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## Research Article

# Ethnobotanical Documentation of Yerba Mate in Syria

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**Ethnopharmacological Relevance:** Yerba Mate (*Ilex paraguariensis*) is a traditional herbal beverage consumed for its stimulating effects and health benefits, with a deep cultural association in Syria following its introduction by migrants from South America in the early 20th century. This study documents the cultural, social, and health-related practices surrounding Yerba Mate in Syria, highlighting its integration into local customs and herbal preparations.

**Objective:** To explore and document the traditional uses, social practices, and preparation methods of Yerba Mate among Syrian consumers, and to investigate the health benefits and cultural significance attributed to it.

**Methods:** An electronic survey was distributed to 430 participants from different regions across Syria, collecting data on Yerba Mate consumption habits, social practices, reasons for use, perceived effects, and traditional preparation methods. Quantitative and qualitative data were analyzed using statistical software. The Relative Frequency of Citation (RFC) index was used to assess the prevalence of herbal additives in Yerba Mate preparations.

**Results:** Yerba Mate is consumed regularly by 89.2% of participants, with health benefits being a key motivator for 60% of users. Syrian traditions enhance Yerba Mate with local and imported herbs, with 68.6% of regular drinkers incorporating herbs like wormwood (*Artemisia herba-alba*) and chamomile (*Matricaria chamomilla*), each offering specific health benefits. The survey revealed high consumption patterns, particularly in group settings (51.6%), and frequent daily use by 50% of participants. **Conclusion:** Yerba Mate has become a deeply rooted part of Syrian culture, with local adaptations that incorporate traditional medicinal herbs. These combinations not only enhance the health benefits of the drink but also reflect a blend of imported traditions with Syrian herbal knowledge. The study highlights Yerba Mate's social significance in Syria and suggests the need for further research into its potential therapeutic uses in traditional medicine. Given the unique Syrian practice of mixing Mate with various herbs, further investigation is needed to assess the differences in effects, flavor, and prevalence among these herbal combinations.

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## 1. Introduction

Yerba mate (*Ilex paraguariensis* A.St.-Hil., Aquifoliaceae) is a traditional herbal drink known for its stimulating effects and numerous health benefits<sup>[1]</sup>. Its leaves contain a variety of bioactive compounds. For the indigenous peoples of Latin America, the evergreen yerba mate tree was considered "a gift from the gods," used in rituals and trade. They carried its leaves on long journeys to chew or brew as a beverage, according to the National Institution of Argentine yerba mate (INYM)<sup>[2]</sup>.

Mate, along with other stimulant plants, has been introduced to communities without a prior tradition of its consumption. This occurred over the past century as migrants and refugees brought it with them and maintained its use in their new locations<sup>[3]</sup>. European

settlers embraced yerba mate when they arrived in the 16th century, and it was similarly adopted by migrants from regions like Syria, who moved to South America between 1881 and 1914 due to the decline of the Ottoman Empire and economic challenges<sup>[4]</sup>. These migrations continued after both World Wars. According to the Institute, many Syrians who settled in Argentina between 1850 and 1860 "fell in love with yerba mate" and brought it back to Syria, incorporating it into their daily lives and cultural practices. Yerba mate became so integrated into Syrian culture that neighboring regions began associating it with Middle Eastern traditions<sup>[5]</sup>.

Migrants returning from South America, quickly gaining popularity, especially in Syria and Lebanon, first introduced yerba mate to the Levant in the early 20th century. Syria became the largest consumer of yerba mate outside South America. The first recorded export to Syria occurred in 1936, and by 2018, Syria was the second-largest importer<sup>[3][6]</sup>, with 39.6 tons. In 2019, Syria ranked as the top destination for yerba mate exports (31 million kilograms), followed by Chile and Lebanon<sup>[5]</sup>.

The people of Western Qalamoun in Rif Dimashq Governorate were the first to introduce yerba mate to Syria, establishing gatherings where it was served in silver cups with straws, alongside nuts, especially during winter. It often surpassed tea, coffee, and herbal tisane in consumption. Unlike coffee or tea, which people may grow tired of after a few cups, yerba mate is enjoyed continuously, regardless of the season.

In the Qalamoun region, it is a tradition for groups to share a single cup and straw during social visits, symbolizing unity and friendship. The leaves are briefly soaked in water, and the straw is rinsed between users. In contrast, coastal regions use individual cups and straws, with leaves soaked in cold water before adding hot. In As-Suwayda, yerba mate is favored as a morning drink called "gooz." The drink has a special cultural significance in areas like Tartus, As-Suwayda, Salamiyah, and Qalamoun<sup>[1]</sup>.

Herbal tisane made from native flowers, often mixed with other ingredients, is widely used in traditional medicine across the Eastern Mediterranean region. They are known by various names, such as "zhourat" (meaning "tisane flowers") and "shai alwird" (Damask rose tea), along with other rose species and cultivars<sup>[7][8][9]</sup>. Despite the widespread availability of local herbal drinks in Syria, their presence has not diminished the popularity of mate. Instead, Syrians have uniquely integrated mate with these herbal teas, creating a distinct preparation method. Many have developed their own ways of enhancing it, adding ingredients like "zhourat" from indigenous aromatic herbs, cardamom, ginger, and wormwood.

This study aims to document the traditional uses of yerba mate in Syria and explore the cultural and social practices associated with its consumption.

## 2. Methodology

### *Data Collection*

Participants for the study were chosen using purposive snowball sampling<sup>[10][11]</sup>. Data were collected during June and July 2024 through an electronic survey distributed to a diverse sample of consumers from different regions throughout Syria.

### *Sample Details*

The study sample consisted of 430 participants across different age groups (18 years to over 60 years). The participants came from both rural and urban settings, representing a wide range of geographic areas, including Damascus and its countryside, As-Suwayda, Daraa, Homs, Hama, Latakia, Tartous, Aleppo countryside, and Syria's eastern region.

### *Data Collection Method*

The survey was conducted electronically over a 30-day period.

### *Study Design*

The survey included a range of questions related to demographic factors such as age, gender, education level, and geographic location. Additionally, questions focused on yerba mate consumption habits, reasons for drinking it, potential health risks, and preparation methods.

### *Data Collection Tools*

The survey was structured to assess multiple aspects of yerba mate consumption, including the primary reasons for its use, cultural practices associated with it, and perceived risks as identified by consumers.

### *Data Analysis*

Data were analyzed using statistical tools such as SPSS and Excel, with both qualitative and quantitative methods applied.

### *Calculation method for the Relative Frequency of Citation (RFC) index:*

It is calculated for each plant using the following formula<sup>[12]</sup>:

$$RFC = FC/N$$

Where:

- **FC** is the number of times the plant is cited (i.e., the number of times each plant is mentioned in the questionnaire).
- **N** is the total number of citations.

## **Results**

### *Participant Demographics*

The age distribution of participants consuming yerba mate showed that 31.3% were between 18–30 years old, 32.8% were aged 31–45, 26.9% were between 46–60 years, and 9% were over 60. In terms of gender, 55.4% of participants were female, while 45.6% were male. Geographically, 63.1% of participants resided in rural areas, while 36.9% lived in urban regions. Regarding educational levels, 41.5% had a university education, 20.7% completed high school, 13.3% had secondary education, 15% had primary education, 8% had completed graduate studies, and only 1.5% had no formal education, see figures (1, 2, 3, 4).

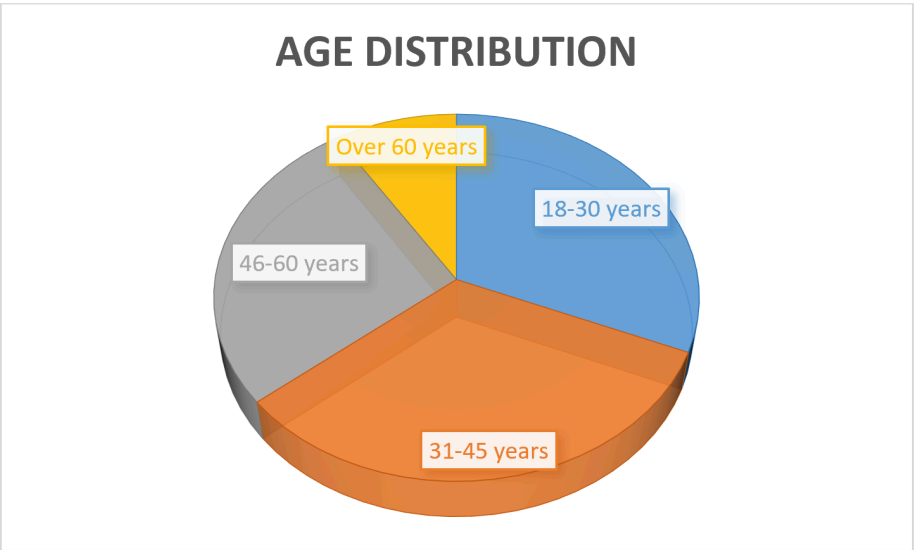


Figure 1. Age Distribution

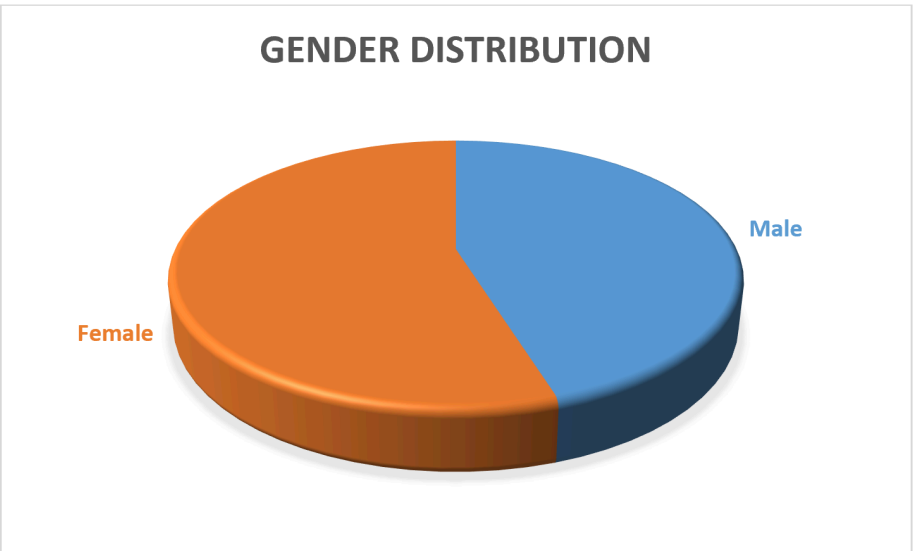
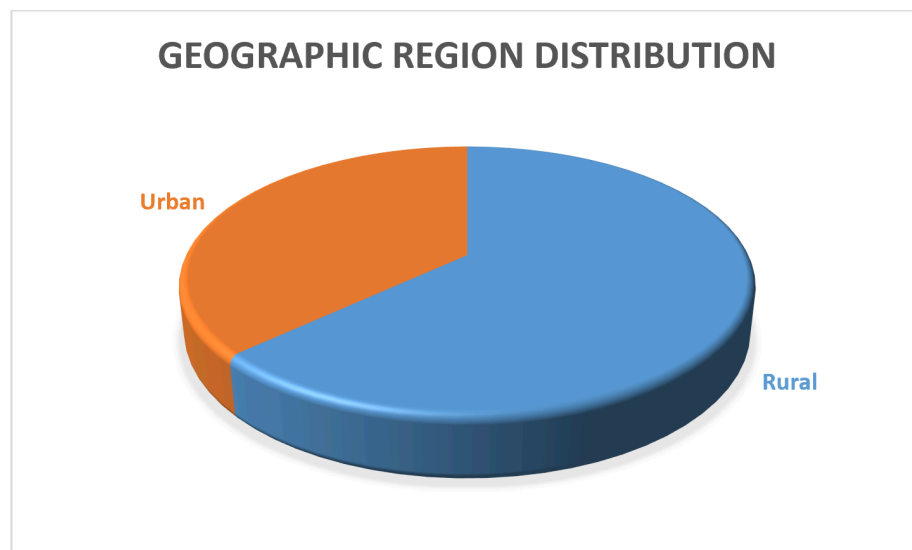
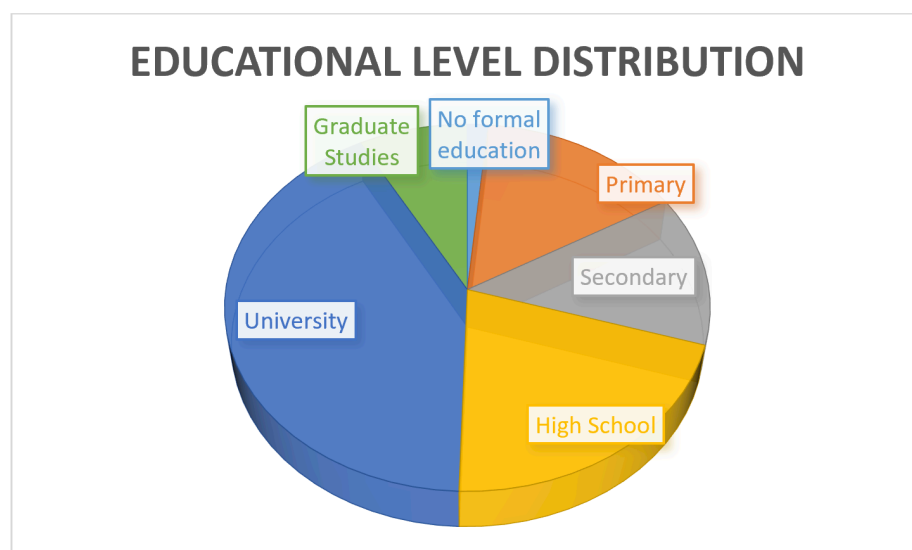


Figure 2. Gender Distribution



**Figure 3.** Geographic Region Distribution



**Figure 4.** Educational Level Distribution

### *Yerba Mate Consumption Patterns*

Among the participants, 89.2% reported consuming yerba mate regularly, with the remaining 10.8% abstaining from consumption due to various reasons, including a dislike of its taste (22.2%), perceived side effects (22.2%), lack of knowledge (11.1%), and other personal reasons (44.5%).

### *Reasons for Yerba Mate Consumption*

Health benefits were a primary motivator, with 60% of participants believing yerba mate is beneficial, 4.6% expressing doubt, and 35.4% uncertain. Among regular consumers, 27.27% cited habitual consumption, 25.9% drank it for health benefits, 24.6% enjoyed it as a social beverage, and 16.8% considered it a delicious drink, see figure (5).

## PRIMARY REASONS FOR YERBA MATE CONSUMPTION

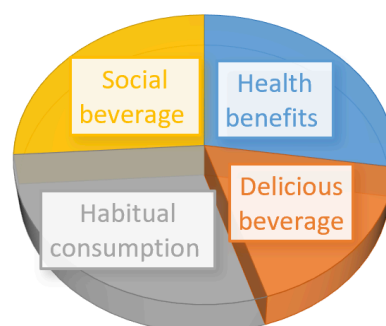


Figure 5. Primary Reasons for Yerba Mate Consumption

### *Social Practices*

Yerba mate plays a significant role in Syrian social customs, with 51.6% of participants reporting that they prefer drinking it in group settings, emphasizing its social importance.

### *Frequency of Consumption*

The majority of participants (50%) consume yerba mate multiple times daily, while 29% drink it once a day. Another 11.3% drink it every few days, and 8.1% consume it monthly or rarely, see figure (6).

## FREQUENCY OF YERBA MATE CONSUMPTION

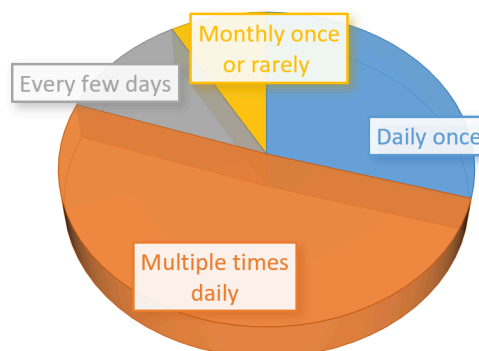


Figure 6. Frequency of Yerba Mate Consumption

### *Perceived Effects*

Participants reported various effects after consuming yerba mate, with 38.5% noting increased urination, 20% feeling enhanced mental activity, and 24.5% not experiencing any significant effects.

### *Preparation Preferences*

Most participants (88.9%) steep yerba mate for 2-5 minutes, with 68.3% preferring to drink it hot.

### *A Unique Method of Consuming Mate in Syria*

Syrian-style mate is commonly enhanced with various herbs, both local and imported. Local additions include Damascene tisane, such as Damascene zhourat, wild thyme, wormwood, marjoram, chamomile, lemongrass, lemon blossom, laurel, rosemary, lemon balm, basil, mint, Damask rose, sage, and Silver nailroot (Algerian tea). Imported options often include ginger, cinnamon, cloves, cardamom, green tea, and stevia. The choice of herbs varies according to individual preferences—some prefer mate without sweeteners, while others add milk or lemon to the brew. A survey revealed that 68.6% of regular mate drinkers opt to include herbs in their preparation. Table (1) presents the herbs used, along with their usage rates, relative frequency of citation (RFC), and health benefits. This practice, deeply rooted in Syrian culture, reflects a rich tradition where herbs are chosen not only for flavor but also for their health-boosting properties. Wormwood (*Artemisia herba-alba* Asso.) leads with a usage rate of 64.41% and an RFC of 0.120, known as a tonic, immune booster, and remedy for headaches, migraines, and digestive issues. Chamomile (*Matricaria chamomilla* L.), with a 59.32% usage rate and 0.110 RFC, is widely used to treat colds, flu, boost immunity, and support digestion. Other notable herbs like rosemary (*Rosmarinus officinalis* L.) and lemon balm (*Melissa officinalis* L.) are prized for their effects on memory, stress reduction, and digestive health. Although herbs like laurel (*Laurus nobilis* L.) have a lower usage rate (1.01%) and RFC (0.001), they are valued as body tonics and for their ability to alleviate headaches, chest infections, and rheumatism. Syrian mate drinking combines both local and imported herbs, supporting respiratory, digestive, and immune health, and even weight management, showcasing how this traditional practice enriches both cultural heritage and well-being through natural remedies.

Scientific Name	Common Name	Used Part	Usage Rate %	Relative Frequency of Citation (RFC)	Traditional Medicinal Benefits in Syria <sup>[13][14]</sup>
<i>Artemisia herba-alba</i> Asso.	Wormwood	L	64.41	0.120	Used as a tonic to boost immunity, treat headaches and migraines, and address digestive disorders and liver conditions.
<i>Rosmarinus officinalis</i> L.	Rosemary	L	61.01	0.113	Acts as a tonic and immune booster, helps alleviate headaches, serves as an antidepressant, reduces stress, and enhances memory.
<i>Matricaria chamomilla</i> L.	Chamomile	Fl	59.32	0.110	Commonly used for colds, flu, boosting immunity, relieving cramps, and aiding digestion.
<i>Melissa officinalis</i> L.	Lemon balm	L	45.76	0.085	Functions as a laxative, soothes the respiratory system, and treats stomach issues and colic.
<i>Thymus syriacus</i> Boiss.	Wild thyme	L	38.98	0.072	Used for respiratory conditions, particularly as a bronchodilator to clear the chest and bronchi, and to treat colds and flu.
<i>Ocimum basilicum</i> L.	Basil	L	35.59	0.066	Known for reducing blood pressure, stimulating digestion, acting as an anti-emetic and expectorant, and enhancing appetite.
<i>Origanum syriacum</i> L.	Marjoram	L	30.51	0.056	Helps treat chest congestion, relieve headaches and back pain, reduce stomach cramps, and alleviate indigestion and colic.
<i>Cymbopogon citratus</i> (DC.) Stapf	Lemongrass	L	23.72	0.044	Used as a digestive stimulant and energizer.
<i>Myrtus communis</i> L.	Myrtle	L	23.38	0.043	Acts as a general tonic, treats joint diseases and colds, serves as a diuretic, and helps lower blood sugar.
<i>Cinnamomum cassia</i> (L.) J.Presl	Cinnamon	Bk	21.01	0.039	Used as a tonic beverage and for lowering blood sugar levels.
<i>Elettaria cardamomum</i> (L.) Maton	Cardamom	F	20.67	0.038	Enhances flavor with its unique aroma, helps with nausea, vomiting, excess stomach acidity, digestive disorders, and stimulates appetite.
<i>Micromeria myrtifolia</i> Boiss. & Hohen.	Syrian Hyssop	AP	18.64	0.034	Treats chest and respiratory diseases, acts as an expectorant for colds and asthma, and helps with colic, digestion, and migraines.
<i>Zingiber officinale</i> Roscoe.	Ginger	R	17.96	0.033	Used for weight loss, as a general tonic, and for lowering blood lipid levels.



Scientific Name	Common Name	Used Part	Usage Rate %	Relative Frequency of Citation (RFC)	Traditional Medicinal Benefits in Syria <sup>[13][14]</sup>
<i>Mentha pulegium</i> L.	Mint	L	12.88	0.024	Relieves colic, soothes spasms and nausea, treats colds and digestive disorders, and acts as a pain reliever and nerve sedative.
<i>Salvia officinalis</i> L.	Sage	L	11.52	0.021	Aids in treating digestive and colon issues, addresses stomach problems and gas, enhances memory, acts as a diuretic, and helps regulate female hormones and menstrual pain.
<i>Rosa × damascena</i> Herrm.	Damask rose	Pt	9.83	0.018	Treats chest infections, coughs, and colds.
<i>Camellia sinensis</i> (L.) Kuntze	Green tea	L	9.15	0.017	Serves as a general tonic, reduces lipids and cholesterol, and aids in slimming and weight loss.
<i>Stevia rebaudiana</i> Bertoni	Stevia	L	9.15	0.017	Natural sweetener, helps reduce blood sugar levels, and supports weight loss.
<i>Viola odorata</i> L.	Common violet	Fl	6.44	0.012	Relieves cold and flu symptoms, serves as an expectorant and cough suppressant, and acts as a diuretic.
<i>Althaea officinalis</i> L.	Marsh mallow	Fl	4.06	0.007	Known for its expectorant, diuretic, emollient, digestive, and decongestant properties, and for alleviating joint pain.
<i>Paronychia argentea</i> Lam.	Algerian tea	AP	3.38	0.006	Acts as a diuretic, helps eliminate kidney stones and urinary sand, and is used to suppress coughs.
<i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry	Clove	Bu	3.05	0.005	Popular for calming stomach discomfort, reducing bloating, and enhancing digestion.
<i>Jasminum grandiflorum</i> L.	Jasmine	Fl	2.72	0.005	Used as a tonic and for treating respiratory and digestive issues.
<i>Olea europaea</i> L.	Olive	L	2.37	0.004	Helps manage diabetes, hypertension, and aids in weight loss.
<i>Laurus nobilis</i> L.	Laurel	L	1.01	0.001	Acts as a body tonic, relieves headaches, treats chest infections, and is used for rheumatism.

**Table 1.** Syrian Traditional Herbs Commonly Added to Mate: Usage, Health Benefits, and Citation Frequencies

### Concerns about Caffeine

When asked about caffeine content, 53.3% of participants reported no concerns and stated they would maintain their current consumption levels, while 38.3% indicated they might reduce their intake due to caffeine-related concerns.

### Cultural Significance

A notable 81% of participants viewed yerba mate as an integral part of their cultural heritage, highlighting its significance in both daily life and local traditions.

### Recent Studies on the Medicinal Use of Yerba Mate

Yerba mate is consumed not only for its traditional medicinal purposes but also for its numerous health benefits, which are attributed to its wealth of bioactive compounds. Below is a summary of the key medicinal uses of yerba mate based on recent research findings.

### Medicinal Uses of Yerba Mate

1. **Yerba mate has antioxidant properties** that protect cells from oxidative stress and may help to prevent the development of chronic diseases, such as cancer and CVD<sup>[15][16]</sup>.
2. **Promote Cardiovascular Health:** Studies show yerba mate can help to maintain healthier levels of LDL while boosting HDL. This also helps contribute to better heart health<sup>[17][18][19]</sup>.
3. **Weight Management:** Yerba mate has been linked to weight loss benefits. It may stimulate fat oxidation and promote feelings of fullness, which can aid in weight management. Some studies report that it can enhance metabolic rates during exercise<sup>[20][21][22]</sup>.
4. **Anti-Inflammatory Properties:** The product shows promise in reducing inflammation in the body, such as may help with arthritis and other inflammatory disorders<sup>[23][24][25]</sup>.
5. **Promotes Digestion:** Yerba mate has been employed historically to help digestion and relieve gastrointestinal discomfort, rendering it an excellent choice for digestive support<sup>[26][27]</sup>.
6. **Increased Cognitive Function and Mood:** The caffeine in yerba mate can stimulate mental alertness, concentration, and mood<sup>[16][28]</sup>.
7. **Antimicrobial properties:** Some preliminary evidence indicates that yerba mate might possess antimicrobial abilities and could potentially help in preventing bacterial and fungal infections<sup>[29][30][31]</sup>. Investigations show that yerba mate might contain antimicrobial features which could encourage infection protection. Research indicates that it can inactivate bacteria such as *E. coli*, the primary cause of UTIs. It also has antioxidant and anti-inflammatory properties which may help to support urinary tract health. Most current evidence is derived from in vitro studies or animal models. More rigorous clinical trials are necessary to confirm these benefits in humans<sup>[32]</sup>.
8. **Diabetes Management:** Due to the fact that yerba mate may enhance insulin sensitivity and control blood sugar levels, that is particularly valuable for people with type 2 diabetes<sup>[28][33][34]</sup>.
9. **Chemopreventive Properties:** There are indications that yerba mate might possess chemopreventive characteristics, which help prevent cellular damage that could cause cancer<sup>[35][36][37]</sup>.
10. **Other benefits:** In fact, one study found that postmenopausal women who consumed >1 liter/day of Yerba Mate for at least 4 years exhibited between 9.7%

higher bone mineral density (BMD) in the lumbar spine and 6.2% greater BMD in the femoral neck vs. a matched cohort of non-drinkers. These results indicate that consumption of Yerba Mate could exert beneficial effects on bone-associated parameters<sup>[38]</sup>. Yerba Mate consumption, however, does not seem to be related to a lower risk of fractures and has apparently no effect on bone metabolism<sup>[39]</sup>.

While yerba mate is often used for its diuretic properties, the clinical evidence supporting these benefits remains insufficient. Yerba mate infusion may promote diuresis due to its caffeine content, a well-known diuretic that enhances kidney function, leading to increased urination. The extent of this dehydrating effect varies depending on the caffeine dosage, with higher doses producing a more pronounced diuretic response<sup>[40][41]</sup>.

Although yerba mate has numerous proven health benefits, survey participants reported only a few noticeable effects: 38.5% experienced increased urination, 20% noted enhanced mental activity, and 24.5% observed no significant changes. This suggests a need to better inform users about yerba mate's potential benefits. Additionally, as most participants did not experience side effects, it is equally important to raise awareness of possible adverse effects, emphasize the importance of proper dosage, and highlight the risks of interactions with medications. Some studies indicate that frequent consumption of yerba mate, particularly at high temperatures or in large quantities over extended periods, may increase the risk of certain cancers, such as those affecting the mouth and throat<sup>[42]</sup>. People with conditions like hypertension or heart disease should consult healthcare professionals before consuming yerba mate due to its caffeine content<sup>[43]</sup>. Furthermore, high caffeine intake, especially when combined with diuretic medications that lower potassium, can lead to potassium depletion and increased diuresis<sup>[44]</sup>.

## 4. Discussion

Yerba Mate, originally from South America, has undergone a remarkable transformation in Syrian culture, becoming a staple beverage due to historical migration patterns. This study highlights the significant role it plays in both daily consumption and social rituals, particularly in rural regions like Qalamoun and As-Suwayda, Salamiyah, and the coastal region. Syrian adaptations, such as the communal sharing of Yerba Mate and the practice of adding medicinal herbs, reflect both cultural integration and an enhanced understanding of herbal medicine. The addition of herbs like wormwood, chamomile, and rosemary, each with distinct health benefits, demonstrates the synergistic use of Yerba Mate with local remedies, blending stimulant effects with immune-boosting, digestive, and respiratory health properties.

The findings suggest that Yerba Mate consumption in Syria is not only a social practice but also an herbal medicine ritual, potentially contributing to public health through its combination with locally esteemed medicinal plants. The high frequency of Yerba Mate consumption and its association with group gatherings emphasize its importance in Syrian social customs. Moreover, the preference for Yerba Mate over coffee and tea, especially with added herbs, indicates its unique status as a versatile and health-promoting beverage.

Given the unique Syrian experience of consuming mate with blends of traditional medicinal herbs (such as "Al-Zuhurat Al-Shamieh") or with individual herbs in proportions personally estimated by users according to their preferences and taste, further research is needed to evaluate the differences in terms of effects, flavor, and prevalence between the various mixtures of mate and Syrian herbs.

## 5. Conclusion

Yerba Mate has been successfully integrated into Syrian cultural and social life, with local adaptations enriching its traditional uses. The addition of medicinal herbs tailored to individual preferences and health needs suggests a complex interplay between cultural

heritage and functional beverage use. This fusion of traditions illustrates Yerba Mate's potential as both a social and therapeutic drink in Syria, offering health benefits through its bioactive compounds and the additional properties of the herbs used in preparation. Further research on the health impacts of these herbal combinations within Syrian Yerba Mate consumption could provide valuable insights into its broader applications in complementary medicine.

## 6. Limitations

The sample that participated in the survey may not represent the entire population, but it provides valuable insights into the prevalence of mate plant use in Syrian society. Many of the pharmacological effects and side effects of the mate plant remain insufficiently studied. This is due to the fact that traditionally used herbs are primarily consumed as traditional foods and supplements, and they require further research and scientific evaluation.

## Appendix A: Questionnaire Items

**Title:** Survey on the Folk Uses of the Mate Plant in Syria

**Informed Consent:** The data collected in this survey are intended for scientific research purposes and will be published in a scientific paper. Do you consent to the use of the traditional information you provide in this context?

1. Age
2. Gender
3. Which governorate are you from?
4. Geographic region
5. Which area or village are you from?
6. Educational level
7. Type of work
8. Do you consume mate beverage?
9. Do you think mate is beneficial?
10. If you do not consume mate, please explain the reason. (You may select more than one answer)
11. If you consume mate, what is the reason? (You may select more than one answer)
12. How did you learn to use mate? (You may select more than one answer)
13. If you consume mate, how often do you drink it?
14. If you consume mate, how do you feel when you drink it? (You may select more than one answer)
15. If you consume mate, do you add sugar for sweetness?
16. The method of preparing mate by steeping affects the solubility of active compounds; how long do you steep mate before drinking it?
17. If you consume mate, what is your preferred way to drink it?
18. Mate contains 0.35% - 1.7% caffeine alkaloids, which stimulate the central nervous system. Does this encourage you to:
19. Do you think regular consumption of mate leads to habituation?
20. If you consume mate, what do you think is the best time to drink it?
21. If you consume mate, do you regularly consume any other beverages? (You may select more than one answer)
22. If you consume mate, how much do you usually consume?
23. What is the estimated monthly expenditure on mate for your household in Syrian pounds?
24. If you consume mate, do you add other herbs to it?
25. Please list any herbs you add to the mate beverage (if any).
26. If you consume mate, how do you prepare it?
27. Have you experienced any side effects when consuming it?
28. If yes, please specify the side effects you experienced.

29. If you consume mate, how do you distinguish good quality from poor quality?
30. Do you believe that the use of mate is part of the cultural heritage in your area?
31. Are there traditions associated with serving or consuming mate during specific occasions?
32. What are the health benefits of mate from your perspective?
33. Do you think mate needs further scientific studies to determine its benefits more accurately?
34. What are the potential harms of consuming mate from your perspective?
35. Do you think that drinking mate is associated with social habits in your area?
36. Do you believe that mate consumption increases during study times or when there is a need for mental focus?
37. Do you think mate is imported or grown locally in Syria?
38. How would you evaluate your personal experience with mate?
39. Would you recommend others to drink mate?

## Statements and Declarations

### *Competing Interests*

We affirm that there are no conflicts of interest with any business organization regarding the study.

### *Funding*

No specific funding was received for this work.

### *Author Contributions*

CK: Conceptualization, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. OA: Data curation, Investigation (survey design assistance, dissemination, and data collection). Both authors have read and approved the final manuscript.

### *Ethical Considerations*

Ethical approval for this study was obtained from the relevant review committee of the Syrian Scientific Society of Medicinal Herbs and Complementary Medicine prior to the commencement of data collection. The study was conducted in accordance with recognized ethical guidelines.

Electronic informed consent was obtained from all individual participants before they proceeded with the survey. The introductory section of the survey explicitly stated: (1) the research purpose, including the intent to publish the findings; (2) that participation was voluntary and anonymous; (3) that no financial or other incentives would be provided; and (4) that by completing and submitting the survey, participants consented to the use of their anonymized data for research and publication. Participants were assured that all data would be handled with confidentiality.

### *Data Availability*

The anonymized dataset generated and analyzed during the current study is not publicly deposited but is available from the corresponding author (Chadi Khatib, [chadi.khatib@manara.edu.sy](mailto:chadi.khatib@manara.edu.sy)) on reasonable request. The survey instrument used for data collection is provided in Appendix A.

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## References

1. <sup>a</sup> <sup>b</sup>Sulaiman N, Pieroni A, Söukand R, Whitney C, Polesny Z (2021). "Socio-cultural significance of Yerba Maté among Syrian residents and diaspora." *Economic Botany*. 75:97–111.
2. <sup>a</sup>INYM (2019). "National Institution of Argentine yerba maté." INYM. <https://inym.org.ar/>.
3. <sup>a</sup> <sup>b</sup>Pieroni A, Vandebroek I (2007). *Traveling cultures and plants: The ethnobiology and ethnopharmacy of human migrations*. New York, Oxford: Berghahn Books.
4. <sup>a</sup>Karpat KH (1985). "The "Syrian" emigration from the Ottoman state, 1870–1914." *International Journal of Middle East Studies*. 17(2):175–209.
5. <sup>a</sup> <sup>b</sup><https://verbamateargentina.org/> (4 October 2024)
6. <sup>a</sup>Folch C (2010). "Stimulating consumption: Yerba mate myths, markets, and meanings from conquest to present." *Comparative Studies in Society and History*. 52:6–36.
7. <sup>a</sup>Carmona MD, Llorach R, Obon C, Rivera D (2005). "Zahraa, a Unani multicomponent herbal tea widely consumed in Syria: components of drug mixtures and alleged medicinal properties." *Journal of Ethnopharmacology*. 102(3):344–350. doi:10.1016/j.jep.2005.06.030.
8. <sup>a</sup>Obón C, Rivera D, Alcaraz F, Attieh L (2014). "Beverage and culture. Zhourat, a multivariate analysis of the globalization of a herbal tea from the Middle East." *Appetite*. 79:1–10. doi:10.1016/j.appet.2014.03.024.
9. <sup>a</sup>Obón C, Rivera D, Fonollá E, Alcaraz F, Attieh L (2021). "A Comparison Study on Traditional Mixtures of Herbal Teas Used in Eastern Mediterranean Area." *Frontiers in Pharmacology*. 12:632692. doi:10.3389/fphar.2021.632692.
10. <sup>a</sup>Bernard HR (2002). *Research methods in anthropology: Qualitative and quantitative methods*. Walnut Creek, California: Alta Mira Press.
11. <sup>a</sup>Dolores M, Tongco C (2007). "Purposive sampling as a tool for informant selection." *Ethnobotany Research & Applications*. 5:147–158.
12. <sup>a</sup>Tardío J, Pardo-de-Santayana M (2008). "Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain)." *Economic Botany*. 62:24–39.
13. <sup>a</sup>Khatib C, Nattouf A, Hasan Agha MI (2021). "Traditional medicines and their common uses in central region of Syria: Hama and Homs—an ethnomedicinal survey." *Pharmaceutical Biology*. 59(1):776–786.
14. <sup>a</sup>Khatib C, Nattouf A, Agha MIH (2021). "Ethnobotanical survey of medicinal herbs in the Western region in Syria (Latakia and Tartus)."
15. <sup>a</sup>Gris CCT, Frota EG, Guarienti C, Vargas BK, Gutkoski JP, Biduski B, Bertolin TE (2021). "In vitro digestibility and stability of encapsulated yerba mate extract and its impact on yogurt properties." *Journal of Food Measurement and Characterization*. 15(2):2000–2009.
16. <sup>a</sup> <sup>b</sup>Alkhatib A, Atcheson R (2017). "Yerba Maté (*Ilex paraguariensis*) metabolic, satiety, and mood state effects at rest and during prolonged exercise." *Nutrients*. 9(8):882.
17. <sup>a</sup>Junior ELC, Morand C (2016). "Interest of mate (*Ilex paraguariensis* A. St.-Hil.) as a new natural functional food to preserve human cardiovascular health—A review." *Journal of Functional Foods*. 21:440–454.
18. <sup>a</sup>Sarria B, Martinez-Lopez S, Garcia-Cordero J, Gonzalez-Ramila S, Mateos R, Bravo L (2020). "Yerba mate improves cardiovascular health in normocholesterolemic and hypercholesterolemic subjects." *Proceedings of the Nutrition Society*. 79(OCE2):E635.
19. <sup>a</sup>Da Veiga DTA, Bringhenti R, Copes R, Tatsch E, Moresco RN, Comim FV, Premaor MO (2018). "Protective effect of yerba mate intake on the cardiovascular system: a post hoc analysis study in postmenopausal women." *Brazilian Journal of Medical and Biological Research*. 51(6):e7253.

20. <sup>△</sup>Kim SY, Oh MR, Kim MG, Chae HJ, Chae SW (2015). "Anti-obesity effects of Yerba Mate (*Ilex Paraguariensis*): a randomized, double-blind, placebo-controlled clinical trial." *BMC Complementary and Alternative Medicine*. **15**:1–8.
21. <sup>△</sup>Yimam M, Jiao P, Hong M, Brownell L, Lee YC, Hyun EJ, Jia Q (2016). "Appetite suppression and antiobesity effect of a botanical composition composed of *Morus alba*, Yerba mate, and *Magnolia officinalis*." *Journal of Obesity*. **2016**(1):4670818.
22. <sup>△</sup>Balsan G, Pellanda LC, Sausen G, Galarraga T, Zaffari D, Pontin B, Portal VL (2019). "Effect of yerba mate and green tea on paraoxonase and leptin levels in patients affected by overweight or obesity and dyslipidemia: a randomized clinical trial." *Nutrition Journal*. **18**:1–10.
23. <sup>△</sup>Arçari DP, Bartchewsky Jr W, Dos Santos TW, Oliveira KA, DeOliveira CC, Gotardo ÉM, Ribeiro ML (2011). "Anti-inflammatory effects of yerba maté extract (*Ilex paraguariensis*) ameliorate insulin resistance in mice with high fat diet-induced obesity." *Molecular and Cellular Endocrinology*. **335**(2):110–115.
24. <sup>△</sup>Puangpraphant S, De Mejia EG (2009). "Saponins in yerba mate tea (*Ilex paraguariensis* A. St.-Hil) and quercetin synergistically inhibit iNOS and COX-2 in lipopolysaccharide-induced macrophages through NF- $\kappa$ B pathways." *Journal of Agricultural and Food Chemistry*. **57**(19):8873–8883.
25. <sup>△</sup>Olate-Briones A, Albornoz-Muñoz S, Rodríguez-Arriaza F, Rodríguez-Vergara V, Aguirre J M, Liu C, Herrada AA (2024). "Yerba Mate (*Ilex paraguariensis*) Reduces Colitis Severity by Promoting Anti-Inflammatory Macrophage Polarization." *Nutrients*. **16**(11):1616.
26. <sup>△</sup>Correa VG, Garcia-Manieri JAA, Dias MI, Pereira C, Mandim F, Barros L, Bracht A (2024). "Gastrointestinal digestion of yerba mate, rosemary and green tea extracts and their subsequent colonic fermentation by human, pig or rat inocula." *Food Research International*. **194**:114918.
27. <sup>△</sup>Gris CCT, Frota EG, Guarienti C, Vargas BK, Gutkoski JP, Biduski B, Bertolin TE (2021). "In vitro digestibility and stability of encapsulated yerba mate extract and its impact on yogurt properties." *Journal of Food Measurement and Characterization*. **15**(2):2000–2009.
28. <sup>△</sup><sup>b</sup>Meyer K, Ball P (2004). "Psychological and cardiovascular effects of guaraná and yerba maté: A comparison with coffee." *Revista Interamericana de Psicología/Interamerican Journal of Psychology*. **38**(1).
29. <sup>△</sup>Kungel PT, Correa VG, Corrêa RC, Peralta RA, Soković M, Calhelha RC, Peralta RM (2018). "Antioxidant and antimicrobial activities of a purified polysaccharide from yerba mate (*Ilex paraguariensis*)." *International Journal of Biological Macromolecules*. **114**:1161–1167.
30. <sup>△</sup>Martin JGP, Porto E, de Alencar SM, da Glória EM, Corrêa CB, Cabral ISR (2013). "Antimicrobial activity of yerba mate (*Ilex paraguariensis* St. Hil.) against food pathogens." *Revista Argentina de Microbiologia*. **45**(2):93–98.
31. <sup>△</sup>Burris KP, Davidson PM, Stewart Jr CN, Harte FM (2011). "Antimicrobial activity of yerba mate (*Ilex paraguariensis*) aqueous extracts against *Escherichia coli* O157: H7 and *Staphylococcus aureus*." *Journal of Food Science*. **76**(6):M456–M462.
32. <sup>△</sup>de Vasconcellos AC, Frazzon J, Zapata Noreña CP (2022). "Phenolic Compounds Present in Yerba Mate Potentially Increase Human Health: A Critical Review." *Plant Foods Hum Nutr*. **77**(4):495–503. doi:10.1007/s11130-022-01008-8. PMID 36169873.
33. <sup>△</sup>Sarria B, Martinez-Lopez S, García-Cordero J, Gonzalez-Ramila S, Mateos R, Bravo L (2020). "Yerba mate may prevent diabetes according to a crossover, randomized, controlled study in humans." *Proceedings of the Nutrition Society*. **79**(OCE2):E245.
34. <sup>△</sup>Kang YR, Lee HY, Kim JH, Moon DI, Seo MY, Park SH, Oh HG (2012). "Anti-obesity and anti-diabetic effects of Yerba Mate (*Ilex paraguariensis*) in C57BL/6J mice fed a high-fat diet." *Laboratory animal research*. **28**(1):23–29.
35. <sup>△</sup>Amigo-Benavent M, Wang S, Mateos R, Sarriá B, Bravo L (2017). "Antiproliferative and cytotoxic effects of green coffee and yerba mate extracts, their main hydroxycinnamic acids, methylxanthine and metabolites in different human cell lines." *Food and chemical toxicology*. **106**:125–138.
36. <sup>△</sup>Puangpraphant S, Berhow MA, Vermillion K, Potts G, Gonzalez de Mejia E (2011). "Dicaffeoylquinic acids in Yerba mate (*Ilex paraguariensis* St. Hilaire) inhibit NF- $\kappa$ B nucleus translo

- cation in macrophages and induce apoptosis by activating caspases-8 and -3 in human colon cancer cells." *Molecular nutrition & food research*. 55(10):1509–1522.
37. <sup>△</sup>Boaventura BCB, Amboni RDDMC, da Silva EL, Prudencio ES, Di Pietro PF, Malta LG, Liu RH (2015). "Effect of in vitro digestion of yerba mate (*Ilex paraguariensis* A. St. Hil.) extract on the cellular antioxidant activity, antiproliferative activity and cytotoxicity toward HepG2 cells." *Food Research International*. 77:257–263.
  38. <sup>△</sup>Conforti AS, Gallo ME, Saravi FD (2012). "Yerba Mate (*Ilex paraguariensis*) consumption is associated with higher bone mineral density in postmenopausal women." *Bone*. 50(1):9–13.
  39. <sup>△</sup>da Veiga DT, Brighenti R, Bolignon AA, Tatsh E, Moresco RN, Comim FV, Premaor MO (2018). "The yerba mate intake has a neutral effect on bone: a case–control study in postmenopausal women." *Phytotherapy Research*. 32(1):58–64.
  40. <sup>△</sup>Bastos DHM, Fornari AC, Queiroz YD, Soares RAM, Torres EAFS (2005). "The chlorogenic acid and caffeine content of yerba maté (*Ilex paraguariensis*) beverages." *Acta Farm. Bonaerense*. 24(1):91–5.
  41. <sup>△</sup>Aburwais R, Abukhattala E, Ashini F, Arafat M (2024). "The effect of ethanolic extract and Caffeine extract of the yerba Mate plant (*Ilex paraguariensis*) on the vital functions and tissues of the liver and kidneys in guinea pigs." *Libyan Journal of Academic Research*. 28:53–44.
  42. <sup>△</sup>Loria D, Barrios E, Zanetti R (2009). "Cancer and yerba mate consumption: a review of possible associations." *Revista Panamericana de Salud Pública*. 25:530–539.
  43. <sup>△</sup>Reyes CM, Cornelis MC (2018). "Caffeine in the diet: country-level consumption and guidelines." *Nutrients*. 10(11):1772.
  44. <sup>△</sup>Santin D, et al. (2014). "Effect of potassium fertilization on yield and nutrition of yerba mate (*Ilex paraguariensis*)." *Revista Brasileira de Ciência do Solo*. 38:1469–1477.

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