



MOL2NET, International Conference Series on Multidisciplinary Sciences

FROM MOLECULES TO NETWORKS



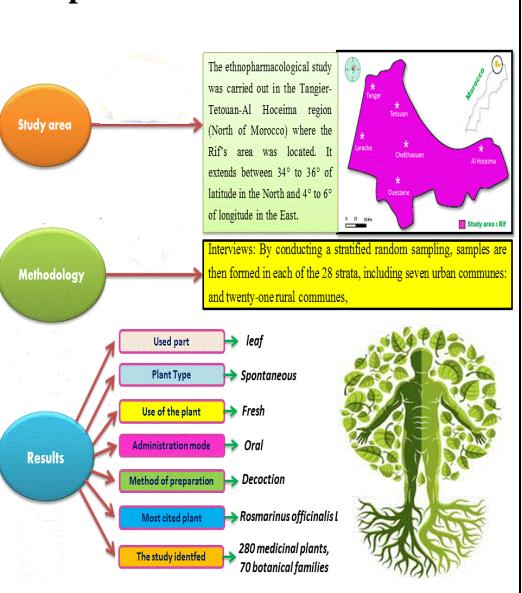
Indigenous knowledge on medicinal plants used in the health care system by local communities of Rif, North of Morocco

Noureddine Chaachouay^a, Lahcen Zidane^b

^a Higher Education and Training School, Berrechid, University Hassan 1st, 50 Rue Ibnou Lhaytham, B.P. 577, 26002 Settat, Morocco. *Corresponding Author: Tel: +212677488621 Email: noureddine.chaachouay@uit.ac.ma ORCID iD: <https://orcid.org/0000-0002-0745-6268>

^b Plant, Animal Productions and Agro-Industry Laboratory, Department of Biology, Faculty of Sciences, Ibn Tofail University, B.P. 133, 14000 Kenitra, Morocco

Graphical Abstract



Abstract.

Since the beginning of time, the Moroccan people have used many medicinal plants as a popular medicine to cure many human and livestock health problems. Yet, few studies have been carried in the past to properly document and promote traditional ethnomedicinal knowledge. This study was conducted out from July 1st, 2016 to July 30th, 2018 in the Rif; it was aimed to establish the list of medicinal plants. The ethnomedicinal data obtained were from 1000 traditional healers using semi-structured discussions, free listing, and focus groups. Family importance value, plant part value, fidelity level, the relative frequency of citation, and informant consensus factor were applied in data interpretation. A total of 280 medicinal plants belong to 204 genera and 70 families were documented. Asteraceae with 29 species was the most used family in this study area. *Rosmarinus officinalis* L. (*RFC*=0.189) was the species the most commonly prescribed by local traditional healers. Similarly, the leaf was the most useful part of the plant (*PPV* = 0.364), the most frequent affections were osteoarticular affections (*ICF* = 0.983), and the majority of herbal remedies were prepared from a decoction (38.6%). The results of the present investigation confirmed the presence of indigenous ethnomedicinal information of plant species in the Rif's area to treat various disorders. More investigation on phytochemical, pharmacological, and toxicological should be considered to determine new drugs from these reported plants.

References

- [1] Dolatkhahi, M.; Dolatkhahi, A.; Nejad, J. B.: Ethnobotanical study of medicinal plants used in Arjan-Parishan protected area in Fars Province of Iran », *Avicenna J. Phytomedicine*, vol. 4, n° 6, p. 402, (2014)
- [2] Birjees, M.; Ahmad, M.; Zafar, M.; Nawaz, S.; Jehanzeb, S.; Ullah, F.; Zaman, W.: Traditional knowledge of wild medicinal plants used by the inhabitants of Garam Chashma valley, district Chitral, Pakistan », *Acta Ecol. Sin.*, (2021)
- [3] O. World Health, *WHO traditional medicine strategy: 2014-2023*. World Health Organization, 2013.
- [4] Benkhnigue, O.; Zidane, L.; Fadli, M.; Elyacoubi, H.; Rochdi, A.; Douira, A.: Etude ethnobotanique des plantes médicinales dans la région de Mechraâ Bel Ksiri (Région du Gharb du Maroc) », *Acta Bot. Barcinonensis*, vol. 53, p. 191–216, (2010).
- [5] Fatiha, B. A.; Ouafae, B.; Souad, S.; Jamila, D.; Allal, D.; Lahcen Z.: Ethnobotany study of medicinal plants used in the treatment of respiratory diseases in the middle region of Oum Rbai », *Int. J. Environ. Agric. Biotechnol.*, vol. 2, n° 4, p. 238815, (2017)
- [6] El Azzouzi F.; Zidane L.: La flore médicinale traditionnelle de la région de Béni-Mellal (Maroc) », *J. Appl. Biosci.*, vol. 91, n° 1, p. 8493–8502, (2015)
- [7] Chaachouay N.; Benkhnigue, O.; Fadli, M.; El Ayadi, R.; Zidane, L.: Ethnobotanical study of medicinal plants used to treat osteoarticular diseases in the Moroccan Rif, Morocco », *J. Pharm. Pharmacogn. Res.*, vol. 7, n° 6, p. 454–470, (2019)
- [8] Saqib A. A.; Gul, S: Traditional knowledge of medicinal herbs among indigenous communities in Maidan Valley, Lower Dir, Pakistan », *Bull Env Pharmacol Life Sci*, vol. 7, p. 01–23, (2018)
- [9] Noman, A.; Hussain, I.; Ali, Q.; Ashraf, M. A.; Haider, M. Z.: Ethnobotanical studies of potential wild medicinal plants of Ormara, Gawadar, Pakistan », *Emir. J. Food Agric.*, p. 751–759, (2013)
- [10] Islam, M. K.; Saha, S.; Mahmud, I.; Mohamad, K.; Awang, K.; Uddin, S. J.; Rahman, M. M.; Shilpi, J. A.: An ethnobotanical study of medicinal plants used by tribal and native people of Madhupur forest area, Bangladesh », *J. Ethnopharmacol.*, vol. 151, n° 2, p. 921–930, (2014)
- [11] Mussarat, S.: Amber, R.; Tariq, A.; Adnan, M.; AbdElsalam, N. M.; Ullah, R.; Bibi, R.: Ethnopharmacological assessment of medicinal plants used against livestock infections by the people living around Indus river », *BioMed Res. Int.*, vol. 2014, (2014)
- [12] Ahmad, M.; Sultana, S.; Fazl-i-Hadi, S.; Ben Hadda, T.; Rashid, S.; Zafar, M.; Khan, M. A.; Khan, M. P. Z.; Yaseen, G.: An Ethnobotanical study of Medicinal Plants in high mountainous region of Chail valley (District Swat-Pakistan) », *J. Ethnobiol. Ethnomedicine*, vol. 10, n° 1, p. 36, (2014)
- [13] Shinwari, S.; Ahmad, M.; Luo, Y.; Zaman, W.: Quantitative analyses of medicinal plants consumption among the inhabitants of Shangla-Kohistan areas in Northern-Pakistan », *Pak. J. Bot.*, vol. 49, n° 2, p. 725–734, (2017)
- [14] Chaachouay, N.; Benkhnigue, O.; Douira, A.; Zidane, L.: Poisonous medicinal plants used in the popular pharmacopoeia of the Rif, northern Morocco », *Toxicon*, p. 24-32, 2021.
- [15] Chaachouay, N.; Benkhnigue, O.; Fadli, M.; El Ibaoui H.; Zidane, L: Ethnobotanical and ethnopharmacological studies of medicinal and aromatic plants used in the treatment of metabolic diseases in the Moroccan Rif », *Heliyon*, p. e02191, (2019)
- [16] Chaachouay, N.; Benkhnigue, O.; Zidane, L.: Ethnobotanical Study Aimed at Investigating the Use of Medicinal Plants to Treat Nervous System Diseases in the Rif of Morocco », *J. Chiropr. Med.*, vol. 19, n° 1, p. 70-81, (2020)
- [17] Rhattas, M.; Douira, A.; Zidane, L.: Étude ethnobotanique des plantes médicinales dans le Parc National de Talassemtane (Rif occidental du Maroc) », *J. Appl. Biosci.*, vol. 97, p. 9187–9211, (2016)
- [18] Ouziki M.; Taiqui, L.: Evaluation exhaustive de la diversité des plantes aromatiques et médicinales de la Péninsule Tingitane (Maroc) », *Eur. Sci. J.*, vol. 12, n° 15, (2016)
- [19] HCP: Haut-commissariat au plan, Monographie de la région Tanger Tétouan Al Hoceima, Direction Régionale de Tanger-Tétouan-Al Hoceima, oct. (2018)
- [20] DMNM: Direction de la Météorologie Nationale, Ministère de l'Equipement, du Transport, de la Logistique et de l'Eau, (2018). <https://www.marocmeteo.ma>
- [21] Cotton C. M.; Wilkie, P.: *Ethnobotany: principles and applications*. John Wiley & Sons Chichester, (1996)
- [22] Martin, G. J.: *Ethnobotany: a methods manual*, vol. 1. Springer, (2014)

- [23] Klotoé, J. R.; Dougnon, T. V.; Koudouvo, K.; Atègbo, J. M.; Loko, F.; Akoègninou, A.; Aklikokou, K.; Dramane, K.; Gbeassor, M.: Ethnopharmacological survey on antihemorrhagic medicinal plants in South of Benin », *Eur. J. Med. Plants*, vol. 3, n° 1, p. 40, (2013)
- [24] A. Kahouadji, « Recherches floristiques sur le massif montagneux des Béni-Snassène (Maroc oriental), PhD Thesis, Montpellier 2, (1986)
- [25] Sijelmassi, A.: Les plantes médicinales du Maroc, 3ème édition Fennec », *Casablanca Moroc*, (1993)
- [26] Valdés, B.: *Catalogue des plantes vasculaires du Nord du Maroc, incluant des clés d'identification*, vol. 1. Editorial CSIC-CSIC Press, (2002)
- [27] Fennane, M.; Ibn Tattou, M.; El Oualidi, J.: Flore pratique du Maroc, Dicotylédones (pp), Monocotylédones », *Trav. L'Institut Sci. Rabat Sér. Bot.*, vol. 40, (2014)
- [28] Fennane, M.; Tattou, M. I.; Valdés, B.: *Catalogue des plantes vasculaires rares, menacées ou endémiques du Maroc*. Herbarium Mediterraneum Panormitanum, (1998)
- [29] Fennane, M.; Tattou, M. I.; Mathez, J.; Quézel, P.: *Flore pratique du Maroc: manuel de détermination des plantes vasculaires. Pteridophyta, Gymnospermae, Angiospermae (Lauraceae-Neuradaceae)*. Institut scientifique, (1999)
- [30] Mori, S. A.; Boom, B. M.; de Carvalino, A. M: Ecological importance of Myrtaceae in an eastern Brazilian wet forest », *Biotropica*, vol. 15, n° 1, p. 68–70, (1983)
- [31] Tardío J.; Pardo-de-Santayana, M.: Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain) », *Econ. Bot.*, vol. 62, n° 1, p. 24–39, (2008)
- [32] Chaachouay, N.; Benkhnigue, O.; Khamar, H.; Zidane, L.: Ethnobotanical study of medicinal and aromatic plants used in the treatment of genito-urinary diseases in the Moroccan Rif », *Journal of Materials and Environmental Sciences*, p. 15-29, (2020)
- [33] Friedman, J.; Yaniv, Z.; Dafni, A.; Palewitch, D.: A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev Desert, Israel », *J. Ethnopharmacol.*, vol. 16, n° 2-3, p. 275–287, (1986)
- [34] Heinrich, M.; Ankli, A.; Frei, B.; Weimann, C.; Sticher, O.: Medicinal plants in Mexico: Healers' consensus and cultural importance », *Soc. Sci. Med.*, vol. 47, n° 11, p. 1859–1871, (1998)
- [35] Chaachouay, N.; Douira, A.; Zidane, L.: COVID-19, prevention and treatment with herbal medicine in the herbal markets of Salé Prefecture, North-Western Morocco », *Eur. J. Integr. Med.*, p. 101285, (2021)
- [36] Salehi, B.; Sharifi-Rad, J.; Quispe, C.; Llaque, H.; Villalobos, M.; Smeriglio, A.; Trombetta, D.; Ezzat, S. M.; Salem, M. A.; Zayed, A.: Insights into Eucalyptus genus chemical constituents, biological activities and health-promoting effects », *Trends Food Sci. Technol.*, vol. 91, p. 609–624, (2019)
- [37] Waterman, P. G: Costs and benefits of secondary metabolites to the Leguminosae », *Adv. Legume Syst.*, vol. 5, p. 129–149, (1994)
- [38] Chaachouay, N.; Benkhnigue, O.; Fadli, M.; El Ibaoui, H.; El Ayadi, R.; Zidane, L.: Ethnobotanical and Ethnopharmacological Study of Medicinal and Aromatic Plants Used in the Treatment of Respiratory System Disorders in the Moroccan Rif », *Ethnobotany Research and Applications*, p. 1-16, (2019)
- [39] Chaachouay, N.; Zidane, L.: Ethno-medicinal studies on medicinal plants used by people of Rif, Morocco, 5th International Electronic Conference on Medicinal Chemistry,MDPI, (2019)
- [40] Umair, M.; Altaf, M.; Abbasi, A. M.: An ethnobotanical survey of indigenous medicinal plants in Hafizabad district », *Punjab-Pak. PloS One*, vol. 12, n° 6, (2017)
- [41] Amjad, M. S.; Qaeem, M. F.; Ahmad, I.; Khan, S. U.; Chaudhari, S. K.; Zahid Malik, N.; Shaheen, H.; Khan, A. M.: Descriptive study of plant resources in the context of the ethno-medicinal relevance of indigenous flora: A case study from Toli Peer National Park, Azad Jammu and Kashmir, Pakistan », *PloS One*, vol. 12, n° 2, p. e0171896, (2017)
- [42] Majeed, M.; Bhatti, K. H.; Amjad, M. S.; Abbasi, A. M.; Bussmann, R. W.; Nawaz, F.; Rashid, A.; Mehmood, A.; Mahmood, M.; Khan, W. M.: Ethno-veterinary uses of Poaceae in Punjab, Pakistan », *PloS One*, vol. 15, n° 11, p. e0241705, (2020)
- [43] Cheung, S.; Tai, J.: Anti-proliferative and antioxidant properties of rosemary Rosmarinus officinalis », *Oncol. Rep.*, vol. 17, n° 6, p. 1525–1531, (2007)
- [44] Oluwatuyi, M.; Kaatz, G. W.; Gibbons, S: Antibacterial and resistance modifying activity of Rosmarinus officinalis », *Phytochemistry*, vol. 65, n° 24, p. 3249–3254, (2004)
- [45] Schwarz K.; Ternes, W: Antioxidative constituents of Rosmarinus officinalis and Salvia officinalis », *Z. Für Lebensm.-Unters. Forsch.* vol. 195, n° 2, p. 99–103, (1992)

- [46] Kayani, S.; Ahmad, M.; Zafar, M.; Sultana, S.; Khan, M. P. Z.; Ashraf, M. A.; Hussain, J.; Yaseen, G.: Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies–Abbottabad, Northern Pakistan », *J. Ethnopharmacol.*, vol. 156, p. 47–60, (2014)
- [47] Kadir, M. F.; Sayeed, M. S. B.; Shams, T.; Mia, M. M. K.: Ethnobotanical survey of medicinal plants used by Bangladeshi traditional health practitioners in the management of diabetes mellitus », *J. Ethnopharmacol.*, vol. 144, n° 3, p. 605–611, (2012)
- [48] Idm'hand, E.; Msanda, F.; Cherifi, K: Ethnobotanical study and biodiversity of medicinal plants used in the Tarfaya Province, Morocco », *Acta Ecol. Sin.*, vol. 40, n° 2, p. 134–144, (2020)
- [49] Benítez, G.; González-Tejero, M. R.; Molero-Mesa, J.: Pharmaceutical ethnobotany in the western part of Granada province (southern Spain): Ethnopharmacological synthesis », *J. Ethnopharmacol.*, vol. 129, n° 1, p. 87–105, (2010)
- [50] Canales, M.; Hernández, T.; Caballero, J.; De Vivar, A. R.; Avila, G.; Duran, A.; Lira, R.: Informant consensus factor and antibacterial activity of the medicinal plants used by the people of San Rafael Coxcatlán, Puebla, México », *J. Ethnopharmacol.*, vol. 97, n° 3, p. 429–439, (2005)
- [51] Chaachouay, N.; Benkhnigue, O.; El Ibaoui, H.; El Ayadi, R.; Zidane, L.: Medicinal plants used for diabetic problems in the Rif, Morocco », *Ethnobotany Research and Applications*, (2019)
- [52] Ramana, M. V.: Ethno-medicinal and Ethnoveterinary Plants from Boath, Adilabad district, Andhra Pradesh, India », *Ethnobot. Leafl.*, vol. 2008, n° 1, p. 46, (2008)
- [53] Abdurhman, N.: Ethnobotanical study of medicinal plants used by local people in Ofla Wereda, Southern Zone of Tigray Region Ethiopia », *Addis Ababa Univ. MSc Thesis*, (2010)
- [54] Ramos, U. F.; Soledade, S. C.; Baptista, E. R.: Utilização de plantas medicinais pela comunidade atendida no programa saúde da família da Pirajá, Belém, PA », *Infarma-Ciênc. Farm.*, vol. 23, n° 5/6, p. 10–18, (2013)
- [55] Ong, H. G.; Ling, S. M.; Win, T. T. M.; Kang, D.H.; Lee, J.H.; Kim, Y.D.: Ethno-medicinal plants and traditional knowledge among three Chin indigenous groups in Natma Taung National Park (Myanmar) », *J. Ethnopharmacol.*, vol. 225, p. 136–158, (2018)
- [56] Asase, A.; Oteng-Yeboah, A. A.; Odamten, G. T.; Simmonds, M. S.: Ethnobotanical study of some Ghanaian anti-malarial plants », *J. Ethnopharmacol.*, vol. 99, n° 2, p. 273–279, (2005)
- [57] Offiah, N. V.; Makama, S.; Elisha, I. L.; Makoshi, M. S.; Gotep, J. G.; Dawurung, C. J.; Oladipo, O. O.; Lohlum, A. S.; Shamaki, D.: Ethnobotanical survey of medicinal plants used in the treatment of animal diarrhoea in Plateau State, Nigeria », *BMC Vet. Res.*, vol. 7, n° 1, p. 36, (2011)
- [58] Al-Rawi S.; Fetters, M. D.: Traditional Arabic & Islamic medicine: a conceptual model for clinicians and researchers », *Glob. J. Health Sci.*, vol. 4, n° 3, p. 164, (2012)
- [59] AlRawi, S. N.; Khidir, A.; Elnashar, M. S.; Abdelrahim, H. A.; Killawi, A. K.; Hammoud, M. M.; Fetters, M. D.: Traditional Arabic & Islamic medicine: validation and empirical assessment of a conceptual model in Qatar », *BMC Complement. Altern. Med.*, vol. 17, n° 1, p. 1–10, (2017)
- [60] Khan, H.; Khan, M. A.: Abdullah, « Antibacterial, antioxidant and cytotoxic studies of total saponin, alkaloid and sterols contents of decoction of Joshanda: Identification of components through thin layer chromatography », *Toxicol. Ind. Health*, vol. 31, n° 3, p. 202–208, (2015)
- [61] Bammi, J.; Douira, A.: Les plantes médicinales dans la forêt de l'achach (plateau central, Maroc), (2002)
- [62] Lahsissene, H.; Kahouadji, A.; Hseini, S.: Catalogue des plantes médicinales utilisées dans la région de Zaër (Maroc Occidental) », *Lejeunia Rev. Bot.*, (2009)
- [63] Asnake, S.; Teklehaymanot, T.; Hymete, A.; Erko, B.; Giday, M.: Survey of medicinal plants used to treat malaria by Sidama People of Boricha District, Sidama Zone, South Region of Ethiopia », *Evid. Based Complement. Alternat. Med.*, vol. 2016, (2016)
- [64] Kidane, L.; Gebremedhin, G.; Beyene, T.: Ethnobotanical study of medicinal plants in Ganta Afeshum District, Eastern Zone of Tigray, Northern Ethiopia », *J. Ethnobiol. Ethnomedicine*, vol. 14, n° 1, p. 1–19, (2018)
- [65] Miguéis, G. da S.; da Silva, R. H.; Damasceno Júnior, G. A.; Guarim-Neto, G.: Plants used by the rural community of Bananal, Mato Grosso, Brazil: Aspects of popular knowledge », *PLoS One*, vol. 14, n° 1, p. e0210488, (2019)
- [66] Polat, R.; Satılı, F.: An ethnobotanical survey of medicinal plants in Edremit Gulf (Balıkesir–Turkey) », *J. Ethnopharmacol.*, vol. 139, n° 2, p. 626–641, (2012)