



Journal of Advanced Research in Applied Sciences and Engineering Technology

Journal homepage:
https://semarakilmu.com.my/journals/index.php/applied_sciences_eng_tech/index
ISSN: 2462-1943



A Preliminary Observation on the Role of Traditional Medicinal Plants in Post-COVID-19 Health Recovery in Seri Kembangan, Selangor, Malaysia

Mohamad Zaki Mohamad Saad^{1,2,*}, Shampazuraini Samsuri¹, Shiamala Ramaiya³, Nurul Aisyah Yusli³, Nathaniel Maikol⁴, Rofi Muhamad Ridho Muhyidin^{5,6}

¹ Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA, 77300 Jasin, Melaka, Malaysia

² Malaysia TRIZ Innovation Association (MyTRIZ), No 20 Jalan USJ 11/18, Subang Jaya, Selangor, Malaysia

³ Department of Crop Science, Faculty of Agriculture Science and Forestry, Universiti Putra Malaysia Bintulu Campus, 97000 Bintulu, Sarawak, Malaysia

⁴ Faculty of Science and Natural Resources, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia

⁵ Faculty of Agro-Industrial Technology, Universitas Padjadjaran, Jatinagor, Sumedang Jawa Barat 45363, Indonesia

⁶ PT Indofood CBP Sukses Makmur Tbk, Jl. Raya Caringin No.353, Caringin, Kec. Bandung Kulon, Kota Bandung, Jawa Barat 40223, Indonesia

ARTICLE INFO

Article history:

Received 15 July 2025

Received in revised form 24 July 2025

Accepted 19 August 2025

Available online 26 August 2025

Keywords:

Traditional medicine; ethnobotany;
COVID-19 recovery; herbal remedies;
cultural health practices

ABSTRACT

This study aims to provide a preliminary observation on the utilization and perceived benefits of ethnobotanical knowledge among individuals in Seri Kembangan, Selangor, after their recovery from COVID-19. Specifically, the research explores the types of traditional herbs used, their frequency and methods of use and the underlying reasons for their consumption. Data were collected from 30 participants through an online survey. Findings indicate a strong reliance on commonly used herbs such as ginger, turmeric and lemongrass, which were primarily consumed for immune support, respiratory relief, fatigue reduction and stress management. Usage patterns varied by ethnicity, with Malays and Indians more likely to use traditional herbs influenced by cultural beliefs, inter-generational recommendations and easy accessibility of health information online. The study continues to address the role of ethnobotanical post-pandemic healing instruments and the challenge of culturally competent community health public systems that embrace holistic wellness perceptions.

1. Introduction

The COVID-19 pandemic has changed human life and living through it has been a new and challenging experience for everyone. The practitioners faced various issues with the diagnosis and surgery of patients who were addicted to herbal supplements during the span of COVID. Abd Wahab *et al.*, [81] explain that due to emerging concerns, widespread protection and immunity were given to HDS frameworks everywhere, with patent rights that only served to reassess people. Herbal remedies gained widespread acceptance owing to drastic measures caused by government lockdowns. For instance, in India, the use of herbs gained popularity as a common remedy to support

* Corresponding author.

E-mail address: mohamadzaki327@gmail.com

immunity against prevalent diseases [26]. This global health crisis renewed interest in ethnobotany, the study of how people of a particular culture and region make use of indigenous plants for healing, nourishment and ritual. In 2020, researchers studied how 17 Indigenous communities responded to the pandemic and found that many families reused homemade herbal remedies or foods they had used in the past for flu and other breathing problems [54,68].

A shift in consumption was observed with the increased use of ginger and garlic, followed by onions, turmeric and lemons due to the unverified belief that these could work against COVID-19 symptoms [68]. Ethnobotanical knowledge includes plants or a mixture of plant-based ingredients like herbs, roots and leaves that are believed to have medicinal and therapeutic properties. Recently, these modes of treatment were brought back during the pandemic and became a common form for many individuals living in Asia [26,38,68].

The pandemic inspired many in Asian countries to reinstate their disappearing traditional medicine practices with the spread of modernization and globalization [81]. Common herbs such as *Zingiber officinale* (ginger), *Curcuma longa* (turmeric) and *andropholis paniculata* (king of bitters or in Malay hempedu bumi), *Piper nigrum* (black pepper), *Centella asiatica* (pegaga) and *Syzygium aromaticum* (clove) have become known to people used for mild symptoms of cough, fever, sore throat and fatigue due to the ease in obtaining them for self-treatment [46]. Furthermore, *Zingiber officinale* (ginger), *Curcuma longa* (turmeric) and *Cymbopogon citratus* (lemongrass) have had a lot of success in herbal drinks for immunity boosting and through body therapies in countering anxiety as well [22].

Interestingly, the use of these traditional remedies during the pandemic was not solely limited to physical health. Ethnobotanical practices also provided emotional and psychological relief. According to Mphekgwana *et al.*, [61], Countries like China and Tanzania have promoted traditional and alternative medicines, such as *Artemisia annua* (sweet warmwood) and *Curcuma longa* (turmeric), to fight COVID-19. The interventions described were informed by cultural beliefs and they may help with both immunity and healing. While there have been studies that suggest benefits of some of these herbs and some of these treatments, there is really little clinical evidence for efficacy. In Southern Africa, such practices are used, but overall, it is difficult to assess how practices were used or changed. For some individuals, practices such as preparing herbal teas, engaging in steam inhalation or performing family plant-based rituals provided a sense of control, comfort and connection to their cultural heritage during times of uncertainty. In particular, many women, who often serve as custodians of traditional household knowledge, actively reintroduced and adapted these remedies within their families, integrating cultural traditions with modern practices [15].

This study provides a preliminary observation of ethnobotanical practices in Malaysia after COVID-19, focusing on the types of traditional herbs used, their frequency, modes of use and perceived benefits, as well as the influence of gender, ethnicity and culture. Based on responses from 30 individuals of diverse ethnic backgrounds, it offers a snapshot of post-pandemic traditional health behaviour in a multicultural context. The findings highlight the enduring importance of traditional plant knowledge in health emergencies, illustrating how communities relied on ethnobotanical remedies to address health challenges. This underscores ethnobotany's potential to support place-based health equity, cultural continuity and sustainability in a post-COVID-19 world. The study also lays groundwork for integrating ethnobotanical knowledge into healthcare, education and conservation efforts, reinforcing its value for future policy development aimed at preserving indigenous knowledge systems while promoting holistic and inclusive healthcare strategies.

2. Methodology

This study adopted a quantitative survey design structured using the Knowledge–Attitude–Behaviour (KAB) model to assess respondents' awareness, perceptions and practices related to the research topic [19,44]. The questionnaire comprised two sections. Section A collected demographic information, including gender, age, ethnicity, education level and other relevant background characteristics. Section B consisted of KAB-based items, divided into three components: knowledge, which measured respondents' awareness and understanding through multiple-choice and true/false questions; attitude questions were Yes/No to capture perspectives and behaviour questions used multiple-choice and open-ended responses to determine actual practices. A pilot test was conducted to ensure clarity and reliability of the instrument before full deployment. The finalized survey was administered online via social media platforms between February 2nd and March 1st, 2023, targeting residents of Seri Kembangan, Selangor, Malaysia. A total of 30 respondents participated in the study. Data were compiled and analysed using Microsoft Excel, applying descriptive statistics such as frequencies, percentages and means to summarize demographic and KAB-related responses, while cross-tabulations were used to explore potential associations between the three components. Charts and graphs were generated to present the results clearly and effectively.

3. Results

3.1 Demographic Information

Based on responses from 30 participants, the majority (83.3%, $n = 25$) reported using traditional plants after recovering from COVID-19, suggesting that such remedies continue to hold relevance in daily health practices. Findings revealed that distinct patterns for the ethnicity aspect, where nearly all Malay (94.4%, $n = 18$) and Indian (100% $n=7$) respondents reported using traditional plants, compared to only (20% $n= 1$) of Chinese respondents. The findings highlight in Table 1 underscore the continued cultural relevance and potential of integrating traditional plant-based remedies into public health strategies, particularly within multicultural societies like Malaysia. They also underscore the importance of tailoring health communication and policy interventions to accommodate cultural preferences and beliefs.

This is consistent with prior research that addresses traditional medicine use as being culture-sensitive and prevalent among certain ethnic groups [24]. This is likely due to the use of traditional herbs among Malay and Indian communities, such as Tongkat Ali (*Eurycoma longifolia*), misai kucing (*Orthosiphon aristatus*), turmeric (*Curcuma longa*) and Neem (*Azadirachta indica*) are typical in Malay/Indian traditional medicine [57]. Traditional medicine was the main form of healthcare among indigenous communities in rural Southeast Asia before Western colonial powers such as the British, Dutch, Portuguese, Spanish and French arrived in what is now Malaysia and Indonesia [3,47]. The medical knowledge was passed through generations by oral and in written form, which was tightly associated with the cultural practices and belief system of indigenous populations [55,80].

The lower utilization of traditional herbs by Chinese respondents on average may come down to a few reasons. Others may have chosen to optimize against modern medical practices or stated a preference for Traditional Chinese Medicine (TCM) formulations that our broad "traditional plants" category may not effectively capture. In addition, access, perceived efficacy and generational differences may affect these patterns [49]. These results are in accordance with the results of Weckmuller *et al.*, [83] and Kutal *et al.*, [41], which have connected high knowledge regarding medicinal plants to older age. The diminished involvement of the youth in traditional practices, as

well as the broadening access to modern health care and western education, all help us understand how the preferences towards non-traditional remedies begin to develop [16].

Table 1
Traditional plant usage by ethnicity (n = 30)

Ethnicity	Number of Respondents	Used Traditional Plant	Percentage (%)
Malay	18	17	94.4%
Indian	7	7	100%
Chinese	5	1	20.0%
Total	30	25	83.3%

3.2 Types of Plants used Among Respondents

The data on herbal plant use post-COVID-19 highlights a clear trend in how individuals across different backgrounds turned to traditional remedies as part of their recovery or wellness routine. A total of 30 respondents participated in the survey, with multiple answers permitted regarding the types of herbs used post-COVID-19. The findings regarding the type of plants used among the respondents were detailed in Table 2.

Table 2
Frequency and percentage of herbal plant usage
(n=30)

Herb	No of Use	Percentage (%)
Ginger	22	73.3%
Turmeric	17	56.7%
Lemongrass	15	50.0%
Citronella	10	33.3%
Misai Kucing	10	33.3%
Pegaga (Centella asiatica)	8	26.7%
Tongkat Ali	7	23.3%
Sirih (Piper betle)	11	36.7%
Daun Kaduk	6	20.0%
Sambung Nyawa	5	16.7%
Lain-lain	4	13.3%
• Neem		
• Ashwaganda		
• Chrisynthimum tea		
• Goji Berry		

The most commonly used herb was Ginger (*Zingiber officinale*) where, 22 of 30 respondents (73.3%) were utilising ginger as a herb, followed by turmeric (*Curcuma longa*) with 17 respondents utilising it remedies after the COVID-19 (56.7%). As previously reported by Natta *et al.*, [62] Chua [14] and Pintatum *et al.*, [69], the findings highlight the anti-inflammatory and immune-stimulating properties of both herbs, which are generally recognised through local and conventional medicine as they were mentioned to have higher citation frequency by respondents from all ethnicities or subethnic groups. The Gingers or *Zingiberaceae*, are also a herb family that is typically viewed in the lowland tropical rainforest of the Malesian region [58,59].

Misai Kucing (*Orthosiphon stamineus*) and Citronella (Serai Wangi), both cited by 10 respondents (33.3%), also demonstrated a moderate degree of popularity. Though well-known to repel insects, citronella has also been utilized traditionally to relieve congestion as well as muscle pain, symptoms most commonly associated with post-viral illness, through inhalation as well as mixing it with an

herbal bath [53]. Research on the medicinal application of citronella, specifically its native application in Southeast Asia against dengue viruses, also attests to this [37,48]. As a result of its diuretic, anti-inflammatory and antioxidant activities, Misai Kucing is also used traditionally as an herbal tea. It is also gaining popularity for use against mild diseases such as cough, drowsiness and kidney disease [1]. Its consumption can be an indication of the tendency towards recovery through unwinding, less active herbs. Flavonoids, phenolic acids, chromenes and diuretic, anti-inflammatory and antioxidant terpenoids are some of the numerous bioactive components that are responsible for these advantages [82].

Frequently used herbs such as Pegaga (*Centella asiatica*) (26.7%), Tongkat Ali (*Eurycoma longifolia*) (23.3%), Daun Kaduk (*Piper sarmentosum*) (20.0%) and Sambung Nyawa (*Gynura procumbens*) 16.7%. While less typical in number, these are plants with a long cultural and traditional knowledge base. Perhaps, Tongkat Ali is attractive to male respondents due to potential ADS-like and anabolic properties because it has been heavily advertised as an energizer and testosterone-booster over the lifetime of the Valentus products [79]. Even though *E. longifolia* has been employed traditionally for the treatment of sexual dysfunction; its pharmacological effects include anti-inflammatory, antimalarial, antimicrobial, anti-ulcer and antioxidant activities [56,70,73]. Tongkat Ali (*Eurycoma longifolia*) has traditionally been used to treat ailments such as fever, hypertension, diarrhoea and fatigue and contemporary studies have demonstrated its testosterone-enhancing and other therapeutic properties [43,60]. Despite being less promoted, Daun Kaduk and Sambung Nyawa are still commonly used in the local Malays due to their various role in overall health and serve as remedies towards metabolic disorders, inflammation and hypertension [85,86]. As rural and traditional herbs, some of these are more uncommon because people do not know of them or use them as they are found in the wild.

Interestingly, 13.3% of the participants reported having consumed herbs from "other" groups that were not included in their initial list (Supplementary Data). Results of a qualitative examination of the open-ended answers suggested that ethical considerations affected preferences. According to them, Indian respondents use Neem (*Azadirachta indica*), Tulsi (*Ocimum sanctum*) and Ashwagandha (*Withania somnifera*), which are three pillars of Ayurvedic medicine. These herbs are recognized for their immunomodulatory, anti-inflammatory and apoptogenic properties in the recovery of infections [20]. Their immunomodulatory and apoptogenic activity has brought worldwide attention during the current COVID-19 pandemic [39]. The use of dried tangerine peel, goji berries and chrysanthemum tea to "cool the body", support liver-lung function and anti-inflammatory (Chinese respondents) [7]. Their setup shows the ongoing relevance of Traditional Chinese Medicine (TCM) ideas, especially this one that we can cure ourselves if our body achieves internal balance again. In TCM, post-illness recovery is regarded as requiring the restoration of internal balance through the use of herbs such as salvia, ginseng, astragalus and curcumin [23]. The holistic system of healing and long-term wellness in TCM is mirrored in the traditional use to enhance immune function, reduce inflammation and vital energy as seen with this specific herb [51,84].

The results of this study indicate that there is a certain association between cultural identity and health-seeking behaviour, especially in times of health emergency. Then there are the features that hold much broader usage, as indicated by turmeric and ginger, in contrast to others that appear to embody more ingrained cultural beliefs and practices. It is for this reason that we need culturally inclusive health promotion strategies that recognise and honour traditional knowledge systems. Trends with herbal medicine use are on the rise post-pandemic, providing an opportunity for cross-cultural communication and integration of traditional evidence-based approaches into public health campaigns.

3.3 Factor Influencing Traditional Plants Use for Post-COVID

The data presented in Figure 1 reveal the underlying motivations behind the continued use of traditional plants among respondents following recovery from COVID-19. Among the 30 individuals surveyed, a majority cited immune support (76.7%) as the principal reason for using traditional plants, followed by the treatment of respiratory symptoms such as cough and flu (66.7%), reducing fatigue (50.0%), managing stress or anxiety (40.0%) and detoxification (23.3%).

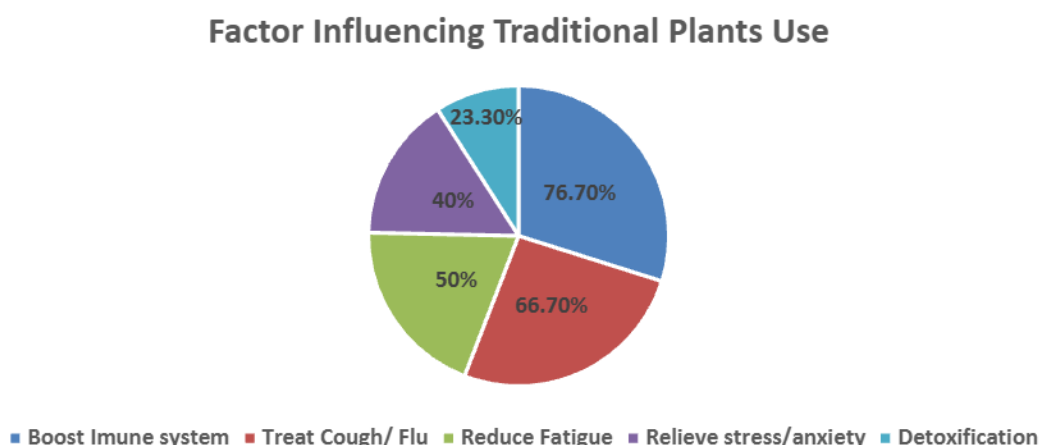


Fig. 1. Factor influencing traditional plants use (n=30)

More importantly, the fact that immune enhancement is a principal reason reinforces prior literature on greater utilization of immune-modulatory herbal medications during global health crises. This is followed by the study of Harfiani *et al.*, [30] stated that communities in Indonesia also used garlic, lemongrass, moringa and habatussauda as herbal components, which are well known for their health benefits. For preparation form, Turmeric tamarind drinks, ginger tea and green Tea were the most popular (in order), followed by others, including wedang uwuh, virgin coconut oil (VCO) and kencur rice during the COVID-19 pandemic. The increasingly frequent use of ginger, onion and garlic is actually based on the widespread assumption that these materials could strengthen immunity and help reduce exposure to diseases such as COVID-19 [30,87].

Herbs with promising beneficial anti-inflammatory and antioxidant activities and improved immune function, like ginger (*Zingiber officinale*), turmeric (*Curcuma longa*), tulsi (*Ocimum sanctum*). Post viral infection period during recovery phase following COVID-19 are documented as potent therapeutic agents would justify their selection for the proposed nutritional supplement regimen in this study [8].

66.7% indicate this by citing the use of cough and flu another lasting concern post-COVID. Common plants like Lemongrass (*Cymbopogon citratus*) and Misai Kucing (*Orthosiphon stamineus*) in Southeast Asia exert expectorant and bronchodilatory effects, which are related to the improvement of respiratory health that have been used by generations [73,74]. Herbs such as ginger, turmeric, moringa or tamarind, for the majority of people are not just ingredients but living healers where the testimonials passed on from generations. The persistent use of herbal teas, home-made remedies and functional foods in recovery may not only stem from the belief that those methods work but also a lack of availability or preference for alternative clinical settings in some locales [30]. A large body of research reports that the traditional health and knowledge systems serve as a foundation to guide post-pandemic health management for not only physical but also for psychosocial and spiritual well-being [36,64]. However, what is clear is the importance of conserving and incorporating these

teachings into larger public health perspectives as populations around the globe seek to cultivate more whole-person-centred self-directed paths of care for themselves.

Half of the respondents (50.0%) reported the use of traditional plants to alleviate the symptom of fatigue frequent among COVID-19 survivors. It is a tradition based on ancient beliefs in the health benefits of adaptogenic herbs such as Tongkat Ali (*Eurycoma longifolia*) and Pegaga (*Centella asiatica*), known to enhance stamina, energy levels and mind performance [79]. 40% of respondents cited stress and anxiety as a key reason to use herbs, demonstrating the mental health repercussions of the pandemic. The consumption of natural anxiolytics like lemon grass tea, Ashwagandha (*Withania somnifera*) and Chrysanthemum showed mutual path with accepting integrative approach in mental health [25]. The use of these remedies may derive not only from cultural familiarity but also from their availability and perceived safety over pharmaceutical options [30,36,64].

Finally, 23.3% of the respondents used traditional plants to detoxify themselves. While the definition of detox is in squishy territory and the notion a culturally conditioned concept common among those who suffer from chronic illness, it generally refers to an internal rebalancing act following critical sickness. Locally, herbs like Sambung Nyawa (*Gynura procumbens*) and Pegaga (*Centella asiatica*) had been used traditionally for blood purification or liver support which may convey these populations at lower risk of underworld ailments compared to the urban population.

Overall, Figure 1 illustrates the complex and diverse motivations for traditional plant use, encompassing biomedical factors such as immune support and symptom relief, as well as psychosocial and cultural influences. These results highlight how consideration of such traditional health perspectives may be crucial for post-pandemic recovery efforts, particularly in cross-cultural contexts. Public health messaging for COVID-19 in India requires incorporation of best evidenced traditional practices to enhance health literacy, ensure adherence and provide culturally sensitive care.

3.4 Frequency of Traditional Plant Use

Respondents indicated varying frequencies of traditional plant use post-COVID-19. Out of 30 respondents:

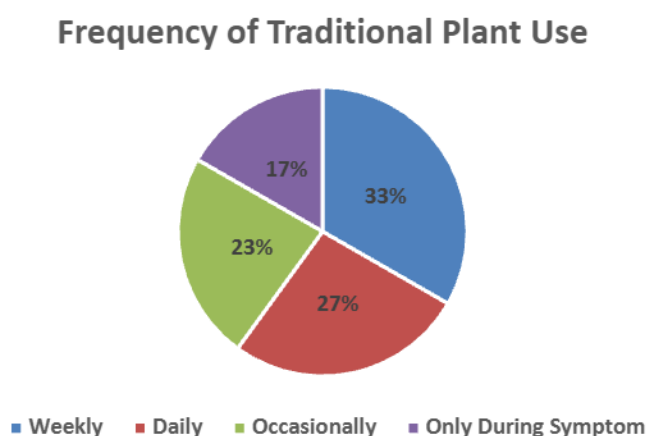


Fig. 2. Frequency of traditional plant use (n=30)

The findings show a varied trend in how often people are using traditional plants after COVID-19. In a survey conducted among 30 participants, the results indicated that 33% of respondents utilize these plants on a weekly basis, while 27% reported daily usage. Additionally, 23% indicated

occasional use and 17% stated that they only utilize these plants when experiencing specific symptoms. This suggests that people are still relying on traditional remedies, making them a regular part of their health routines and preventive care [34]. The considerable weekly and daily user statistics suggest that plant-based practices remain a valuable component in the realm of community healthcare. This is further underscored by the continued integration of medicinal plants and traditional healers into primary care, particularly in rural or underserved communities, a practice that deserves our respect and recognition [12,67,71,72]. For example, in many parts of Africa and South East Asia, up to 80% of the population relies on traditional medicine as their first line of healthcare [32,40]. In India alone, approximately 70% of rural residents depend on plant-based remedies for primary medical needs [13,75].

This could be due to increased awareness of health and immunity since the pandemic, as supported by research on behavioural changes and the heightened use of natural remedies following COVID-19 [27,29]. The continued use of traditional plants highlights a strong cultural connection to natural therapies, which many consider easy to access and effective. This ease of access is a significant factor in their continued popularity, as supported by ethnobotanical and anthropological studies that emphasize how traditional plant use is deeply rooted in cultural beliefs, social practices and intergenerational knowledge transmission [18,45]. Such studies highlight that in many communities, the use of medicinal plants is not only based on perceived efficacy but also maintained as a cultural tradition, reinforcing identity and collective memory [65,76].

3.5 Source of Knowledge about Traditional Plants

Participants were asked where they learned about the use of traditional plants. Responses were as follows.

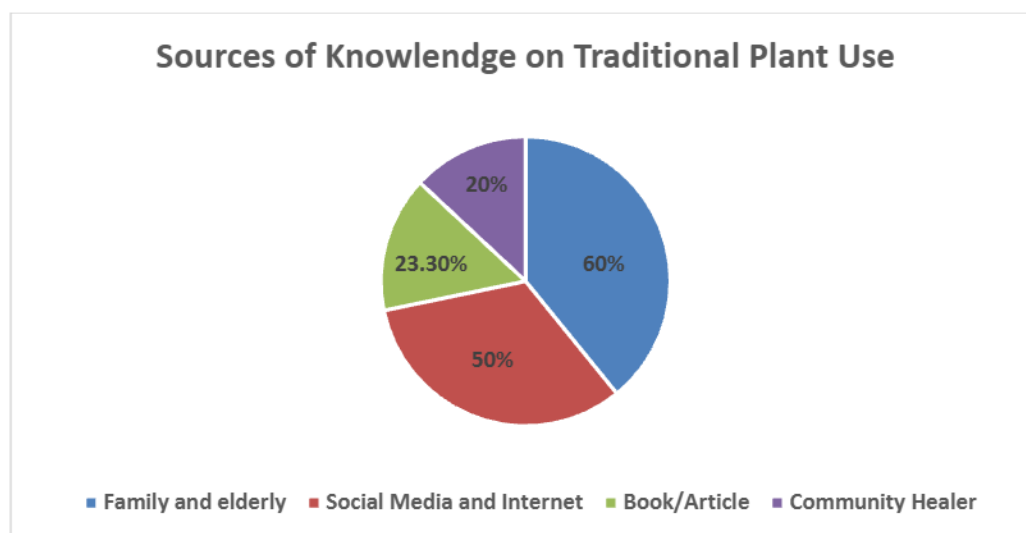


Fig. 3. Sources of knowledge on traditional plant use (n=30)

Respondents were informed about a number of other ways utilised to garner knowledge on historical plant utilisation. (60.0%) of respondents indicated that family or elders were the main source of knowledge on historical plant use which proved that, it is relevant that knowledge should be exchanged from one generation to the other and keep traditional plant-based medicine alive. Firstly, in many Indigenous and rural communities, knowledge regarding medicinal plants and their applications is rarely documented, due to limited access to technology, lack of interest or both. Rather, it is instead a gift from the generations that came before us in an oral tradition [9]. Knowledge

is likewise spread by families and communities through stories, practices, presentations or individual testimonies [4,18]. Elders are also responsible for keeping traditional knowledge alive through teaching youth how to identify, process and use herbs in medicinal applications [66]. Adefila *et al.*, [2] assert that this informal or spoken method ensures integrated culturally grounded information for a contemporary context and is responsive to health and environmental challenges flexibly. Moreover, disseminating this information fosters social connectedness, providing individuals with a sense of shared experience and reducing feelings of isolation. However, in a world with increasing modernisation and globalisation particularly in regions where youth are increasingly moving away from traditional ways of life, severing these oral (informal) or verbal networks could also jeopardise ethnobotanical knowledge. To protect culture and biodiversity, as well as to make sure that community health systems that rely on plant-based remedies are strong, it's important to keep oral or verbal traditions alive [54].

Additionally, half of the respondents (50.0%) also considered social media and internet platforms vital sources of information, indicating a growing influence from digital media on contemporary perception toward traditional medicine. Research now suggests more people are using the internet to seek out health information about alternative and conventional treatments alike. In Saudi Arabia, during the COVID-19 pandemic, social media had a big influence on herbal use in research that was conducted [6]. Research was carried out in Sri Lanka; the result showed that educated youth started to access traditional health tips material through platforms like Facebook by continued doubts about the authenticity of that information [28,78]. This study revealed the positive and negative aspects of using digital methods for the dissemination of information on conventional medicine.

Books and academic publications were cited by 23.3% of respondents, but community healers at 20.0% although less commonly recognised, nevertheless contribute significantly to knowledge gathering. The results suggest a blended model of information communication that involves traditional and modern technology-based approaches. In the recent work on integrative knowledge systems in ethnobotany oral to digital is now an old-fashioned aspect of the evolution trend of learning models, as well as a transition to hybrid repositories where traditional medicinal knowledge can continue, adapt and improve through modern tools [17,52]. Creating pathways for cultural transferability and access enables the embodied practices surrounding healing to remain relevant in quickly shifting social and technological contexts.

This trend not only showcases the adaptability of traditional knowledge systems but also emphasizes their relevance in today's increasingly digital society. Recent studies have explored how traditional knowledge, including ethnobotanical practices, is being recontextualized and revitalized through digital platforms such as mobile apps, online databases and social media networks [11,17]. These digital tools enable broader dissemination, foster cross-cultural exchange and support the documentation of indigenous practices that might otherwise be lost.

3.6 Willingness to Recommend Traditional Plant Use

Respondents were asked whether they would recommend the use of traditional plants to others. The majority expressed positive responses, indicating general trust in traditional remedies post-COVID.

Recommendation of Traditional Plant Use

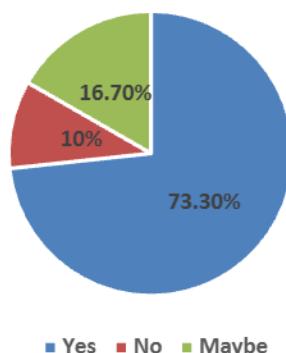


Fig. 4. Recommendation of traditional plant use (n = 30)

Regarding the recommendation of traditional plant use to others, 73.3% said "yes" and 16.7% said "maybe," while 10.0% had doubts about it (Figure 4). These results suggest that there is a high level of trust in the curative power of traditional herbs within local communities. Lending credence to earlier studies on the importance of community validation and trust in traditional medicine, People are more likely to take herbal remedies if they were approved by family, friends and respected elders [20].

Additionally, the vast support of the majority to recommend the use of traditional plants would be consistent with personal experiences and view these traditional practices as acceptable and valuable even among this larger social community. This fact is evident in ethnobotanical and public health studies, which have indicated how social validation plays a crucial role in the continued use of traditional medicine [10]. The sharing of ethnomedicinal knowledge from one generation to the next is solidified by its proximity within a community and the role passed down through generations created trust, thus creating a step for reliability in other medicines [35].

Favor may have been given to complementary and culturally appropriate health solutions, the closer you were to lockdown, while traditional healthcare was partially or fully interrupted. This trend is supported by several post-COVID studies. For example, a study in Vietnam, found that herbal medicine was resorted to by about 70% of the respondents in the course of the COVID-19 pandemic because it was considered locally available and largely safe among other things [63]. Similar in Hong Kong, Traditional, Complementary and Integrative Medicine (TCIM) was significantly employed to promote personal health during the virus pandemic especially to target populations [50]. These discoveries eliminate the importance of traditional health practices, even when modern healthcare systems are operating under stress.

However, the reluctance or resistance of a minority to participate in some cases may suggest doubts about the efficacy, scientific validation or risks of other treatment options. Studies regarding scepticism towards traditional remedies suggest that reasons for non-acceptance usually relate to doubts about clinical evidence, fear of side effects and the opinion that the use of traditional medicine is unstandardized and unregulated [42]. Respondents with a higher level of education were more likely to express scepticism in terms of safety and efficacy about herbal medicines, particularly when there was no scientific evidence [20,33]. Our findings emphasize the need for evidence-based validation, safety assurance and appropriate communication in balancing cultural sensitivity with scientific rigor within mainstream health systems.

Overall, the affirmative responses confirm that the traditional use of plants continues to be culturally and practically significant in local communities, with potential for resurgence as

communities seek sustainable and locally integrated options in healthcare. The rekindling of traditional medicine in the era of global health and sustainability has been evident from recent work [5]. Traditional medicine is being re-evaluated both as a culture-appropriate approach to care and an essential part of sustainable healthcare development [25]. Health professionals as gatekeepers to the selection and inclusion of herbal medicines among those that can be publicly endorsed, especially in areas with limited access to conventional care [21]. These accomplishments signal a major shift whereby the historical plant-based practices are either safeguarded or reanimated, serving as practical, socio-economically sustainable interventions for contemporary health and ecological problems [31,67,77].

4. Conclusions

This study explores ethnobotanical practices in Seri Kembangan, Selangor, after COVID-19 recovery, highlighting a strong reliance on traditional medicinal plants such as ginger, turmeric, lemongrass and Misai Kucing. These remedies are valued for immune support, respiratory health, fatigue reduction and stress relief, with greater understanding and acceptance among Malay and Indian respondents. Knowledge is primarily passed down from family and elders, though social media and technology also play a role in promoting engagement with health practices. All respondents expressed trust in and willingness to use these plants, with usage patterns influenced by ethnicity, age and cultural preferences. Despite a small sample of 30 participants, findings show ethnobotanical knowledge remains integral to community health. The study emphasizes the need to document, protect and promote this heritage and to integrate traditional plant use into public health policy to foster cultural resilience, sustainable wellness practices and post-pandemic healthcare strategies.

Acknowledgement

This research was not funded by any grant.

References

- [1] Adnana, Adieya Atyrrah, Mohd Ezuan Khayatb, Murni Halima, Helmi Wasoha and Zulfazli M. Sobria. "Evaluation of Misai Kucing (*Orthosiphon stamineus*) extract on diabetic cell line."
- [2] Adefila, Adebimpe Oluwabukade, Oluwatosin Omotola Ajayi, Adekunle Stephen Toromade and Ngodoo Joy Sam-Bulya. "Integrating traditional knowledge with modern agricultural practices: A sociocultural framework for sustainable development." *World Journal of Biology Pharmacy and Health Sciences* 20, no. 02 (2024): 125-135. <https://doi.org/10.30574/wjbphs.2024.20.2.0850>
- [3] Ahmad, Shahrudin. "Traditional medicine in Southeast Asia with special reference to Malaysia and Indonesia." In *Geography, Culture and Education*, pp. 51-64. Dordrecht: Springer Netherlands, 2002. https://doi.org/10.1007/978-94-017-1679-6_5
- [4] Akhmar andi Muhammad, Fathu Rahman, Supratman, Husain Hasyim and Muhammad Nawir. "The cultural transmission of traditional ecological knowledge in Cerekang, South Sulawesi, Indonesia." *Sage Open* 13, no. 4 (2023): 21582440231194160. <https://doi.org/10.1177/21582440231194160>
- [5] Akunna, G. G., C. A. Lucyann and L. C. Saalu. "Rooted in tradition, thriving in the present: The future and sustainability of herbal medicine in Nigeria's healthcare landscape." *Journal of Innovations in Medical Research* 2, no. 11 (2023): 28-40. <https://doi.org/10.56397/JIMR/2023.11.05>
- [6] Alotiby, Amna. "The impact of media on public health awareness concerning the use of natural remedies against the COVID-19 outbreak in Saudi Arabia." *International Journal of General Medicine* (2021): 3145-3152. <https://doi.org/10.2147/IJGM.S317348>
- [7] Ashraf, Kamran, Sadia Sultan and Aishah Adam. "Orthosiphon stamineus Benth. is an outstanding food medicine: Review of phytochemical and pharmacological activities." *Journal of Pharmacy and Bioallied Sciences* 10, no. 3 (2018): 109-118. https://doi.org/10.4103/JPBS.JPBS_253_17

- [8] Ayustaningwarno, Fitriyono, Gemala Anjani, Azzahra Mutiara Ayu and Vincenzo Fogliano. "A critical review of Ginger's (*Zingiber officinale*) antioxidant, anti-inflammatory and immunomodulatory activities." *Frontiers in nutrition* 11 (2024): 1364836. <https://doi.org/10.3389/fnut.2024.1364836>
- [9] Balick, Michael J. and Paul Alan Cox. *Plants, people and culture: the science of ethnobotany*. Garland Science, 2020. <https://doi.org/10.1201/9781003049074>
- [10] Banerjee, Sabyasachi. "Introduction to Ethnobotany and Traditional Medicine." In *Traditional Resources and Tools for Modern Drug Discovery: Ethnomedicine and Pharmacology*, pp. 1-30. Singapore: Springer Nature Singapore, 2024. https://doi.org/10.1007/978-981-97-4600-2_1
- [11] Baniseti, Dileepu Kumar and Nagendra Prasad Kosuri. "Ethnobotanical research in the digital age: harnessing technology for data collection and analysis." *International Journal of Indigenous Herbs and Drugs* (2023): 1-6. <https://doi.org/10.46956/ijihd.v8i4.466>
- [12] Barimah, Antwi Joseph, Kofi Bobi Barimah, James Dumba, Yaw Boakye Nketiah, Adom-Brobby David, Tampuri Sheena Mmaa, Asantewaa Nancy Ntow and Owusu Kwadwo. "The role of traditional medicine in providing palliative care and improving the quality of life: a survey on patients' knowledge and utilization in Kumasi metropolis, Ghana." *BMC Complementary Medicine and Therapies* 25, no. 1 (2025): 212. <https://doi.org/10.1186/s12906-025-04961-4>
- [13] Pullaiah, T., K. V. Krishnamurthy and Bir Bahadur. *Ethnobotany of India, Volume 3: North-East India and the Andaman and Nicobar Islands*. Apple Academic Press, 2017. <https://doi.org/10.1201/9781315365831>
- [14] Chua, S. K. "Monitoring the quality of essential oil from *etilingera* SP. 4." *Zingiberaceae*) by gas chromatography-mass spectrometry (GC-MS). *Universiti Malaysia Pahang* (2008).
- [15] Chance, Emmanuel Aoudi and Innocent Sardi Abdoul. "The roles and contributions of women to the health of their families and household economics in rural areas in the district of Mbe, Cameroon." *Social Sciences & Humanities Open* 11 (2025): 101456. <https://doi.org/10.1016/j.ssaho.2025.101456>
- [16] Check, Joseph and Russell K. Schutt. *Research methods in education*. Sage publications, 2011. <https://doi.org/10.4135/9781544307725>
- [17] De Meyer, Emiel and Melissa Ceuterick. "Digital Ethnobiology: exploring the digisphere in search of traditional and indigenous knowledge and practices." *Ethnobotany Research and Applications* 24 (2022): 1-8. <https://doi.org/10.32859/era.24.37.1-8>
- [18] Dean, Muhajirin. "Exploring ethnobotanical knowledge: Qualitative insights into the therapeutic potential of medicinal plants." *Golden Ratio of Data in Summary* 4, no. 2 (2024): 154-166. <https://doi.org/10.52970/grdis.v4i2.491>
- [19] Eifert, Georg H. and Lyn Craill. "The relationship between affect, behaviour and cognition in behavioural and cognitive treatments of depression and phobic anxiety." *Behaviour Change* 6, no. 2 (1989): 96-103. <https://doi.org/10.1017/S0813483900007634>
- [20] El-Dahiyat, Faris, Mohamed Rashrash, Sawsan Abuhamdah, Rana Abu Farha and Zaheer-Ud-Din Babar. "Herbal medicines: a cross-sectional study to evaluate the prevalence and predictors of use among Jordanian adults." *Journal of pharmaceutical policy and practice* 13, no. 1 (2020): 2. <https://doi.org/10.1186/s40545-019-0200-3>
- [21] Eruaga, Michael Alurame, Esther Oleiye Itua and James Tabat Bature. "Exploring herbal medicine regulation in Nigeria: Balancing traditional practices with modern standards." *GSC Advanced Research and Reviews* 18, no. 3 (2024): 083-090. <https://doi.org/10.30574/gscarr.2024.18.3.0094>
- [22] Estiasih, Teti, Jaya Mahar Maligan, Jatmiko Eko Witoyo, Adilla Aisyah Hana Mu'alim, Kgs Ahmadi, Tunjung Mahatmanto and Elok Zubaidah. "Indonesian traditional herbal drinks: diversity, processing and health benefits." *Journal of Ethnic Foods* 12, no. 1 (2025): 7. <https://doi.org/10.1186/s42779-025-00267-5>
- [23] Fang, Yue, Meng Xue Tang and Xu Liu. "Traditional Chinese medicine trade among RCEP countries: structural characteristics and determinants." *Frontiers in Public Health* 12 (2025): 1508839. <https://doi.org/10.3389/fpubh.2024.1508839>
- [24] Febriyanti, Raden Maya, Kurniawan Saefullah, Raini Diah Susanti and Keri Lestari. "Knowledge, attitude and utilization of traditional medicine within the plural medical system in West Java, Indonesia." *BMC Complementary Medicine and Therapies* 24, no. 1 (2024): 64. <https://doi.org/10.1186/s12906-024-04368-7>
- [25] Felix, Pascal. "Application of the andersen health system utilization framework in the investigation of the use of traditional medicine in kumasi, Ghana." (2020).
- [26] Filip, Roxana, Roxana Gheorghita Puscaselu, Liliana Anchidin-Norocel, Mihai Dimian and Wesley K. Savage. "Global challenges to public health care systems during the COVID-19 pandemic: a review of pandemic measures and problems." *Journal of personalized medicine* 12, no. 8 (2022): 1295. <https://doi.org/10.3390/jpm12081295>

- [27] Guèvremont, Amélie, Caroline Boivin, Fabien Durif and Raoul Graf. "Positive behavioral change during the COVID-19 crisis: The role of optimism and collective resilience." *Journal of consumer behaviour* 21, no. 6 (2022): 1293-1306. <https://doi.org/10.1002/cb.2083>
- [28] Gunarathna, Manjula. "Health Information Seeking Behaviour among Teenagers Sri Lanka." (2023).
- [29] Güngör, Ömür and Hüsnü Baykal. "Attitudes toward herbal medicine for COVID-19 in healthcare workers: A cross-sectional observational study." *Medicine* 102, no. 38 (2023): e35176. <https://doi.org/10.1097/MD.00000000000035176>
- [30] Harfiani, Erna, Ratna Puspita and Isniani Ramadhani Sekar Prabarini. "Herbal Medicine Usage During the COVID-19 Pandemic in Indonesia: Trends and Determinants." *The Scientific World Journal* 2025, no. 1 (2025): 1639500. <https://doi.org/10.1155/tswj/1639500>
- [31] Hemmami, Hadia, Mohammed Messaoudi, Barbara Sawicka, Wafa Zahnit, Nadjet Osmani, Mokhtar Benmohamed and Abdelkrim Rebiai. "The Importance of Traditional Resources in Ethnomedicine." In *Traditional Resources and Tools for Modern Drug Discovery: Ethnomedicine and Pharmacology*, pp. 91-127. Singapore: Springer Nature Singapore, 2024. https://doi.org/10.1007/978-981-97-4600-2_5
- [32] Izah, Sylvester Chibueze, Odangowei Inetiminebi Ogidi, Matthew Chidozie Ogwu, Saoban Sunkanmi Salimon, Zaharadeen Muhammad Yusuf, Muhammad Akram, Morufu Olalekan Raimi and Austin-Asomeji Iyingiala. "Historical perspectives and overview of the value of herbal medicine." In *Herbal medicine phytochemistry: Applications and trends*, pp. 3-35. Cham: Springer International Publishing, 2024. https://doi.org/10.1007/978-3-031-43199-9_1
- [33] Jalil, Banaz, Abdallah Y. Naser, Jose M. Prieto and Michael Heinrich. "Herbal supplements in Jordan: a cross-sectional survey of pharmacists' perspectives and knowledge." *BMJ open* 12, no. 7 (2022): e057405. <https://doi.org/10.1136/bmjopen-2021-057405>
- [34] Jamaludin, Shariffah Suraya Syed, B. H. Shian and P. Jing. "Role of traditional and complementary medicine in sustaining health and well-being of Malaysians." *Journal of Sustainability Science and Management* 19, no. 3 (2024): 10-25. <https://doi.org/10.46754/jssm.2024.03.002>
- [35] Kacunguzi, Dianah Twinoburyo. "Knowledge preservation practices of herbalists in Uganda: an ethnographic study." PhD diss., University of Illinois at Urbana-Champaign, 2022.
- [36] Katonge, Jackson Henry. "Exploring the role of traditional remedies, cultural practices and belief interventions in combating COVID-19 in Dodoma City, Tanzania." *Pharmacological Research-Natural Products* 7 (2025): 100225. <https://doi.org/10.1016/j.prenap.2025.100225>
- [37] Kaushik, Sulochana, Samander Kaushik, Vikrant Sharma and Jaya Yadav. "Antiviral and therapeutic uses of medicinal plants and their derivatives against dengue viruses." *Pharmacognosy Reviews* 12, no. 24 (2018). https://doi.org/10.4103/phrev.phrev_2_18
- [38] Khalil, Mohamad, Hala Abdallah, Maria Calasso, Nour Khalil, Ahmad Daher, Jihen Missaoui, Farah Diab *et al.*, "Herbal medicine in three different mediterranean living areas during the COVID-19 pandemic: the role of polyphenolic-rich thyme-like plants." *Plants* 13, no. 23 (2024): 3340. <https://doi.org/10.3390/plants13233340>
- [39] Khanna, Kanika, Sukhmeen Kaur Kohli, Ravdeep Kaur, Abhay Bhardwaj, Vinay Bhardwaj, Puja Ohri, Anket Sharma, Ajaz Ahmad, Renu Bhardwaj and Parvaiz Ahmad. "Herbal immune-boosters: Substantial warriors of pandemic Covid-19 battle." *Phytomedicine* 85 (2021): 153361. <https://doi.org/10.1016/j.phymed.2020.153361>
- [40] Kosoe, Enoch Akwasi, Godwin TW Achana and Matthew Chidozie Ogwu. "Regulations and policies for herbal medicine and practitioners." In *Herbal medicine Phytochemistry: Applications and Trends*, pp. 1-23. Cham: Springer International Publishing, 2024. https://doi.org/10.1007/978-3-031-21973-3_33-2
- [41] Kutal, Durga, Ripu M. Kunwar, Kedar Baral, Prabhat Sapkota, Hari P. Sharma and Bhagawat Rimal. "Factors that influence the plant use knowledge in the middle mountains of Nepal." *PLoS One* 16, no. 2 (2021): e0246390. <https://doi.org/10.1371/journal.pone.0246390>
- [42] Lakhotia, Yashika, Swarnali Chakraborty, Yadavi Thirani, Joachim George Poulouse, Madalaimuthu Anthony and Yogeswarie Sreedharan. "Psychological Factors Shaping Vaccine Hesitancy During COVID-19 in India." In *Behavioral Economics and Neuroeconomics of Health and Healthcare*, pp. 213-250. IGI Global Scientific Publishing, 2025. <https://doi.org/10.4018/979-8-3693-6055-2.ch010>
- [43] Leisegang, Kristian, Renata Finelli, Suresh C. Sikka and Manesh Kumar Panner Selvam. "Eurycoma longifolia (jack) improves serum total testosterone in men: a systematic review and meta-analysis of clinical trials." *Medicina* 58, no. 8 (2022): 1047. <https://doi.org/10.3390/medicina58081047>
- [44] Li, Xiaoyu, Qin An, Wilson Cheong Hin Hong, Yunfeng Zhang, Kimberly Kolletar-Zhu and Xiaoshu Xu. "Undergraduates' knowledge attitude and behavior (KAB) towards the disclosure of personal data online in China." In *Modern Management Based on Big Data IV*, pp. 46-63. IOS Press, 2023. <https://doi.org/10.3233/FAIA230168>

- [45] Lima Mota, Markos Rogério, Iani Dias Lauer-Leite and Jailson Santos de Novais. "Intergenerational transmission of traditional ecological knowledge about medicinal plants in a riverine community of the Brazilian Amazon." *Polibotánica* 56 (2023): 311-329. <https://doi.org/10.18387/polibotanica.56.16>
- [46] Liew, Kong Yen, Md Faizul Hafiz, Yi Joong Chong, Hanis Hazeera Harith, Daud Ahmad Israf and Chau Ling Tham. "A review of malaysian herbal plants and their active constituents with potential therapeutic applications in sepsis." *Evidence-Based Complementary and Alternative Medicine* 2020, no. 1 (2020): 8257817. <https://doi.org/10.1155/2020/8257817>
- [47] Liu, Chang-Xiao. "Overview on development of ASEAN traditional and herbal medicines." *Chinese Herbal Medicines* 13, no. 4 (2021): 441-450. <https://doi.org/10.1016/j.chmed.2021.09.002>
- [48] Mahmud, Faiza, Md Rezwan Ahmed Mahedi, Sadia Afrin, Rashedul Haque, Md Shanzid Hasan, Fatema Akter Sum, Md Abdul Bary, Nikolaos Syrmos and Oviyet Chandra Kuri. "Biological & insecticidal effect of citronella oil: A short review." *Clinical Medicine And Health Research Journal* 2, no. 6 (2022): 261-265. <https://doi.org/10.18535/cmhrj.v2i6.108>
- [49] Li, Hao, Juan Liu, Xinyi Hu, Songyi Wei and Wang Jun. "Practices, knowledge and attitudes of Chinese university students toward traditional Chinese herbal medicine for the control of COVID-19." *Infection and Drug Resistance* (2022): 6951-6962. <https://doi.org/10.2147/IDR.S387292>
- [50] Marques, Bruno, Claire Freeman and Lyn Carter. "Adapting traditional healing values and beliefs into therapeutic cultural environments for health and well-being." *International journal of environmental research and public health* 19, no. 1 (2021): 426. <https://doi.org/10.3390/ijerph19010426>
- [51] Matos, Luís Carlos, Jorge Pereira Machado, Fernando Jorge Monteiro and Henry Johannes Gretten. "Understanding traditional Chinese medicine therapeutics: an overview of the basics and clinical applications." In *Healthcare*, vol. 9, no. 3, p. 257. MDPI, 2021. <https://doi.org/10.3390/healthcare9030257>
- [52] Magare, Dipak A. and Madhukar Patil. "Ethnobotany in the digital age: Opportunities and challenges of traditional knowledge digitization." *World Journal of Biology Pharmacy and Health Sciences* 21, no. 1 (2025): 235-242. <https://doi.org/10.30574/wjbphs.2025.21.1.0043>
- [53] Magotra, Sumeet, Ajeet Pal Singh and Amar Pal Singh. "A review on pharmacological activities of *Cymbopogon citratus*." *International Journal of Pharmaceutics and Drug Analysis* 9, no. 2 (2021): 151-157. <https://doi.org/10.47957/ijpda.v9i2.475>
- [54] Maikhuri, Rakesh Kumar, Ajay Maletha, Ravindra Singh, Girish Bhatt, Sunil Agarwal, Shalini Dhyani, Sunil Nautiyal et al., "Traditional health care systems and immunity boosting: exploring plant based indigenous knowledge systems amidst the COVID-19 pandemic." *Discover Plants* 1, no. 1 (2024): 5. <https://doi.org/10.1007/s44372-024-00005-2>
- [55] Mukti, Bayu Hari. "Ethnobotanical studies of medicinal plants in Borneo: Bridging tradition and pharmaceutical research." *Health Sciences International Journal* 2, no. 2 (2024): 154-168. <https://doi.org/10.71357/hsij.v2i2.41>
- [56] Mohd Zaki, A., W. Nor Fadilah, A. Mohd Radzi, L. Sui Kiong, A. G. Ab Rasip, N. Mohamad Lokmal, L. Abdul Rashid, M. S. Ahmad Fauzi, M. A. Farah Fazwa and J. Regina Mariah. "Preliminary phytochemical screening of eurycomanone for selection of high quality planting materials: *Eurycoma longifolia*." *Malaysian Applied Biology* 44, no. 1 (2015).
- [57] Yusoff, Ahmad Nasir Mohd and Muhammad Hannan Abdul Aziz. "The Use of Herbs According to the Perspective of Traditional Malay Medicine in Selangor, Malaysia."
- [58] Mohamad, S. and M. Kalu. "Assessment of Zingiberaceae (Tribe Alpinieae) from North East Sarawak, Malaysia." In *IOP Conference Series: Earth and Environmental Science*, vol. 269, no. 1, p. 012032. IOP Publishing, 2019. <https://doi.org/10.1088/1755-1315/269/1/012032>
- [59] Mohamad, Salasiah, Meekiong Kalu and Axel Dalberg Poulsen. "A new species and a new combination of *Sundamomum* (Zingiberaceae) from Sarawak, Borneo." *Kew Bulletin* 75, no. 4 (2020): 58. <https://doi.org/10.1007/s12225-020-09919-y>
- [60] Mohamed, Aini Norhidayah, Jaya Vejayan and Mashitah Mohd Yusoff. "Review on *Eurycoma longifolia* pharmacological and phytochemical properties." *Journal of Applied Sciences* 15, no. 6 (2015): 831. <https://doi.org/10.3923/jas.2015.831.844>
- [61] Mphhekgwana, Peter M., Mpsanyana Makgahlela and Tebogo M. Mothiba. "Use of traditional medicines to fight COVID-19 during the South African nationwide lockdown: A prevalence study among university students and academic staff." *The Open Public Health Journal* 14, no. 1 (2021). <https://doi.org/10.2174/1874944502114010441>
- [62] Natta, L., K. Orapin, N. Krittika and B. Pantip. "Essential oil from five Zingiberaceae for anti food-borne bacteria." *International Food Research Journal* 15, no. 3 (2008): 337-346.
- [63] Nguyen, Phuc Hung, Van De Tran, Duy Toan Pham, Tran Nhat Phong Dao and Rebecca Susan Dewey. "Use of and attitudes towards herbal medicine during the COVID-19 pandemic: a cross-sectional study in Vietnam." *European Journal of Integrative Medicine* 44 (2021): 101328. <https://doi.org/10.1016/j.eujim.2021.101328>

- [64] Ola, Kunle. "Role of traditional knowledge in the COVID-19 battle." *The Journal of World Intellectual Property* 25, no. 2 (2022): 279-291. <https://doi.org/10.1111/jwip.12220>
- [65] Ona, Genís, Ali Berrada and José Carlos Bouso. "Communalistic use of psychoactive plants as a bridge between traditional healing practices and Western medicine: A new path for the Global Mental Health movement." *Transcultural Psychiatry* 59, no. 5 (2022): 638-651. <https://doi.org/10.1177/13634615211038416>
- [66] Otang-Mbeng, Wilfred, Dumisane Thomas Muloche, Elizabeth Kola and Peter Tshepiso Ndhlovu. "The role of indigenous knowledge systems in sustainable utilisation and conservation of medicinal plants." In *Sustainable uses and prospects of medicinal plants*, pp. 245-254. CRC Press, 2023. <https://doi.org/10.1201/9781003206620-13>
- [67] Pangestu, Aria Bayu, Haris Abd Wahab and Mohd Rashid Mohd Saad. "Revitalizing Indigenous Knowledge for Sustainable Living in Malaysian Indigenous Communities." In *Community Climate Justice and Sustainable Development*, pp. 123-146. IGI Global Scientific Publishing, 2025. <https://doi.org/10.4018/979-8-3373-0619-3.ch007>
- [68] Pieroni andrea, Ina Vandebroek, Julia Prakofjewa, Rainer W. Bussmann, Narel Y. Paniagua-Zambrana, Alfred Maroyi, Luisa Torri *et al.*, "Taming the pandemic? The importance of homemade plant-based foods and beverages as community responses to COVID-19." *Journal of ethnobiology and ethnomedicine* 16, no. 1 (2020): 75. <https://doi.org/10.1186/s13002-020-00426-9>
- [69] Pintatum, Aknarin, Surat Laphookhieo, Emilie Logie, Wim Vanden Berghe and Wisanu Maneerat. "Chemical composition of essential oils from different parts of Zingiber kerrii Craib and their antibacterial, antioxidant and tyrosinase inhibitory activities." *Biomolecules* 10, no. 2 (2020): 228. <https://doi.org/10.3390/biom10020228>
- [70] bin Ramzi, Muhamad Iyad, Muhammad Hazzim bin Kosnin, Ghasak Ghazi Faisal, Mohd Hafiz Arzmi, Anisa Kusumawardani, A. S. M. Sabere, Essam A. Makky and O. E. Ibrahim. "The effect of Eurycoma longifolia Jack (Tongkat Ali) root extract on salivary S. mutans, Lactobacillus and Candida albicans isolated from high-risk caries adult patients." *Pharmacognosy Journal* 13, no. 3 (2021). <https://doi.org/10.5530/pj.2021.13.100>
- [71] Rajeev, B. R., Mahesh Madhav Mathpati, Mahantu Yalsangi and Ravi Narayan. "Where do traditional healers fit in the dentist-centred oral health system? An ethnography inquiry among the indigenous communities in Gudalur, South India." *SSM-health systems* (2025): 100079. <https://doi.org/10.1016/j.ssmhs.2025.100079>
- [72] Rajoo, Keeren Sundara, Philip Lepun, Beatrice Lyeja Anak Kayok, Nurul Azwany Umayrah and Nazariena Abdullah. "Ethnomedicinal survey of antidiabetic plants used by six indigenous communities in Sarawak, Borneo." *Journal of Herbal Medicine* 51 (2025): 101011. <https://doi.org/10.1016/j.hermed.2025.101011>
- [73] Rehman, Shaheed Ur, Kevin Choe and Hye Hyun Yoo. "Review on a traditional herbal medicine, Eurycoma longifolia Jack (Tongkat Ali): its traditional uses, chemistry, evidence-based pharmacology and toxicology." *Molecules* 21, no. 3 (2016): 331. <https://doi.org/10.3390/molecules21030331>
- [74] Ritho, Michael, Teresa B. Klepser and William R. Doucette. "Influences on consumer adoption of herbal therapies." *Drug information journal: DIJ/Drug Information Association* 36, no. 1 (2002): 179-186. <https://doi.org/10.1177/009286150203600123>
- [75] Sen, Saikat and Raja Chakraborty. "Revival, modernization and integration of Indian traditional herbal medicine in clinical practice: Importance, challenges and future." *Journal of traditional and complementary medicine* 7, no. 2 (2017): 234-244. <https://doi.org/10.1016/j.jtcm.2016.05.006>
- [76] Sesay, Gibrill Amid. "Sociological Investigation on Cultural Impact of Herbal Remedies and Community Wellbeing; Case Study of Mamaka Village."
- [77] Sharma, Anil, Sanoj Kumar Patel and Gopal Shankar Singh. "Revitalizing Traditional Knowledge of the Himalayan Indigenous Tribes: An Ethnoecological and Ethnobotanical Approach." In *Learning 'from' and 'with' the Locals: Traditional Knowledge Systems for Environmental Sustainability in the Himalayas*, pp. 111-133. Cham: Springer Nature Switzerland, 2024. https://doi.org/10.1007/978-3-031-51696-2_6
- [78] Thilina, D. K., M. C. B. Guruge and N. W. O. K. D. S. P. Nanayakkara. "A descriptive analysis on digital behaviour of young adults in Sri Lanka." *International Journal of Business and Management Invention* 9, no. 6 (2020): 58-67.
- [79] Talbott, Shawn M., Julie A. Talbott, Annie George and Mike Pugh. "Effect of Tongkat Ali on stress hormones and psychological mood state in moderately stressed subjects." *Journal of the International Society of Sports Nutrition* 10, no. 1 (2013): 28. <https://doi.org/10.1186/1550-2783-10-28>
- [80] Venugopal, R., V. Mamatha and D. Raju. "Cultural Continuity and Healing Wisdom: A Historical Study of Tribal Medicine in Village Communities." *Education and Society* 48, no. 1, (2024): 98.
- [81] Abd Wahab, Mohd Shahezwan, Aida Azlina Ali, Mahmathi Karuppannan, Muhammad Harith Zulkifli, Sandra Maniam and Carolina Oi Lam Ung. "The use of herbal and dietary supplements for COVID-19 prevention: A survey among the public in a Malaysian suburban town." *Journal of Herbal Medicine* 39 (2023): 100650. <https://doi.org/10.1016/j.hermed.2023.100650>

- [82] Wang, Rui, Ling Qiu, Qing-wen Zhang and Ligen Lin. "Ethnopharmacology, phytochemistry and pharmacology of the genus *Orthosiphon*: A review." *Phytomedicine Plus* (2025): 100748.
<https://doi.org/10.1016/j.phyplu.2025.100748>
- [83] Weckmüller, Holger, Carles Barriocanal, Roser Maneja and Martí Boada. "Factors affecting traditional medicinal plant knowledge of the Waorani, Ecuador." *Sustainability* 11, no. 16 (2019): 4460.
<https://doi.org/10.3390/su11164460>
- [84] Yadav, Neha, Rohitas Deshmukh and Rupa Mazumder. "A comprehensive review on the use of traditional Chinese medicine for cancer treatment." *Pharmacological Research-Modern Chinese Medicine* 11 (2024): 100423.
<https://doi.org/10.1016/j.prmcm.2024.100423>
- [85] Zakaria, Zainul Amiruddin, Zuleen Delina Fasya Abdul Ghani, Raden Nur Suraya Raden Mohd. Nor, Hanan Kumar Gopalan, Mohd Roslan Sulaiman, Abdul Manan Mat Jais, Muhammad Nazrul Somchit, Arifah Abdul Kader and Johari Ripin. "Antinociceptive, anti-inflammatory and antipyretic properties of an aqueous extract of *Dicranopteris linearis* leaves in experimental animal models." *Journal of natural medicines* 62, no. 2 (2008): 179-187.
<https://doi.org/10.1007/s11418-007-0224-x>
- [86] Zhang, X. F. and B. K. H. Tan. "Effects of an ethanolic extract of *Gynura procumbens* on serum glucose, cholesterol and triglyceride levels in normal and streptozotocin-induced diabetic rats." *Singapore medical journal* 41, no. 1 (2000): 9-13.
- [87] Zhao, Shi, Qianyin Lin, Jinjun Ran, Salihu S. Musa, Guangpu Yang, Weiming Wang, Yijun Lou *et al.*, "Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: A data-driven analysis in the early phase of the outbreak." *International journal of infectious diseases* 92 (2020): 214-217.
<https://doi.org/10.1016/j.ijid.2020.01.050>