Hexadecanoic acid, methyl ester	Fatty acid
11	15.458	3.43	9-Octadecenoic acid (Z)-, methyl ester	Fatty acid
12	15.887	0.15	cis-9-Tetradecenoic acid, propyl ester	Fatty acid
13	11.842	0.32	Tricosan-2-ol	Phenol
14	15.332	0.16	Dodecahydropyrido[1,2-b]isoquinoli - n-6-one	Saponins
15	8.907	0.91	Carbonic acid, prop-1-en-2-yl tetradecyl ester	Tannin
16	9.238	0.95	Carbonic acid, octadecyl prop-1-en -2-yl ester	Tannin
17	11.373	0.28	Carbonic acid, octadecyl prop-1-en-2-yl ester	Tannin
18	12.460	0.11	Carbonic acid, decyl undecyl ester	Tannin
19	13.026	0.31	Succinic acid, tridec-2-yn-1-yl trans-hex-3-en-1-y	Tannin
20	14.383	0.19	Nonyl tetradecyl ether	Tannin
21	14.434	1.24	Trichloroacetic acid, pentadecyl ester	Tannin

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Table 2: Identified phytochemicals of *C. olitorius* leaf. Using GC-MS

SN	RT	P A%	Compound name	Phytochemical
1	4.792	1.27	Arsenous acid, tris(trimethylsilyl	Alkaloid
2	5.359	0.10	N-Benzylethanethioamide	Alkaloid
3	5.593	0.22	1,4,7-Trimethyl-2-azafluorenone	Alkaloid
4	6.623	0.05	1,2,5-Oxadiazol-3-amine, 4-(4-meth	Alkaloid
5	6.887	2.58	Benz(a)anthracene-7-carbonitrile	Alkaloid
6	7.110	0.23	3-(4-Formylphenyl)-2-(phenylsulfon yl)	Alkaloid
7	7.682	0.13	1H-Indole, 5-methyl-2-phenyl	Alkaloid
8	7.768	0.58	Glaucine	Alkaloid
9	8.580	0.25	3-[p-Methoxyphenyl]-5-methylrhodanine	Alkaloid
10	8.649	0.18	1-Benzenesulfonyl-1H-pyrrole	Alkaloid
11	8.786	0.58	1,2,5-Oxadiazol-3-amine, 4-(4-meth	Alkaloid
12	8.907	1.36	Di-n-decylsulfone	Alkaloid
13	8.975	0.54	trans-2,3-Methylenedioxy-b-methyl-	Alkaloid
14	9.135	0.63	2-[p-Cyanophenyl]-5-chlorobenzimid azole	Alkaloid
15	9.513	0.28	4-Allyl-5-furan-2-yl-2,4-dihydro-[1,2,4]tr	Alkaloid
16	13.135	3.05	9,10-Anthracenedione, 1-amino-2-me thyl-	Alkaloid
17	13.444	0.07	1-Benzenesulfonyl-1H-pyrrole	Alkaloid
18	14.137	0.58	Hexahydropyridine, 1-methyl-4-[4,5 -	Alkaloid
19	15.584	0.29	2-Pyrazolin-5-one, 4-[[p-(methylam 232304	Alkaloid
20	16.139	2.89	9,10-Anthracenedione, 1-amino-2-me	Alkaloid
21	17.072	2.29	1H-Indole-2-carboxylic acid, 6-(4- 233050	Alkaloid
22	5.101	5.67	Benzoic acid, 2-methoxy-, methyle ester	Fatty acid
23	8.878	0.31	Tricosanoic acid	Fatty acid
24	12.225	0.34	14-Methylhexadec-9-enoic acid, met	Fatty acid
25	12.963	0.43	Oleic Acid	Fatty acid
26	8.878	0.31	Tricosanoic acid	Fatty acid
27	13.702	2.81	Pentadecanoic acid, 14-methyl-, me thyl ester	Fatty acid
28	15.470	2.50	10-Octadecenoic acid, methyl ester 172321	Fatty acid
29	15.659	0.85	Docosanoic acid, methyl ester	Fatty acid
30	4.186	0.15	Arsenous acid, tris(trimethylsilyl	Tannin
31	10.028	0.26	2-butenedioic acid, 2,3-bis(phenyl	Tannin
32	10.337	0.24	Acetic acid, (4-chlorophenoxy)-, d	Tannin
33	5.857	0.28	Silicic acid, diethyl bis(trimethy lsilyl) ester	Tannin

4.1 DISCUSSION

In the present study, of phytochemical profile of jute mallow (*Corchorus olitorius*) and

white jute (*Corchorus capsularis*) leaf using GC-MS analysis revealed the presence of various phytochemicals, including: alkaloids , fatty acids, tannins, phenols and saponins. These bioactive phytoconstituents could be responsible for the therapeutic ability of (*Corchorus olitorius*) and white jute (*Corchorus capsularis*) leaf. This research is in line with all studies which reported the present of these phytochemicals in jute species.

4.2 CONCLUSION

The present study, have shown many secondary metabolites which possess many pharmacological properties of which antioxidant activity. The GC-MS analysis showed the presence of different phytochemical constituents which contribute the activities like antimicrobial, antioxidant, anticancer, hypercholesterolemic, anti-inflammatory, and other activities. Hence, the presence of phytochemicals is re sponsible for their therapeutic effects. Further investigation is required for possible development of novel drugs using some of the bioactive compounds found in jute mallow (*Corchorus olitorius*) and white jute seed.

REFERENCES

Adesina, A. J., Olaleye, A. A., Popoola, O. K., Olatunya, A. M., Gbolagade, A. Y., Idowu, K. A., & Ajakaye, A. O. (2022). Nutritional evaluation of leafy vegetables of Corchorus olitorius family from Ekiti State, Nigeria. *Chemical Search Journal* **3:** (1*)*, (156.

Amalesh Samanta, Gouranga Das, & Sanjoy Kumar Das. (2021). Review article roles of flavonoids in plants. *International Journal of Pharmaceutical Sciences and Technology*, **6**: (1). ISSN: 0975-0525.

Badri, Sireesha P., Pavitra, D., Sameena, G., Anitha, S. K., Asifa, K., Mahesh, K., & Pushpalatha, E. (2023). A review on medicinal plants containing glycosides. UPI *Journal of Pharmaceutical, Medical, and Health Sciences*, **6**:(3), 8-15.

Biswas, A., Dey, S., Huang, S., Deng, Y., Birhanie, Z. M., Zhang, J., Akhter, D., Liu, L., & Li, D. (2022). A Comprehensive Review of C. capsularis and C. olitorious: A Source of Nutrition, Essential Phytoconstituents and Pharmacological Activities. *Antioxidants,* **11**:(2) 1358.

Gemede, H. F., & Ratta, N. (2014). Antinutritional Factors in Plant Foods: Potential Health Benefits and Adverse Effects. *International Journal of Nutrition and Food Sciences*, **3**: (4), 284-289. doi: 10.11648/j.ijnfs.20140304.18

Guzzetti, L., Panzeri, D., Ulaszewska, M., Sacco, G., Forcella, M., Fusi, P., Tommasi, N., Fiorini, A., Campone, L., & Labra, M. (2021). Assessment of Dietary Bioactive Phenolic Compounds and Agricultural Sustainability of an African Leafy Vegetable *Corchorus olitorius* L. *Frontiers in Nutrition*, 8. doi: 10.3389/fnut.2021.667812

Johnshi, K., Arunasalam, D. Y., Yokio, K., & Gauri, M. Y. (2004). Saponin from edible legumes: Chemistry, processing, and health benefits. *Journal of Medicinal Food*, **7**: (1), 67-78. doi: 10.1089/109662004322984734

Junaid et al. (2020). Qualitative test for preliminary phytochemical screening. An overview. *International Journal of Chemical Studies*, **8**: (2), 33-37.

Kiliobas Kiri SHA'A, Gramso Pwamaddi CLARKSON, & Susan Pwakangdi ARTIMAS. (2019). Phytochemical analysis, proximate composition and antinutritional factors of Corchorus oliterius plant. *International Journal of Biological and Chemical Sciences* **13**: (4), 2147-2157. **doi:** 10.4314/ijbcs.v13i4.21

Marwa A. M. Abdel-Razek, Miada F. Abdelwahab, Usama Ramadan Abdelmohsen, & Ashraf N. E. Hamed. (2022). Pharmacological and phytochemical biodiversity of *Corchorus olitorius.* RSC *Advances*, **9**: 54.

Nakaziba, R., Lubega, A., Ogwal-Okeng, J., & Alele, P. E. (2022). Phytochemical Analysis, Acute Toxicity, as well as Antihyperglycemic and Antidiabetic Activities of *Corchorus olitorius* L. Leaf Extracts.

Panche, A. N., Diwan, A. D., & Chandra, S. R. (2019). Flavonoid: An overview. *Journal of Nutritional Sciences,* **5**: (47), 1-15.

Sunayana, N., Sandeep, R., Ranbeer, S., Rawal, D., Bhatt, B., & Pathak, M. (2023). Soil Constituents Influence accumulation of Phytochemicals and Nutritional content in Wrightia tinctoria. *Indian Journal of Plant Physiology*, **6**: 1- 49.

Yang, R., Zhao, W., & Wang, Q. (2018). Response of plant secondary Metabolites to Environmental factors. *Journal of Molecules*, **23**: (4), 762.