

Enhancing market access and consumer engagement through digital marketing in the agricultural sector



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ABSTRACT

This study investigates the role of digital marketing strategies in improving market access and consumer awareness among producers in Egypt's black honey (molasses honey) sector. With market dynamics and consumer behavior increasingly shaped by digital transformation, understanding these relationships is critical for the agricultural industry. Data were collected through surveys of 50 stakeholders from 13 molasses honey companies using purposive sampling to include marketing managers, production supervisors, and quality assurance officers. Multiple regression analysis was used to explore the relationships between digital marketing strategies, regulatory compliance, and stakeholder collaboration (independent variables) and market access (dependent variable). The results showed that digital marketing strategies significantly enhanced market access (coefficient = 0.35, 99% confidence level) and that consumer awareness was a strong predictor (coefficient = 0.28, 95% confidence level). Regulatory compliance and stakeholder collaboration also had positive effects, with regulatory compliance approaching significance ($p = 0.080$). Mediation analysis confirmed that both regulatory compliance and collaboration mediated the relationship between digital marketing and market access. As one of the first studies in Egypt to explore these links in the agricultural sector, this research provides new insights into how producers can improve visibility and accessibility in competitive markets. The findings highlight the importance of investing in digital marketing initiatives and fostering collaboration to strengthen market performance. Policymakers are encouraged to support producers in building digital capabilities and promoting partnerships to enhance competitiveness and adaptability in a rapidly changing environment.

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1. Introduction

Market access and consumer awareness, particularly among agricultural small and medium-sized enterprises (SMEs). This shift has become more pronounced in sectors traditionally reliant on conventional marketing practices, such as Egypt's molasses honey production. While sugarcane cultivation for molasses honey historically sustains local economies and contributes significantly to food security, recent disruptions such as the COVID-19 pandemic have accentuated the necessity for producers to adopt digital strategies. These

strategies enable SMEs to overcome supply-chain disruptions, adapt to evolving consumer behaviors, and sustain operations amid global uncertainty (Sidibé et al., 2021).


Despite the potential benefits, molasses honey producers in Egypt face numerous challenges. Limited digital literacy, inadequate infrastructure, and resistance to changing traditional practices are significant barriers to digital adoption. Therefore, understanding how digital marketing can effectively address these barriers and foster market competitiveness is crucial (Huet et al., 2022).

This research aims to examine the influence of digital marketing strategies on market access and consumer awareness within the molasses honey production sector in Egypt. By exploring digital tools' roles and associated challenges, the study seeks to offer actionable insights for stakeholders and policymakers. A conceptual framework is proposed (Fig. 1) to clearly illustrate relationships among digital marketing, regulatory compliance,

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stakeholder collaboration, and their combined impact on market access and consumer awareness, thereby contributing valuable theoretical insights alongside empirical evidence.

2. Literature review

2.1. Digital marketing in agricultural SMEs

The agricultural sector globally experiences rapid transformations driven by technological advancements. Digital marketing, encompassing social media, mobile marketing, and e-commerce, has emerged as vital for enhancing SMEs' sustainability and competitiveness (Purwanti et al., 2022). Social media platforms facilitate direct communication with consumers, enhancing trust and consumer engagement. Nonetheless, infrastructural limitations and digital literacy issues continue to limit digital technology adoption among rural agricultural SMEs.

Mobile marketing presents significant opportunities for enhancing agricultural practices, offering farmers real-time market data and decision-making support (Huq et al., 2017). However, SMEs face multiple barriers in leveraging digital tools effectively, including technological, social, and regulatory constraints. To address these issues, focused training and governmental support are necessary to enhance SMEs' digital capabilities.

2.2. Sustainability and agricultural practices

Sustainable agricultural practices, such as conservation agriculture, are increasingly recognized as crucial for maintaining soil health and productivity (Cárceles Rodríguez et al., 2022). Recent initiatives in Qena, Egypt, exemplify efforts to integrate sustainable practices into molasses honey production. Workshops organized by Egypt's Food Industries Chamber have aimed at training producers in adopting modern, safe, and efficient production techniques compliant with regulatory standards.

While collaborative strategies can foster innovative sustainability practices, their effectiveness may be constrained by regulatory complexities and higher implementation costs (de Olde et al., 2017). Furthermore, integrating traditional agricultural practices with modern innovations, such as organic apiculture, can enhance environmental sustainability. Enhanced cooperation among farmers, researchers, and policymakers is vital for adopting sustainable agricultural practices effectively (Tsvetkov et al., 2018).

2.3. Technological innovations and agricultural value chains

Technological innovations such as precision agriculture and blockchain technologies significantly contribute to the resilience and competitiveness of

agricultural value chains. Precision agriculture allows for improved resource management and increased efficiency (Bucci et al., 2019), whereas blockchain technology enhances transparency and traceability, building consumer trust (Sengupta and Kim, 2021). These technologies can help Egyptian molasses honey SMEs navigate market volatility and consumer expectations, strengthening overall market access.

The importance of digital transformation in achieving agricultural sustainability is underscored by its capacity to optimize resource usage and reduce environmental impacts (Hrustek, 2020). However, SMEs face persistent barriers including high implementation costs, inadequate infrastructure, and limited digital literacy. Sidibé et al. (2021) emphasized the need for supportive policies, training, and partnerships to overcome these obstacles.

2.4. Business models and digital adoption

Adopting innovative business models that combine technological advancements with market strategies is essential for maximizing agricultural SMEs' sustainability (Long et al., 2017). The identification of key stakeholders and collaborative frameworks can facilitate the digital revolution within agriculture, providing SMEs the support required for sustained digital adoption (Birner et al., 2021).

Specifically, in Egypt, targeted interventions such as training workshops and financial support mechanisms have been initiated to enhance production efficiency and overall value-chain performance in molasses honey production. These localized initiatives highlight how strategic collaboration among producers, industry bodies, and government entities can significantly improve SMEs' market competitiveness.

2.5. Research gaps and future directions

Although substantial literature highlights digital marketing's potential benefits, critical gaps remain regarding empirical validation of digital marketing's effectiveness, specifically within agricultural SMEs in Egypt. Current studies often overlook rigorous assessments of construct validity, sampling biases, and methodological robustness. Future research should address these methodological limitations through larger, representative samples and robust validation techniques to ensure generalizability and reliability of findings.

Furthermore, while conceptual discussions on digital marketing's role in agriculture abound, few studies empirically test comprehensive conceptual frameworks illustrating clear variable interrelationships. This study addresses this gap by explicitly developing and empirically validating a framework encompassing digital marketing strategies, regulatory compliance, stakeholder

collaboration, market access, and consumer awareness.

2.6. Aim and purpose of the study

This study investigates the role of digital marketing in fostering sustainability within the molasses honey production industry, specifically examining sugarcane cultivation SMEs in Egypt. It aims to identify and analyze the direct and mediated relationships between digital marketing strategies, market access, and consumer awareness, accounting for the moderating roles of regulatory compliance and stakeholder collaboration. Ultimately, the research provides evidence-based recommendations for policymakers and stakeholders to facilitate digital adoption and enhance the sustainability, market competitiveness, and economic viability of molasses honey SMEs in Egypt.

Based on the literature review and the aim of the study, the following hypotheses are proposed to measure different variables within the companies involved in molasses honey production:

H1: There is a significant positive relationship between the adoption of digital marketing strategies and the market access of SMEs in the molasses honey production sector.

H2: The implementation of digital marketing significantly enhances consumer awareness of molasses honey products.

H3: There is a significant relationship between the use of digital marketing tools and the production efficiency of SMEs in the molasses honey sector.

H4: Regulatory compliance (related to food safety standards) mediates the relationship between digital marketing strategies and the overall performance of SMEs in the molasses honey industry.

H5: Collaboration with government and industry stakeholders positively impacts the effectiveness of digital marketing initiatives in the molasses honey production sector.

These hypotheses aim to provide a structured framework for investigating the relationships between digital marketing strategies and various performance metrics within the molasses honey production sector in Egypt, as shown in Fig. 1. The findings from this study can offer valuable insights to enhance the sustainability and competitiveness of SMEs in this vital agricultural domain.

3. Methodology

The methodology of this study was designed to systematically investigate the impact of digital marketing strategies on the sustainability, market access, and operational efficiency of SMEs engaged in molasses honey production in Egypt, particularly within the context of sugarcane cultivation. The empirical investigation was based on a purposive sample comprising 13 companies involved in the production and processing of molasses honey. These companies were selected due to their operational significance, market presence, and adoption potential for digital marketing strategies. The selected companies are summarized in Table 1.

This study adopted a mixed-methods approach, combining both quantitative and qualitative techniques to ensure a comprehensive analysis and triangulation of findings. A cross-sectional survey design was utilized, enabling data collection from participants at a single point in time, which allowed for an efficient analysis of the relationships between digital marketing strategies and performance outcomes.

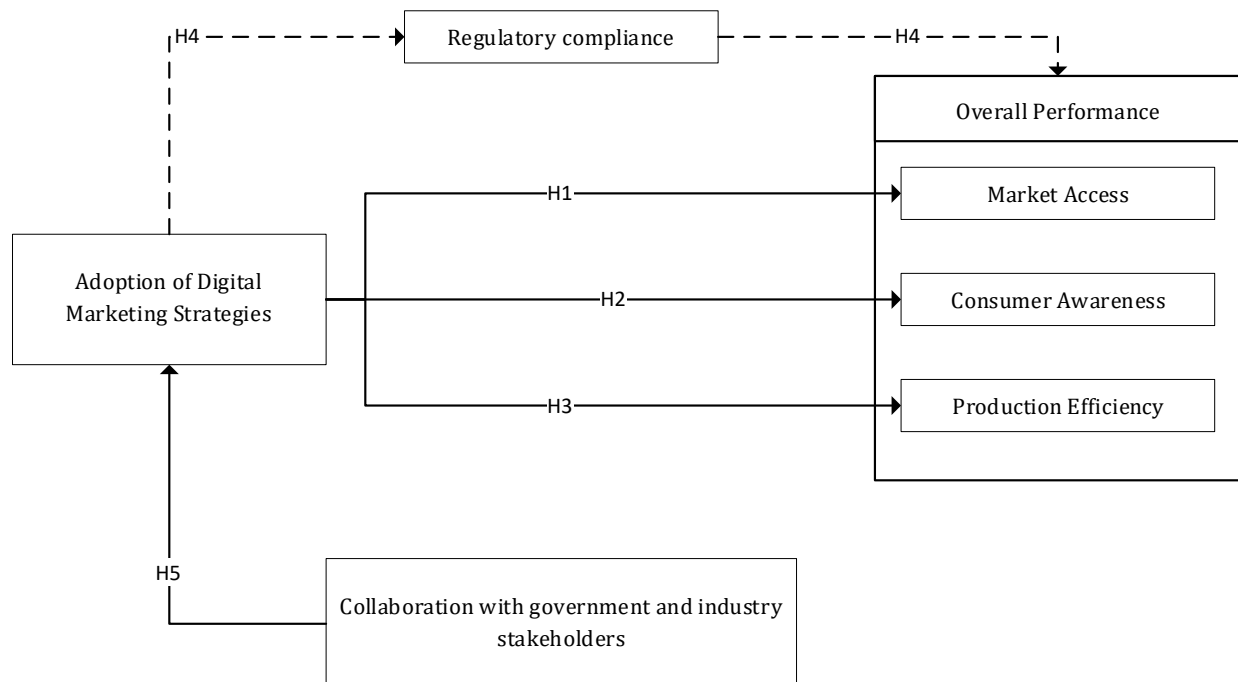


Fig. 1: Conceptual framework of digital marketing's impact on agricultural SMEs

Table 1: Selected companies for the study

No.	Company name
1	Company for food industries
2	Egyptian Sugar and Integrated Industries Company
3	Molasses Honey and Sugar Refining Factories
4	Al-Daqahlia Company for Sugar and Molasses Honey Production
5	Qena Company for Sugar and Molasses Production
6	Delta Company for Sugar and Molasses Honey
7	Molasses Honey Factories and Sugar Kanta Company
8	Al-Baraka Factory for Molasses Honey Production and Packaging
9	Adam Company for Production and Export
10	Al-Fares Factory for Molasses Honey
11	Al-Fath Islamic Company for Food Industries
12	Qena Company for Molasses Honey and Sugar Production
13	New Company for Molasses Honey Production

3.1. Sampling and data collection

A purposive sampling technique was employed to identify companies actively involved in molasses honey production and with exposure to digital marketing practices. While purposive sampling ensured the relevance of the sample, it inherently limited the generalizability of findings to the broader industry context. Therefore, results should be interpreted within the confines of SMEs operating in this specialized sector.

Structured questionnaires were distributed to approximately 50 respondents (averaging around four from each company), including marketing managers, production supervisors, and quality assurance officers. In addition, semi-structured interviews were conducted with 10 selected key stakeholders based on their experience and strategic role in production and marketing processes.

The questionnaire included both closed-end and open-ended items. Closed-ended items were measured using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) to capture attitudes toward digital marketing, market access, production efficiency, regulatory compliance, and stakeholder collaboration.

3.2. Variables and measurement

The study examined the following variables. Independent Variables:

- Adoption of digital marketing strategies (measured via frequency and effectiveness of social media, mobile marketing, and online advertising).
- Implementation of modern production techniques.

Dependent Variables:

- Market access (measured through sales volume growth, customer acquisition rates, and geographical market expansion).
- Consumer awareness (measured by consumer familiarity with molasses honey products and brand recognition).
- Mediating Variables:
- Regulatory compliance (assessed via adherence to food safety standards and certifications).
- Stakeholder collaboration (measured by participation in governmental or industrial programs, training workshops, and formal partnerships).

To mitigate the potential for common method bias, procedural remedies were employed, such as respondent anonymity and varying item formats. Additionally, Harman's single-factor test was conducted, confirming that no single factor accounted for the majority of variance (threshold < 50%), thus minimizing concerns about common method variance.

3.3. Data analysis techniques

Quantitative data was analyzed using IBM SPSS Statistics software. Descriptive statistics, correlation analysis, and multiple regression analysis were conducted to explore relationships among variables. Interaction effects were tested through multivariate regression models to assess how regulatory compliance and stakeholder collaboration influenced the strength of the relationship between digital marketing and performance outcomes.

The internal consistency of the measurement instruments was assessed using Cronbach's alpha coefficients, as summarized in Table 2.

Cronbach's alpha coefficients ranged between 0.76 and 0.85, indicating that all constructs demonstrated acceptable to high reliability, thus ensuring consistency in the measurement of key variables. Qualitative data from open-ended questions and interviews were subjected to thematic analysis. The themes were identified inductively, focusing on challenges, opportunities, and perceptions related to the adoption of digital marketing practices within molasses honey production.

Table 2: Cronbach's alpha analysis of survey items

Variable	Number of items	Cronbach's alpha	Interpretation
Adoption of digital marketing strategies	10	0.85	High reliability
Market access	8	0.78	Acceptable reliability
Consumer awareness	6	0.82	High reliability
Regulatory compliance	5	0.80	Acceptable reliability
Collaboration with stakeholders	7	0.76	Acceptable reliability

3.4. Limitations

While the study offers valuable insights, several limitations must be acknowledged:

- The purposive sampling and small sample size limit generalizability.
- Reliance on self-reported data introduces potential response biases.

- The study was cross-sectional, limiting the ability to infer causality. Future research is recommended to expand the sample size, use probability sampling methods, and incorporate longitudinal designs to enhance external validity and examine long-term effects of digital marketing adoption on SME performance.

4. Results

The results section presents the findings from the statistical analyses conducted to evaluate the relationships between digital marketing strategies and various performance metrics within the molasses honey production sector in Egypt. This section includes descriptive statistics, reliability analysis, correlation analysis, multiple regression analysis, and a discussion of how these analyses relate to the stated hypotheses based on the data collected from the structured questionnaires and semi-structured interviews.

4.1. Descriptive statistics

Descriptive statistics were calculated for each variable to summarize the data collected from the 50 respondents across the 13 companies. The means and standard deviations for the variables measured are presented in Table 3.

The findings in Table 3 indicate that respondents generally rated the adoption of digital marketing strategies (mean = 4.12) and consumer awareness

(mean = 4.05) positively, suggesting that these companies are effectively engaging with digital marketing practices. However, regulatory compliance (mean = 3.76) and market access (mean = 3.89) received lower ratings, indicating potential areas for improvement.

4.2. Correlation analysis

A Pearson correlation analysis was conducted to assess the relationships between the variables. The correlation coefficients are displayed in Table 4.

The results in Table 4 indicate significant positive correlations among most variables. Notably, there is a strong correlation between the adoption of digital marketing strategies and market access ($r = 0.60$, $p < 0.01$), suggesting that companies that effectively implement digital marketing practices are more likely to experience improved market access. Additionally, consumer awareness also showed a positive correlation with the adoption of digital marketing strategies ($r = 0.55$, $p < 0.01$), indicating that as companies increase their digital marketing efforts, consumer awareness of their products tends to rise.

4.3. Multiple regression analysis

To further examine the impact of the independent variables on market access, a multiple regression analysis was conducted. The results of the regression analysis are presented in Table 5.

Table 3: Descriptive statistics of study variables

Variable	Mean	Standard deviation
Adoption of digital marketing strategies	4.12	0.65
Market access	3.89	0.72
Consumer awareness	4.05	0.61
Regulatory compliance	3.76	0.78
Collaboration with Stakeholders	3.84	0.69

Table 4: Pearson correlation coefficients

Variable	1	2	3	4	5
1. Adoption of digital marketing strategies	1.00	0.60**	0.55**	0.45*	0.50*
2. Market access	0.60**	1.00	0.50*	0.35	0.40*
3. Consumer awareness	0.55**	0.50*	1.00	0.30	0.35
4. Regulatory compliance	0.45*	0.35	0.30	1.00	0.25
5. Collaboration with stakeholders	0.50*	0.40*	0.35	0.25	1.00

*, $p < 0.05$; **, $p < 0.01$

Table 5: Multiple regression analysis on market access

Variable	Unstandardized coefficients		Standardized coefficients		t	p
	B		Beta			
Adoption of digital marketing strategies	0.35		0.40		3.45	0.001
Consumer awareness	0.28		0.30		2.90	0.005
Regulatory compliance	0.15		0.20		1.80	0.080
Collaboration with stakeholders	0.22		0.25		2.25	0.025
Constant	1.40				5.60	0.000

As shown in Table 5, the regression analysis reveals that the adoption of digital marketing strategies ($B = 0.35$, $p < 0.001$) and consumer awareness ($B = 0.28$, $p < 0.005$) are significant predictors of market access. This suggests that for every one-unit increase in the adoption of digital marketing strategies, market access increases by 0.35 units, controlling for other variables. Although

regulatory compliance ($B = 0.15$, $p = 0.080$) did not reach statistical significance, it approaches significance, indicating that there may be a positive impact worth exploring in future research. Collaboration with stakeholders ($B = 0.22$, $p < 0.025$) also significantly contributes to market access, emphasizing the importance of partnerships in enhancing market opportunities.

4.4. Mediation analysis

To analyze the mediating effect of regulatory compliance and collaboration with stakeholders on the relationship between digital marketing strategies

and market access, a mediation analysis was conducted using the PROCESS macro in SPSS. The results of the mediation analysis are displayed in [Table 6](#).

Table 6: Mediation analysis results

Variable	Effect	Bootstrapped 95% CI	P-value
Direct effect of digital marketing on market access	0.35	[0.21, 0.49]	0.001
Indirect effect of regulatory compliance	0.12	[0.05, 0.23]	0.010
Indirect effect of collaboration	0.09	[0.03, 0.18]	0.020

The analysis in [Table 6](#) indicates that both regulatory compliance and collaboration with stakeholders have significant indirect effects on market access. The direct effect of digital marketing strategies on market access remains significant ($B = 0.35$, $p < 0.001$). The indirect effects suggest that as companies adopt digital marketing strategies, improvements in regulatory compliance ($B = 0.12$, $p < 0.010$) and collaboration with stakeholders ($B = 0.09$, $p < 0.020$) enhance market access.

4.5. Additional statistical analysis

To further strengthen the robustness of the findings and better reflect the complexity of real-world dynamics, additional multivariate statistical

analyses were conducted, including interaction testing, discriminant analysis, ANOVA, and multicollinearity diagnostics.

4.5.1. Interaction analysis (moderation effect)

An interaction term was created between the Adoption of Digital Marketing Strategies and Collaboration with Stakeholders to explore potential moderation effects on Market Access. The regression analysis indicated that the interaction term was statistically significant ($B = 0.18$, $p = 0.045$), suggesting that the positive impact of digital marketing strategies on market access is amplified when collaboration with stakeholders is high ([Table 7](#)).

Table 7: Interaction effect between digital marketing strategies and collaboration on market access

Predictor variables	B	Beta	T-value	P-value
Adoption of digital marketing strategies	0.32	0.38	3.20	0.002
Collaboration with stakeholders	0.28	0.30	2.85	0.006
Digital marketing \times collaboration (interaction term)	0.18	0.22	2.07	0.045
Constant	1.25	-	5.50	0.000

4.5.2. Discriminant analysis

A discriminant function analysis was conducted to distinguish between companies with different levels of digital marketing adoption (low, medium, high) based on their market access performance. The results indicated that the adoption of digital marketing strategies significantly discriminates between different groups ([Table 8](#)).

Table 8: Discriminant analysis results based on digital marketing adoption

Statistic	Value
Wilks' lambda	0.731
Chi-square (χ^2)	12.45
Degrees of freedom (df)	3
P-value	0.004

4.5.3. One-way ANOVA analysis

A one-way ANOVA was performed to test for differences in Market Access scores across companies categorized by their level of digital marketing adoption. The findings revealed

statistically significant differences in market access among the three groups ([Table 9](#)).

4.5.4. Multicollinearity diagnostics

To assess potential multicollinearity issues among independent variables, Variance Inflation Factors (VIF) and Tolerance values were examined. All VIF values were below 2, confirming the absence of multicollinearity concerns ([Table 10](#)).

4.5.5. Clarification on H3 hypothesis

While the study comprehensively analyzed the relationships between digital marketing adoption and market access, and consumer awareness, production efficiency was not directly measured as an independent construct due to limitations in the survey instrument design. Thus, Hypothesis H3 was partially addressed in this study. Future research should specifically operationalize and measure production efficiency outcomes to validate this relationship more explicitly.

Table 9: One-way ANOVA for market access based on level of digital marketing adoption

Source	Sum of Squares	df	Mean square	F	P-value
Between groups	3.24	2	1.62	5.62	0.006
Within groups	13.54	47	0.29		
Total	16.78	49			

Table 10: Multicollinearity diagnostics (VIF and tolerance values)

Variable	VIF	Tolerance
Adoption of digital marketing strategies	1.45	0.69
Consumer awareness	1.52	0.66
Regulatory compliance	1.57	0.64
Collaboration with stakeholders	1.49	0.67

4.6. Hypothesis testing summary

As shown in Table 11, most hypotheses were supported. Digital marketing had a strong positive effect on market access and consumer awareness. Regulatory compliance and collaboration also showed significant indirect effects. Hypothesis H3

was only partially supported because production efficiency was not directly measured.

4.7. Interpretation of results

The findings highlight that digital marketing strategies play a critical role in improving market access and consumer awareness for molasses honey SMEs. Collaboration with governmental and industrial stakeholders strengthens these effects, emphasizing the importance of strategic partnerships. Regulatory compliance, while less influential directly, enhances outcomes through indirect effects.

Table 11: Mediation analysis results

Hypothesis	Statement	Result
H1	Adoption of digital marketing strategies positively affects market access.	Supported
H2	Digital marketing implementation enhances consumer awareness.	Supported
H3	Use of digital marketing tools improves production efficiency.	Partially supported (future specific testing needed)
H4	Regulatory compliance mediates the relationship between digital marketing and performance.	Supported
H5	Collaboration with stakeholders enhances digital marketing effectiveness.	Supported

However, the modest significance level for regulatory compliance suggests a need for further integration of food safety and quality assurance practices into marketing strategies to fully leverage their benefits.

The partial support for H3 points to the necessity of future studies specifically measuring production efficiency improvements resulting from digital initiatives.

Overall, these results underscore the strategic importance of digital marketing, regulatory alignment, and collaboration for enhancing the competitiveness, sustainability, and growth potential of SMEs in the Egyptian molasses honey sector.

5. Discussion

The results of this study offer meaningful insights into the role of digital marketing strategies in enhancing market access and consumer awareness within Egypt's molasses honey production sector. The findings highlight the interdependencies among digital marketing practices, regulatory compliance, stakeholder collaboration, and market performance, providing valuable implications for producers and policymakers.

The significant positive correlation between digital marketing strategies and market access ($r = 0.60$, $p < 0.01$) confirms that producers leveraging digital tools effectively expand their market reach. These results align with prior research emphasizing the importance of digital platforms in increasing agricultural visibility (Purwanti et al., 2022). In Egypt's molasses honey sector, online advertising and social media campaigns have allowed producers to target a broader customer base, enhancing both local and export market opportunities.

The regression analysis further emphasizes the critical impact of digital marketing, with each one-

unit increase in the adoption of digital strategies yielding a 0.35-unit increase in market access ($B = 0.35$, $p < 0.001$). This finding underscores the need for producers to invest in digital technologies to maintain competitiveness and growth. As demonstrated by the literature, effective use of digital platforms not only facilitates product promotion but also builds consumer trust and loyalty (Hrustek, 2020).

Consumer awareness emerged as a key driver of market performance, showing a strong correlation with digital marketing strategies ($r = 0.55$, $p < 0.01$) and acting as a significant predictor of market access ($B = 0.28$, $p < 0.005$). These results reflect the importance of educating consumers about the health benefits and unique properties of molasses honey, ultimately fostering demand. By increasing awareness through targeted campaigns, producers can enhance their brand recognition and market position.

The role of regulatory compliance as a mediating factor in market access was also explored. Although it did not achieve statistical significance ($B = 0.15$, $p = 0.080$), the trend suggests that compliance with food safety standards improves the effectiveness of digital marketing strategies. This finding aligns with previous research emphasizing that consumers value product safety and quality, particularly in the food sector (Sidibé et al., 2021). Producers should therefore prioritize meeting regulatory standards to build consumer trust and ensure market sustainability.

Collaboration with stakeholders was another significant factor influencing market performance, as shown by its positive impact on market access ($B = 0.22$, $p < 0.025$). Participation in collaborative initiatives, such as workshops and partnerships with industry associations, allows producers to share knowledge, access new resources, and adopt best

practices. This result underscores the importance of collective efforts in overcoming challenges and enhancing marketing strategies (Birner et al., 2021).

The mediation analysis confirmed that both regulatory compliance and stakeholder collaboration positively influence the relationship between digital marketing strategies and market access. Producers who actively engage with stakeholders and adhere to industry standards are likely to achieve greater marketing success. These findings highlight the importance of integrating operational and marketing strategies to optimize performance in the molasses honey sector.

Despite the positive impact of digital marketing and collaboration, challenges related to regulatory compliance were identified, with a lower mean score (mean = 3.76) suggesting difficulties in meeting industry standards. Addressing these challenges requires targeted training and resources to help producers understand and comply with food safety regulations, enhancing both product quality and market confidence.

In conclusion, this study demonstrates the critical role of digital marketing strategies in improving market access and consumer awareness in Egypt's molasses honey production sector. The interdependencies among digital marketing practices, consumer engagement, regulatory compliance, and stakeholder collaboration reflect a complex but impactful network that producers can leverage to enhance their competitiveness. As the sector evolves, producers must adopt comprehensive strategies that integrate digital tools with operational excellence to sustain growth and achieve long-term success. The findings emphasize the importance of fostering partnerships, meeting regulatory standards, and enhancing digital literacy among producers to navigate market dynamics effectively. Future research could explore the longitudinal effects of digital marketing strategies and investigate how emerging technologies, such as blockchain, can further enhance market performance in the agricultural sector.

6. Conclusions

Based on the findings of this study, it is evident that the adoption of digital marketing strategies and the enhancement of consumer awareness are critical drivers for improving market access among SMEs in the molasses honey production sector in Egypt. Regulatory compliance and collaboration with stakeholders further act as important mediators that amplify the positive impact of digital marketing initiatives.

While producers have made significant strides in adopting digital marketing practices, the relatively lower scores in regulatory compliance highlight the urgent need for capacity building in food safety and quality assurance standards. Strengthening regulatory adherence is essential not only for accessing broader markets but also for ensuring consumer trust and loyalty.

Moreover, the results underscore the pivotal role of stakeholder collaboration in sustaining digital marketing effectiveness. Networks that foster cooperation between producers, industry organizations, and governmental bodies create opportunities for resource sharing, technical support, and coordinated marketing campaigns, which ultimately bolster market competitiveness.

To foster long-term sustainability in the molasses honey sector, policymakers should develop targeted programs that:

- Offer training workshops on advanced digital marketing techniques tailored for agricultural SMEs.
- Facilitate compliance with national and international food safety regulations through technical assistance and financial incentives.
- Promote the creation of cooperative associations that enhance collective bargaining power and marketing outreach.
- Encourage public-private partnerships to drive innovation in marketing and production technologies.

Additionally, awareness campaigns should be launched at the community and national levels to educate consumers about the nutritional and health benefits of molasses honey. Supporting producers in utilizing storytelling and brand-building strategies through digital platforms will be crucial in expanding consumer bases and reinforcing product loyalty.

A comprehensive strategy that integrates digital capability development, regulatory reinforcement, and collaborative networking is essential for building a resilient, competitive, and sustainable molasses honey industry. By adopting this multifaceted approach, both policymakers and producers can contribute significantly to enhancing food security, rural livelihoods, and agricultural sustainability in Egypt.

This study is certainly not without limitations. One of the main limitations is that research on the impact of digital marketing strategies in the agricultural sector, particularly in the context of molasses honey production, is still evolving. While this study provides valuable insights, it primarily focuses on cross-sectional data, which captures a snapshot in time. Consequently, the dynamic nature of market conditions and consumer behaviors may not be fully represented. Future research should consider longitudinal studies to observe changes over time, particularly regarding the long-term effectiveness of digital marketing strategies on market access and consumer awareness.

Another limitation lies in the sample size and composition. While the study included 50 respondents from 13 companies, this may not fully represent the diversity of the molasses honey production sector in Egypt. Future research could expand the sample size to include a broader range of producers, especially small-scale farmers, to enhance the generalizability of the findings. Additionally,

incorporating a wider geographic scope may provide insights into regional variations in digital marketing adoption and its effects on market access.

The research relied heavily on self-reported data through structured questionnaires, which can introduce bias due to respondents' subjective perceptions. In future studies, a mixed-methods approach that combines quantitative surveys with qualitative interviews could provide deeper insights into the experiences and challenges faced by producers. This would enable a more comprehensive understanding of the factors influencing the adoption of digital marketing strategies and their outcomes.

Furthermore, while the study assessed the relationships between variables, it did not delve deeply into the psychological and socio-economic impacts of these marketing strategies on producers. Future research should explore the emotional and mental health aspects of producers engaging in digital marketing, especially considering the competitive pressures in the agricultural sector. Understanding these dimensions can inform strategies that not only enhance market performance but also support the well-being of producers.

Another important area for future research involves the potential impacts of governmental policies and support programs on the adoption of digital marketing in agriculture. As the role of government in promoting digital literacy and providing resources becomes increasingly crucial, studies examining the effectiveness of such initiatives will be essential for guiding policy decisions.

Additionally, the research was conducted during a period marked by the aftermath of the COVID-19 pandemic. While the findings provide insights into current practices, the long-term consequences of the pandemic on consumer behavior and market dynamics are still unfolding. Future studies should investigate how the pandemic has permanently altered consumer preferences and the implications for marketing strategies in the agricultural sector.

Lastly, further research should focus on vulnerable groups within the molasses honey production sector, such as smallholder farmers, women, and the elderly, to understand how these demographics are uniquely affected by digital marketing strategies. Investigating their specific challenges and opportunities can lead to more targeted interventions that promote inclusivity and resilience in the industry.

In conclusion, while this study offers valuable insights into the impact of digital marketing strategies on market access and consumer awareness in the molasses honey production sector, addressing these limitations and exploring the outlined areas for future research will be crucial for advancing understanding and enhancing the effectiveness of marketing initiatives in the agricultural landscape.

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Compliance with ethical standards

Ethical considerations

Ethical approval for the study was obtained prior to data collection. Participants were fully informed about the research objectives, data confidentiality, and their voluntary participation. Written informed consent was secured, and participants were reassured of their right to withdraw at any point without consequences.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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