Phytochemical analysis and Ethnomedicinal use of *Azadirachta indica* by Tribal Community of Tirodi Balaghat, Madhya Pradesh India

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***Abstract*—Ethnomedicine practices, particularly the use of wild medicinal plants, play a significant role in animal healthcare in many rural communities of Tirodi, Balaghat Madhya Pradesh India. This study highlights the critical role of neem in ethnomedicine practices in enhancing animal health and emphasizes the need to integrate traditional and modern approaches, promoting conservation and sustainable utilization of wild medicinal plant resources. Active Phytochemicals analyzed through GCMS analysis were: 3, 7, 11, 15 tetramethyl-2-hexadecen-1-ol (synonym: Phytol), 9, 12, 15- Octadecatrienoic acid (synonym: Linolenic acid; α-Linolenic acid), 8, 11, 14-Eicosatrienoic acid (Synonym: Homo-γlinolenic acid), N-Hexadecanoic acid (synonym: Palmitic acid) , Tridecanoic acid (synonym: Tridecylic acid), 1.Propanol were the major components in the extract. Neem leaves are used as an antiseptic and in the treatment of skin infections and wounds. As a strong acaricide against ticks, lice, and mites. Neem leaf oil or neem leaf extract is applied in sprays or washes for the control of ectoparasites on cattle, goats, and poultry. Internally as a liver stimulant and bitter tonic.**

***Key words*— Ethnomedicinal, Tirodi, Tribal community, GCMS analysis**

I. INTRODUCTION

Neem tree is an incredible therapeutic plant Kumar *et al.,* (2015) that has been declared the tree of the 21st century by the United Nations Dhama *et al*., (2013). Based on the phytochemical screening, neem leaves extract contains various active compounds such as steroids, alkaloids, flavonoids, saponins, terpenoids, glycosides, tannins, and phenolics (Saleem *et al*., 2018, Kumar *et al*., 2016, Gupta *et al*., 2017, Amin *et al*., 2017). It plays the key part within Ayurveda which is the establishment of the Indian framework of natural treatment (Sateesh, 1998). Neem derivatives are also used for mosquito repellent to protect animals, fumigation concerning hygiene by burning leaves and bark, for the treatment of viral infections (Anonymous 2006). *Azadirachta indica* mostly reported in Tirodi Balaghat region reported to have anthelminthic activity Jamra et al., (2015) and wound healing activity Alzohairy, (2017). The present study provides a comprehensive documentation and Knowledge of this plant, detailing their local names, botanical families, plant parts utilized, and specific ethnomedicinal applications. This study is also aimed to analyze the phytochemical characteristics of neem leaves methonolic extract through Gas Chromatography-Mass Spectroscopy (GCMS) analysis.

II. METHODOLOGY

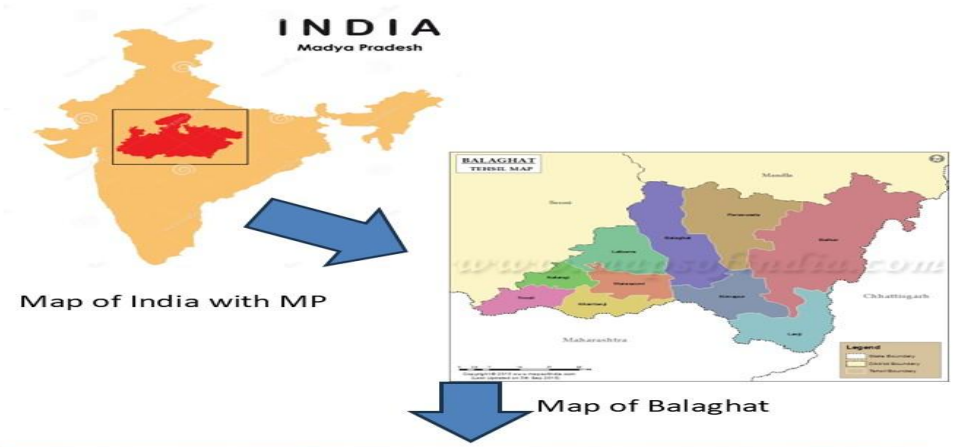
Study Area

Balaghat is one of the districts in the south eastern portion of the state of Madhya Pradesh. The district is situated within 21.19' to 22.24' North latitude and 79.31 to 81.3' East longitude. The people in the rural areas of Tirodi Balaghat are primarily involved in farming and cattle rearing. This district covers an area of about 910.50 sq.km. Tirodi is a town and tehsil (subdistrict) in the eastern part of Balaghat district, Madhya Pradesh, India, situated near the Maharashtra border, known for its agricultural base, and proximity to natural attractions like Kanha Tiger Reserve. Its location is characterized by lowland terrain east of the Wainganga River, with coordinates around 21.68°N, 79.73°E. To identify

the livestock owners and herbalists with erudite expertise in ethnomedicinal knowledge, several visits were made to the study areas. Semi-structured interviews were conducted with the herbalists and livestock owners, who were willing to share their knowledge in animal health care.

Survey, Data Collection and Identification

The study has been conducted among the tribals in the study area of Tirodi Balaghat. Information has been collected and documented through field visits, surveys, questionnaires and semi-structured interviews Martin *et al*., (2004), Gwalwanshi *et al.* (2017). Semi-structured interviews have been conducted through the vernacular language Hindi. The ethnobotanical data of this plant has been collected using the methodology suggested earlier Jain, (2000). People of concerned region were interviewed on information like local name of this plant, diseases treated, the parts used, mode of preparation and administration and dosage of the drug. The plant collected were identified using the Flora of the Presidency of Madras Gamble, (2017) and the World Flora Online WFO, (2021).



Map of Field Area Tidodi, Balaghat

GCMS Analyis of plant Extract

Preparation of plant extract: 50 grams of powdered plant material was extracted with 250 ml of methanol kept on a rotary shaker for 24 h. Thereafter, it was filtered with muslin cloth and filter through sterile whatman filter paper no.1. Filtered extract was concentrated by a rotary film evaporator so as to get dry sample. The leaves of Azadirachta indica were collected from Tirodi region of Balaghat. 15-gram leaves were extracted with 250 ml of methanol at 60C0 for 8hrs in Soxhlet extractor. The methanolic extracts were filtered through Whatmann No. 1 filter paper. The filtrate was evaporated to dryness at 80C0 and stored until further analysis. The extracts were reconstituted in methanol. Methanolic extracts (1 µl) were injected for GC-MS analysis.

Gas Chromatography-Mass Spectrometry analysis

The methanolic extract of the leaves of Azadirachta indica was subjected to GC-MS analysis on a GC-MS Clarus 500 Perkin Elmer system comprising a AOC- 20i autosampler and gas chromatograph interfaced to a mass spectrometer (GC-MS) instrument employing the following conditions: Restek RtxR – 5, (30 meter X 0.25 mm) (5% diphenyl / 95% dimethyl polysiloxane), running in electron impact mode at 70 eV; helium (99. 999%) was used as carrier gas at a constant flow of 1ml/min and an injection volume of 1.0 µl was employed (split ratio of 10:1); injector temperature 280°C. The oven temperature was programmed from 40°C (isothermal for 5 min.), with an increase of 6 C0 / min to 280°C, then ending with an isothermal for 15min at 280°C. Mass spectra were taken at 70 eV; 0.5 seconds of scan interval and

fragments from 40 to 550 Da. Total GC running time was 60 minutes.

Identification of Compounds

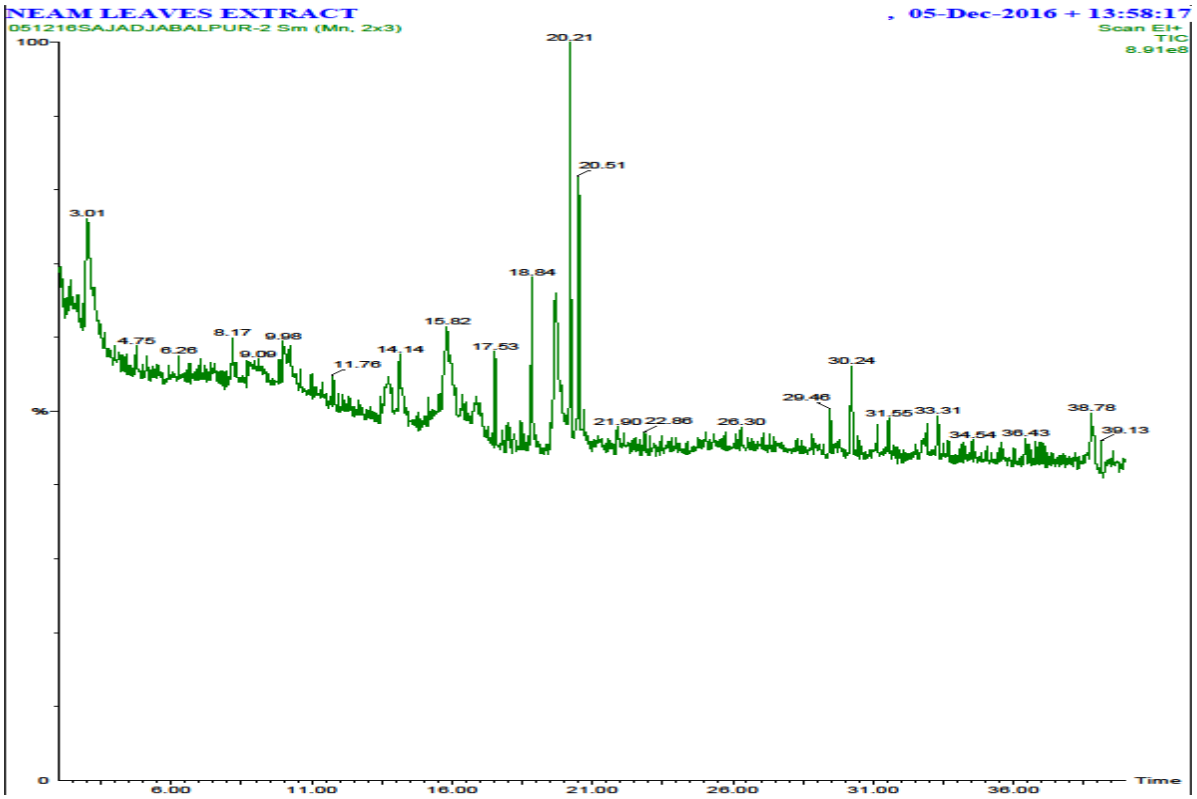
Interpretation on mass spectrum GC-MS was conducted using the database of National Institute of Standard and technology (NIST). The mass spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST library.

III. RESULTS

The objectives of this study were to collect the ethnomedicinal practices for cure and associated knowledge from tribal community of Tirodi region. Local people of Tirodi uses approximately more than 200 species of plants belonging to different families for prevention and cure. The plant commonly found in the region and most widely used as ethnomedicinal is Azadirachta indica.

1. *Azadirachta indica* A.Juss.
Family- Meliaceae
Local name- Neem
Part used- Bark
Disease- Dysentery
Mode of administration- About 200gm bark is crushed and given with fodder to treat dysentery.
Locality- Tirodi (Tirodi Taluka)

GC-MS graph of Methanolic extract of neem leaves



Retention time	Name of the compound	Molecular formula	Mol. Wt.	Activity
18.847	Tridecanoic acid	$C_{13}H_{26}O_2$	244.342	No activity reported
18.847	N-Hexadecanoic acid	$C_{16}H_{32}O_2$	256.424	Nematicide 5-Alpha-Reductase-Inhibitor FLavor Hemolytic Hypercholesterolemic Pesticide Antialopecic Antiandrogenic Antifibrinolytic Antifungal
19.72	Propane-2-Methoxy	$C_4H_{10}O$	74	Antimicrobial

20.208	3, 7, 11, 15 tetramethyl-2-hexadecen-1-ol	$C_{20}H_{40}O$	296.53	Cancer-Preventive Antimicrobial anti-inflammatory anti-diuretic Antioxidant, Antifungal.
20.51	9, 12, 15- Octadecatrienoic acid	$C_{18}H_{32}O_2$	278.429	Antibacterial and antifungal
3.009	1 propanol	C_3H_8O	60	Antimicrobial.

GC-MS chromatogram of the methanolic extract of *Azadirachta indica* showed five major peaks and have been identified after comparison of the mass spectra with NIST library indicating the presence of five phytocomponents. From the results, it was observed that presence of 3, 7, 11, 15 tetramethyl-2-hexadecen-1-ol (synonym: Phytol), 9, 12, 15-Octadecatrienoic acid (synonym: Linolenic acid; α-Linolenic acid), 8, 11, 14-Eicosatrienoic acid (Synonym: Homo-γlinolenic acid), N-Hexadecanoic acid (synonym: Palmitic acid) , Tridecanoic acid (synonym: Tridecylic acid), 1.Propanol were the major components in the extract.

Aqueous extracts of neem leaf and bark have anti-acid secretory and anti-ulcer properties, used to prevent various gastric and duodenal ulcers. Actions: - Antioxidants, Anti-inflammatory Anticarcinogenic, Anti-snake venom sports, Antibacterial. Antiarthritic Antipyretic Antifungal anti gastric spermicidal direction. Makes use of in remedy: - the recuperation homes of neem are in particular due to a few sour substances called triterpenoid acids, (limonoids) with Azadirachta as one of the most important lively factors. neem has been the object of extensive phytochemical studies, due to its strong biological effects (including antibacterial activities) based on its composition, which make it suitable to be implemented in agricultural and medicinal purposes (van der Nat et al., 1991, Pai et al., 2004;). The chemical constituents and antioxidant activities of different extracts from leaves locally collected were studied and the leaves reported to contain limonoids, as nimbin, nimbanene and others, i.e. ascorbic acid, *n*-hexacosanol and aminoacids (Hossain et al., 2013).

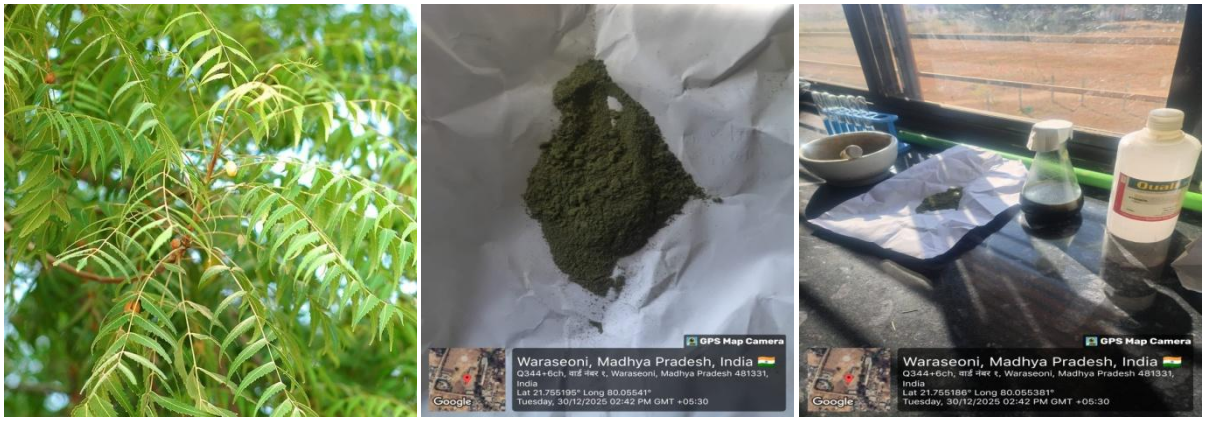


Fig:- *Azadirachta indica* & Its Powdered Form (Leaves)

IV. CONCLUSION

Highlights its vast potential, with all parts used traditionally for antimicrobial, anti-inflammatory, antidiabetic, and insecticidal properties, backed by scientific evidence showing compounds like gedunin and azadirachtin fight bacteria, fungi, malaria, and even show promise against cancer and viruses like COVID-19. While potent natural medicine, further in-depth studies on mechanisms, toxicity, and standardized dosages are needed for modern drug development, validating traditional uses and ensuring safety, especially given growing resistance to conventional treatments.

V. ACKNOWLEDGEMENTS

Authors are also thankful to Agarkar Research institute, Pune, Maharashtra for analyzing my sample and also thankful to tribal and local communities of the study area who have provided valuable information about the uses of this plant and help during research work.

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