



Marketing Efficiency and Marketing Margins of Taranjabin Manna (*Alhagi maurorum*) in Khorasan Razavi Province

Esmail Alizadeh^{1*} , Parmis Siami¹ 

¹ Department of Reclamation of Arid and Mountainous Region, Faculty of Natural Resources, University of Tehran, Alborz, Karaj, Iran. Email: ealizadeh@ut.ac.ir

Article Info.

Article type:
Research Article

Article history:
Received: 06 Feb. 2026
Received in revised form: 07 Mar. 2026
Accepted: 09 Mar. 2026
Published online: 27 Mar. 2026

Keywords:
Taranjabin Manna,
Arid lands,
Marketing margin,
Value chain.

ABSTRACT

Arid and semi-arid regions offer significant potential for producing unique medicinal and pharmaceutical products. Understanding marketing efficiency, value chains, and economic returns from such products can enhance income generation and support sustainable development in local communities. Taranjabin manna, derived from *Alhagi maurorum* (commonly known as camelthorn), is a valuable traditional medicinal product in Iran, used in ethnomedicine as an expectorant, demulcent, and laxative. This study investigated the marketing margins and efficiency of Taranjabin manna across the supply chain using structured questionnaires administered to producers (harvesters), wholesalers, and retailers in Jovin and Kashmar counties of Iran. Marketing margins were calculated at each level, while qualitative indicators, including packaging, sales channels, and market connectivity, were assessed to evaluate overall market performance. Results showed that the retail-level marketing margin 1400000 IRR was substantially higher than the wholesale margin 3700000 IRR. Notably, producers (harvesters) captured 51.5% of the final consumer price, a relatively high share compared to many non-timber forest products and medicinal plants in similar supply chains. Packaging quality emerged as a key factor influencing final price formation and consumer purchase intent. The study also highlighted the role of intermediaries in price determination and the limited direct market access for harvesters. These findings suggest that improving packaging standards, strengthening direct market linkages, and enhancing supply-chain transparency could increase harvester returns, promote sustainable harvesting practices, and reduce dependence on livestock grazing in fragile arid ecosystems. Such interventions may support alternative livelihoods and contribute to environmental conservation in Iran's drylands.

Cite this article: Alizadeh, E., Siami, P. (2026). Marketing Efficiency and Marketing Margins of Taranjabin Manna (*Alhagi maurorum*) in Khorasan Razavi Province. DESERT, 31 (1), DOI: 10.22059/jdesert.2026.107339



1. Introduction

Iran's arid regions exhibit considerable geographic and climatic variation, fostering a diverse array of desert ecosystems. These conditions support varied plant communities that yield distinctive medicinal products. Given the inherent constraints on large-scale production in such environments, these items often have substantial economic value, offering producers attractive profit margins. A more precise grasp of these products and their market dynamics is essential for identifying investment prospects in this sector. Such insights strengthen decision-making among stakeholders and bolster the adaptive capacity of local communities in these challenging settings (Valibeigi *et al.*, 2024).

In the production of medicinal plants, the marketing margin is the difference between the price received by the producer (e.g., the cultivator) and the price at subsequent stages, including wholesalers, retailers, or processors (MacDonald *et al.*, 2004). This margin captures the cumulative markups applied throughout the supply chain to offset expenses related to transport, storage, processing, and intermediary returns, thereby reflecting the economic value added beyond primary cultivation. For medicinal plants such as Moringa and castor, which serve pharmaceutical, herbal medicine, and related purposes, this framework illustrates value distribution from cultivation through to end users, frequently involving processing steps tailored to demands in herbal remedies, cosmetics, and nutraceuticals (Wohlgenant, 2001; Olsen & Helles, 2009; Booker *et al.*, 2012).

Market size in economics hinges on the number of potential buyers, the intensity of their demand, and their purchasing power and willingness to buy. Marketing efforts aim to expand markets, meet consumer needs, and uncover latent needs. Central to this is a thorough understanding of buyers and effective demand management, which encompasses sustaining producer-consumer linkages (Tabas *et al.*, 2025).

A key obstacle to expanding markets for medicinal plant products in developing countries remains limited knowledge of marketing and distribution channels. This shortfall affects critical functions, including packaging, grading, and processing. Intermediaries and brokers often dominate by establishing monopolistic positions and controlling prices, thereby compressing profit margins, especially for primary producers (De Silva, 1997). Small enterprises stand out for their capacity to generate employment, adapt quickly, foster innovation, achieve strong productivity, and deliver suitable returns. These attributes have prompted policymakers in both developed and developing economies to prioritize small businesses, supporting them through targeted programs to advance national economic growth.

In desert areas, establishing small businesses can markedly improve economic conditions, extend life expectancy, and build greater resilience among inhabitants, particularly against climate variability and ecosystem vulnerability. Moreover, demand for medicinal plants continues to grow, driven by their ready availability, low cost, and crucially, their minimal side effects.

Fluctuations primarily influence marketing margins by affecting retail demand, supply volumes, and input costs for marketing activities. Other factors, including temporal mismatches between supply and demand, market power, risk exposure, technological shifts, variations in product quality, and regulatory factors, further shape margin magnitude. The importance of marketing processes and margins in product distribution and sales has prompted substantial research in this domain. (Hosseini & Ahugalandi, 2007) applied a markup model to saffron marketing margins and found that these margins are directly correlated with price levels and marketing costs. (Amirnejad & Rafiei, 2009) assessed rice marketing margins and efficiency in

Mazandaran province using relevant indices; they reported that the wholesale margin surpassed the retail margin, with producers capturing 52% of the final price. Generally, the presence of wholesalers has led to increased market inefficiency. The producer-wholesaler-consumer route is the least efficient in terms of price, technical aspects, and overall inefficiency. In contrast, the most efficient route is the producer-consumer route. (Abebe, 2009) examined honey marketing margins, analyzing influencing factors and distribution patterns using a markup model, and concluded that margins are directly related to retail prices and marketing costs.

(Wongnaa *et al.*, 2014) investigated the economics of tomato marketing in Ghana and identified the wholesale margin as the most significant (99.7%), followed by the retail margin (75.4%). Regression analysis highlighted labour costs, purchase price, transportation, and selling price as principal determinants of marketing profit. Mobarhan *et al.* (2021) studied market behaviour for Iranian borage (*Echium amoenum*), estimating retail marketing margin at 960,000 IRR and wholesale at 28,615,400 IRR; producers retained 57.46% of the final price, deemed a reasonable proportion.

Given that manna has been widely used in various traditional medicines. In Iran, manna from various sources has been recognized for its medicinal properties (Mahboubi *et al.*, 2025). It is commonly used to treat shortness of breath and acts as an antipyretic. Additionally, some types of manna are recommended as laxatives, for relieving jaundice, and as cough remedies (Abdul-Hafeez *et al.*, 2015; Ayati *et al.*, 2024). To extend our view towards future indications of manna for medicinal and clinical purposes, this study is focused on solid understanding of marketing practices, marketing margin and issues that significantly impact final product pricing. Taranjabin (Manna of Hedysarum) consists of an excretory substance generated by the spittlebug *Poophilus nebulosus* feeding on *Alhagi maurorum* (*A. maurorum*), forming small white to yellow granules (Yaghmaee & Karimpour, 2008; Rameshk *et al.*, 2023; Ayati *et al.*, 2024). This product merits attention because *A. maurorum* exhibits strong adaptation to marginal habitats. The plant occurs naturally across most Iranian desert regions and frequently colonizes abandoned farmland. However, the insect's specific habitat requirements limit Taranjabin production to hot, arid zones, notably along desert margins in the provinces of Razavi Khorasan, South Khorasan, and Yazd (Ramezany *et al.*, 2013; Tavassoli *et al.*, 2020; Ayati *et al.*, 2024). Taranjabin finds varied medicinal uses, commonly combined with other herbal preparations, and supports a substantial domestic market alongside demand in neighbouring countries. It ranks among Iran's exported medicinal plant products

Jovin and Kashmar counties emerge as principal production hubs for Taranjabin manna nationwide. With its notable medicinal and economic attributes, Taranjabin offers income-generating opportunities and alternative livelihoods for local communities and rangeland users. This study seeks to elucidate the current market conditions and examine marketing margins at the producer, wholesaler, and retailer stages.

2. Materials and methods

A. maurorum occurs throughout Iran, yet successful cultivation, particularly for Taranjabin production, depends heavily on the environmental adaptations of the associated insect. The natural habitat and primary production canters of this insect remain restricted mainly to Khorasan Razavi Province (Khalilabad, Kashmar, Jovein, Gonabad), South Khorasan Province (Ghaen, Nehbandan, Birjand), and North Khorasan Province (Mane, Salmaghan, Faruj).

Literature review and background information were compiled through library research supplemented by field data collection. This involved questionnaires, semi-structured

interviews, and direct observations in Jovein and Kashmar counties during the summer of 2024 (Fig.1).

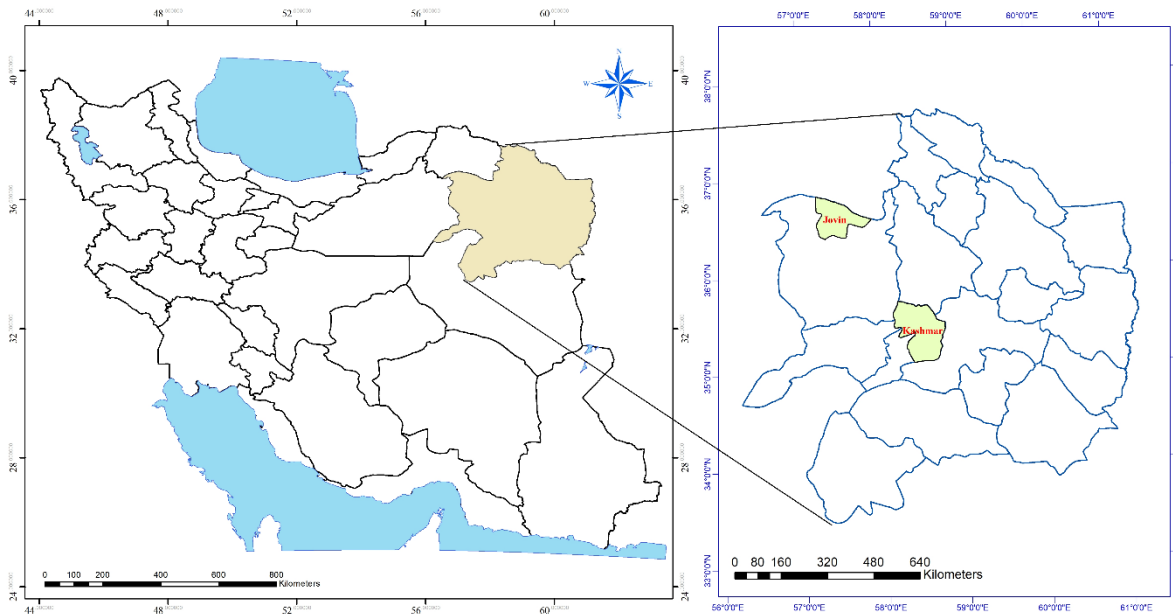


Figure 1. Geographical location of Khorasan Razavi Province in Iran and the Jovein and Kashmar region in Khorasan Razavi Province.

Sample size was estimated using (Cochran, 1977) formula, based on the total populations of producers, wholesalers, and retailers, whose occupation was this. In total, 30 questionnaires were distributed across these groups (Fig.2). Content validity, issues such as all effective factors in the marketing process and increasing its efficiency, was established via expert review, and reliability was assessed with Cronbach's alpha coefficient was 0.76 and it was good level, so the reliability of the questionnaire was acceptable. The statistical population comprised local manna producers, as well as wholesalers and retailers from neighboring cities. Final sample sizes, determined using Cochran's formula, were 20 producers, 5 wholesalers, and 20 retailers.

A central element of marketing analysis involves the computation of the marketing margin. Wallen and Turner (1970) defined this margin as the aggregate costs incurred along the product's marketing channel from harvest to final consumer; in effect, it represents the share of revenue that accrues to marketing activities rather than the producer.

Marketing margins are typically segmented into wholesale, retail, and total (overall) margins. In the present study, margins were calculated using the relative margin model originally outlined by (Gardner, 1975) (1). This approach expresses the marketing margin as a function of total revenue, retail price, and marketing costs, with the contribution of each component determined as follows:

$$\begin{aligned}
 M_R &= P_R - P_W & M_R &= \text{Retail Margin} \\
 M_W &= P_W - P_F & M_W &= \text{Marketing Margin} \\
 M_T &= M_R + M_W = P_R - P_F & M_W &= \text{Wholesale Margin} \\
 & & M_T &= \text{Total Margin} \\
 & & P_F &= \text{Farm – Gate Price} \\
 & & P_R &= \text{Retail Price} \\
 & & P_W &= \text{Wholesale Price}
 \end{aligned}
 \tag{1}$$



Figure 2. A. *maurorum* and traditional harvesting tools for Taranjabin in the study areas.

To evaluate the marketing margin for Taranjabin, the relative margin model proposed by Gardner (1975) (2) was applied. The model frames the marketing margin in terms of total revenue, retail price, and associated costs. Shares attributable to each market participant are computed as:

$$\begin{aligned}
 S_P &= (P_F / P_R) * 100 \\
 S_W &= (M_W / P_R) * 100 \\
 S_R &= (M_R / P_R) * 100
 \end{aligned}
 \tag{2}$$

Here, S_P denotes the producer's share of the retail price, while S_W indicates the wholesaler's share. The marketing cost coefficient, which quantifies the proportion of marketing costs relative to the final price, is derived from the relationship (3):

$$R = (P_R - P_F / P_R) * 100
 \tag{3}$$

In this expression, R represents the marketing cost coefficient.

3. Results

The economic importance of medicinal plants, together with their contributions to public health and well-being, prompted this study to evaluate market efficiency and marketing processes for Taranjabin as a potentially valuable investment opportunity in arid regions. Findings indicate that producers receive an average of 18800000 IRR per kilogram of collected manna. Overall marketing costs for the product averaged 428700 IRR per kilogram, resulting in a net producer income of 18371300 IRR (Table 1). Harvesters perform no distinct marketing activities for the product, and average price data for this stage did not warrant separate cost calculations; thus, their net income remains unaffected, and marketing yields no additional profit at the harvest level.

Table 1. Revenues and costs of Taranjabin manna at the harvester level (IRR/Kg)

Revenues and Costs	IRR /Kg
Average price received by producers	18800000
Sifting cost (product clearing)	90000
Packaging cost for sale	118700
Transportation cost	100000
Storage cost	120000
Total cost of marketing	428700
Net profit from producers	18371300
Average price of Manna before the marketing process	17200000
Net profit from the marketing process	1171300

Taranjabin's relatively stable chemical composition facilitates straightforward storage and transport. Consequently, no specialized marketing services are required, enabling these operations to proceed at minimal cost.

To characterize the market, Taranjabin's revenues and costs were examined at the wholesale and retail levels in Jovein and Kashmar counties, as well as in traditional herbal medicine outlets in Tehran. Wholesalers received an average price of 22500000 IRR per kilogram, while retailers averaged 36500000 IRR per kilogram (Table 2). Packaging and customer presentation occur primarily at these stages and transportation cost pay by wholesalers; total marketing costs reached 1020000 IRR in the wholesale sector and 1810000 IRR in the retail sector. Net profits were calculated at 2680000 IRR for wholesalers and 3140000 IRR for retailers.

Table 2. Revenues and costs of the product at wholesale and retail levels (IRR)

Factor	Retail	Wholesale
Average price received	36500000	22500000
Transportation cost	0	1020000
Packaging cost	720000	0
Rent and labour cost	570000	0
Other costs (advertising, etc.)	520000	0
Total marketing cost	1810000	1020000
Net receipts	34690000	21480000
Average price of Manna before marketing	22500000	18800000
Net profit from the marketing process	3140000	2680000

Marketing margin calculations for the wholesale and retail sectors yielded a wholesale margin of 3700000 IRR, a retail margin of 14000000 IRR, and a total marketing margin of 17700000 IRR. The analysis also quantified each market participant's contribution to the final consumer price: producers accounted for 51.5%, wholesalers for 10.1%, and retailers for 38.4%, with producers retaining the largest share (Table 3).

Table 3. Share of market participants in the final consumer price

Participant	Marketing margin (IRR)	Share of final price (%)
Producer	-	51.5
Wholesale	3700000	10.1
Retail	14000000	38.4
Total Market Margin	17700000	
Average Consumer Price	36500000	

Comparison of the average pre-marketing price with the final retail price yielded a marketing cost coefficient of 6.1%.

Marketing efficiency

Another key indicator of market performance is the marketing cost coefficient, along with the product's marketing efficiency. In Jovein and Kashmar cities, total marketing costs for Taranjabin averaged 2238700 IRR per kilogram. This level of cost generated an added value of 6981300 IRR per unit of marketing expenditure. The primary objective of marketing is to enhance sales, build brand recognition and trust, increase customer return rates and improve market positioning. The rate between various marketing expenses, such as advertising and packaging, and the added value generated is referred to as marketing efficiency. The marketing efficiency ratio for this product is 3.1.

$$ME = VA - TMC$$

$$MER = VA / TMC$$

Table 4. Marketing cost and marketing efficiency coefficient for manna (per kg)

Index	Value
Marketing Cost Ratio, R (%)	6.100
Value Added, VA (IRR)	6981300
Total Marketing Cost, TMC (IRR)	2238700
Marketing Efficiency, ME (IRR)	4742600
Marketing Efficiency Ratio (MER)	3.100

4. Discussion

Interest in the processing and marketing of medicinal plants has persisted for centuries. Contemporary consumer preference for organic and natural remedies, mainly attributable to their lower incidence of adverse effects, has elevated their economic relevance and reshaped market dynamics for these commodities. Creating added value and ensuring business sustainability depends on participants' understanding of supply and demand patterns and their familiarity with marketing channels (Möller & Törrönen, 2003). In this investigation, the total marketing margin for Taranjabin was estimated at 17700000 IRR. The wholesale margin stood at 3700000 IRR, and the retail margin at 14000000 IRR. Comparisons across market segments indicate that retail pricing exerts substantial influence on the overall margin for this product (Amirnejad & Rafiei, 2009; F. Mobarhan *et al.*, 2021; Wohlgenant, 2001). Elevated retail prices stem from multiple sources, including limited availability of standardized supply and subdued sales volumes. Proposals to safeguard consumers by compressing margins overlook the

dominant role of supply shortages in driving disproportionate increases. Rising storage expenses from unsold inventory further contribute to these elevations.

Producers retained 51.5% of the final retail price, compared with 10.1% for wholesalers and 38.4% for retailers. Comparable patterns emerge in studies of horticultural and agricultural commodities, such as the share of producers in the final price of rice and *Echium amoenum*, where producer, retailer and operational cost structures and market transparency strongly determine final prices. (Akbari & Mehrjerdi, 2011; Amirnezhad; Mobarhan *et al.*, 2021). Also, distance from production sites amplifies the effect of marketing margins on pricing, a pattern consistent with prior study on *Echium amoenum* in Behshahr County (Mobarhan *et al.*, 2021) and broader assessments of Iranian agricultural products (Akbari & Mehrjerdi, 2011; Feizabadi, 2011). The relatively high producer share likely reflects several factors: absence of formal cultivation costs for this wild-harvested resource, occasional direct sales to retailers that circumvent intermediaries, and negligible marketing outlays.

Given the seasonal nature of collection and sale, many participants derive primary income from agriculture or livestock, which may reduce incentives to invest in value-adding steps such as quality-based grading or improved packaging. The product's extended shelf life reinforces this limited emphasis on post-harvest enhancements. In this regard, increasing market transparency could also better illustrate these limitations. Market transparency can be defined as the availability of relevant market information to market participants. This includes prices, production and stocks. Transparency increases the efficiency of markets, reduces information asymmetries and supports evidence-based policy-making.

5. Conclusion

The study of marketing processes showed that intermediaries increase the final consumer price by approximately 48.5%. To mitigate such escalation, policy interventions should prioritize market expansion by supporting the cultivation of *Alhagi* species, alongside improvements in product quantity and quality. Complementary measures, including access to low-interest credit and development of direct producer-to-consumer channels, could incentivize greater involvement in marketing activities, yielding higher-quality outputs. These steps would strengthen the production-to-consumption chain, delivering greater value to participants and enhanced consumer welfare. Labour constitutes the principal expense in harvesting, which remains reliant on manual, traditional techniques. Adopting mechanized or semi-mechanized approaches to product sorting and packaging holds promise for reducing these costs and improving overall productivity.

Acknowledgments

This work was supported by the Office of Research and Technology of the University of Tehran.

Authors Contribution

Esmail Alizadeh: Conceptualization, Investigation, Methodology, Project administration, Supervision, Writing – review & editing. Parnis Siami: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Ethics approval and Consent to participate

Not applicable.

Competing Interests

The authors declare that they have no conflicts of interest.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Consent for Publication

The authors consent to the publication of identifiable details, which may include in-text details, which will be published in the journal and the above article.

Data Availability

Data available on request from the authors.

References

- Abdul-Hafeez, E., Mahmoud, A., & Ibrahim, O. (2015). Antibacterial activities and phytochemical screening of *Alhagi pseudalhagi*. *Assiut Journal of Agricultural Sciences*, 46(5), 33–47. <https://doi.org/10.21608/AJAS.2016.530>
- Abebe, A. (2009). *Market chain analysis of honey production in Atsbi Wemberta District, eastern zone of Tigray national regional state* Haramaya University.
- Akbari, S. M. R., & Mehrjerdi, M. Z. (2011). Analysis of marketing margins, dry garden products in Iran. *Chinese Business Review*, 10(7).
- Amirnejad, H., & Rafiei, H. (2009). Investigation of the margin and efficiency of rice market in Mazandaran province. 7th Iranian Conference on Agricultural Economics.(In Persian). <https://doi.org/10.22067/jead2.v1389i2.3935>
- Ayati, Z., Azizi, N., Amiri, M. S., Ramezani, M., Nikakhtar, Z., Tavassoli, A. P., Salehifar, E., Aalinezhad, S., Dabaghian, F., & Emami, S. A. (2024). Ethnobotany, phytochemistry and medicinal properties of plants contain manna in Iran. In *Medicinal and Aromatic Plants: Current Research Status, Value-Addition to Their Waste, and Agro-Industrial Potential (Vol II)* (pp. 101–146). Springer. https://doi.org/10.1007/978-3-031-64601-0_9
- Booker, A., Johnston, D., & Heinrich, M. (2012). Value chains of herbal medicines—Research needs and key challenges in the context of ethnopharmacology. *Journal of ethnopharmacology*, 140(3), 624–633. <https://doi.org/10.1016/j.jep.2012.01.039>
- Cochran, W. (1977). *Sampling techniques*. 3rd edition John Wiley & Sons. Inc. New York. pp.
- De Silva, T. (1997). medicinal plants in developing countries. *Medicinal plants for forest conservation and health care*, 92, 34. F.A.O Press.
- Feizabadi, Y. (2011). Study of rice marketing system in Iran. 85th Annual Conference of the Agricultural Economics Society Warwick University.
- Gardner, B. L. (1975). The farm-retail price spread in a competitive food industry. *American Journal of Agricultural Economics*, 57(3), 399–409.
- Hosseini, S., & Ahugalandi, M. (2007). Economic analysis of marketing margin of Iranian Saffron. the Sixth Conference of Agricultural Economics (pp. 8-9).

- Mahboubi, M., Nia, S. S., & Mokari, Z. (2025). Alhagi maurorum for urolithiasis: its bioactive substances, pharmacological actions and clinical trials. *Clinical Traditional Medicine and Pharmacology*, 6(1), 200193. <https://doi.org/10.1016/j.ctmp.2025.200193>
- MacDonald, J. M., Perry, J., Ahearn, M. C., Banker, D., Chambers, W., Dimitri, C., ... & Southard, L. W. (2004). Contracts, markets, and prices: Organizing the production and use of agricultural commodities. *USDA-ERS Agricultural Economic Report*, (837).
- Mobarhan, F., Yeganeh, H., Barani, H., & Rezaee, A. (2021). Marketing status of Iranian borage (*Echium amurense* (FM)) in Azadshahr city of Golestan province. *Rangeland*, 15(3), 494–503. <http://doi.org/20.1001.1.20080891.1400.15.3.10.9>
- Möller, K. K., & Törrönen, P. (2003). Business suppliers' value creation potential: A capability-based analysis. *Industrial marketing management*, 32(2), 109–118. [https://doi.org/10.1016/S0019-8501\(02\)00225-0](https://doi.org/10.1016/S0019-8501(02)00225-0)
- Olsen, C. S., & Helles, F. (2009). Market efficiency and benefit distribution in medicinal plant markets: empirical evidence from South Asia. *International Journal of Biodiversity Science & Management*, 5(2), 53–62. <https://doi.org/10.1111/1475-4959.00088>
- Rameshk, M., Khoshbin, E., Moeinzadeh, M., Sharififar, K., Bahrami, D., & Sharififar, F. (2023). Mannas, unique products of a dynamic insect-plant interaction: Biodiversity, conservation and ethnopharmacological considerations. *Heliyon*, 9(12).
- Ramezany, F., Kiyani, N., & Khademizadeh, M. (2013). Persian manna in the past and the present: an overview. *Am J Pharmacol Sci*, 1(3), 35–37.
- Tabas, A. M., Rehman, M. A., Khitous, F., & Urbinati, A. (2025). Stakeholder and customer engagement in circular economy ecosystems: A systematic literature review and research agenda. *Business Strategy and the Environment*, 34(1), 402–416. <https://doi.org/10.1002/bse.3989>
- Tavassoli, A. P., Anushiravani, M., Hoseini, S. M., Nikakhtar, Z., Baghdar, H. N., Ramezani, M., Ayati, Z., Amiri, M. S., Sahebkar, A., & Emami, S. A. (2020). Phytochemistry and therapeutic effects of Alhagi spp. and tarangabin in the Traditional and modern medicine: a review. *Journal of Herbmed Pharmacology*, 9(2), 86–104. <https://doi.org/10.34172/jhp.2020.13>
- Valibeigi, M., Taghipour, A. A., Ahmadi Dehrashid, P., & Asvadi, K. (2024). Disaster Risk Management and Resilience Assessment of Small Communities in Iran. *Chinese Journal of Urban and Environmental Studies*, 12(02), 2450011. <https://doi.org/10.1142/S2345748124500118>
- Wohlgenant, M. K. (2001). Marketing margins: Empirical analysis. *Handbook of agricultural economics*, 1, 933–970. [https://doi.org/10.1016/S1574-0072\(01\)10024-1](https://doi.org/10.1016/S1574-0072(01)10024-1)
- Wongnaa, C. A., Mensah, S. O., Ayogyam, A., Asare-Kyire, L., & Anthony, Z. K. S. (2014). Economics of tomato marketing in Ashanti Region, Ghana. *Russian Journal of Agricultural and Socio-Economic Sciences*, 26(2), 3–13.
- Yaghmaee, F., & Karimpour, H. (2008). Assessment of behavioural characteristics of *Poophilus nebulosus* Leth. spittlebug on Alhagi persarum Boiss and Buhse camel thorn plant in Torbat Jam region, Khorasan Razavi Province. *Journal of Plant Protection*, 22(2), 161–170.