



# Effects of the COVID -19 Pandemic on the Global Market for Palestinian Medjool Dates

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## Abstract

This study examines the widespread impact of the COVID -19 pandemic on the global market for Palestinian medjool dates. The study covers a population of 80,000 farmers, workers and owners of date palm plantations in Palestine as documented by the Ministry of Agriculture in 2022. Using the G\*Power (2017) calculator, the sample size of the study was set at 382 farmers, workers and owners of date palm plantations. The study is geographically located in Palestine, with data collection facilitated by self-completed questionnaires provided to the respondents. Using the cascade regression approach for data analysis, this study examines the relationship between the independent variable, covid 19 pandemic, and several dependent variables: Packaging (commercial enterprises), Marketing (date palm industry), Agricultural work and care of trees, and Trade Expectations. The impact of the global COVID -19 pandemic has permeated virtually every aspect of human existence, including various sectors of the economy. The Palestinian market for Medjool dates has not been exempt from the profound effects of this crisis. This study seeks to shed light on the multifaceted consequences of the pandemic for this particular market. Through a close examination of the interplay between the Covid 19 pandemic and its impact on various variables, including packaging activities, marketing strategies, farm labor, and trade practices, this study aims to shed light on the impact of the pandemic on the global market for Palestinian Medjool dates. The findings of this research highlight the critical challenges faced by the date palm industry during the pandemic and provide insights that can serve as the basis for strategic actions to promote resilience and recovery. As the global industry grapples with the complex consequences of the pandemic, studies of this nature play a pivotal role in informing informed decision-making and promoting adaptation measures for sustainable growth and rejuvenation in affected sectors. The study conclusively demonstrates that the Covid 19 pandemic has significant and negative impacts on packing, farm labor and tree care, marketing and trade of Medjool dates in Palestine.

## Keywords

COVID -19 Pandemic, Cascade Regression Approach, Global Market, Medjool Dates, Palestinian

## 1. Introduction

The socioeconomic landscape of Palestine is inextricably linked to its political stability, which is often assessed through the prism of intifada events. After 2000, the Palestinian economy experienced several negative impacts characterized by dependency, business closures, reduced tax revenues, and disruptions in the influx of labor (Mustafa, et al., 2022). These difficulties were exacerbated by increased transaction costs, the presence of market imperfections, and ineffective strategies to combat competitive pressures (Fraihat, 2022). The Oslo Agreement between Palestine and Israel led to a system of offsetting import tariffs, although it also led to budget deficits. The ongoing Israeli-Palestinian conflict led to significant losses, such as the annexation of 150,000 Palestinian jobs in Israel, resulting in substantial financial losses totaling \$800 million, mainly from taxes (Ragab, & Saad, 2023). In this complicated context, a crucial development

emerged in 2020: About 90% of the raw materials sourced from Palestine were processed into manufactured goods in Israel, generating export revenues of \$600 million. Israel's advantage lies in securing raw materials at costs below competitive market prices (AbdAlrahman, 2020). Consequently, entrepreneurs rely on foreign aid and government support, even as they accept the undervaluation of their resources. In the midst of this complex situation, a turning point occurred in 2020, when 90% of the raw materials sourced from Palestine were processed into finished products in Israel, resulting in export revenues of \$600 million (Coccia, 2023). However, the outbreak of the Covid 19 pandemic fundamentally changed the economic landscape. While initially successful in containing the outbreak by 2020, successive waves of the virus triggered an economic collapse. These waves brought political, security, and health risks and exacerbated the economic crisis due to fiscal constraints and the lack of a national currency. This turbulent environment led to a decline in trade, culminating in a 3.4% contraction in GDP and an average contraction of 12% (Q1-Q3), highlighting the difficulties in boosting private consumption and capital investment. This narrative mirrors the economic slump observed in 2019, when factors such as the presence of HAMAS led to an 11.5% contraction (Ravitz et al., 2022). The impact of the Covid 19 pandemic extended to various industries and affected businesses with unprecedented disruptions. The global market for Palestinian Medjool dates faced significant challenges even before the pandemic. The labeling of Jordan Valley products as Israeli goods posed an obstacle to the Palestinian economy (Morrar, & Baba, 2022). This situation hindered health care and sustainable production efforts as Palestine sought to rebuild its economy after years of instability (Baidoun, & Salem, 2023). The pandemic exacerbated these challenges and disproportionately affected Medjool date producers. In Palestine, home to 5.2 million people, over 351,809 cases and 3,720 deaths were recorded by March 2022 (Balatia, et al., 2023). These figures underscore the regional devastation that has significantly impacted the global market for Medjool dates. A key problem is the disruption of global supply chains due to travel restrictions and border closures, which impede the movement of goods and result in significant sales losses. Another challenge is mislabeling: 75% of exports from the Jordan Valley are mislabeled as Israeli products. This mislabeling allows Israel to appropriate over \$181 million from exports of Medjool dates destined for the Palestinian economy (Yaacobi, et al., 2023). These issues were made worse by the pandemic, which led to the closure of markets, a drop in tourism, and a decrease in consumer spending power. As a result, Palestinian farmers have had trouble selling their crops and have seen large drops in income. Workers in the Medjool-Dattel business were also negatively impacted by the Covid-19 outbreak, which hampered efforts to establish safety measures and social distancing (Gupta et al., 2023) in the industry. Concerns about the long-term and immediate effects on farmers and markets are prompted by this convoluted scenario. Understanding the current market dynamics and the restricted export potential for Palestinian Medjool dates can be achieved by investigating alternative strategies, such as government efforts and policies to promote Medjool date production. The separation wall between Gaza and the West Bank has made supply issues much worse. Economic interdependence, geopolitical variables, and external shocks all interact in complex ways; a theoretical assessment of the effect of the Covid 19 pandemic on the global market for Palestinian medjool dates will provide light on these dynamics. The impact of the pandemic on the Palestinian market for Medjool dates highlights the need to develop approaches to promote sustainable agriculture, explore alternative markets, and implement measures to strengthen the Palestinian economy. Consequently, this study fills the gap left by previous studies by examining the impact of the Covid 19 pandemic on the global landscape of Palestinian Medjool dates.

## 2. Literature Review

### 2.1 Global Trade Theory

The concept of the theory of global trade provides a valuable perspective from which to interpret the impact of international trade policies and agreements on the field of Palestinian medjool dates. The reverberations of disruptions in world trade, fluctuations in import and export regulations, and the implementation of protection strategies can have a noticeable impact on the availability and competitiveness of Medjool dates in the world market. Following the Covid 19 pandemic, there was significant disruption in world trade. Governments worldwide took a range of measures to contain the spread of the virus, including travel bans, border closures, and lockdowns (Alkadash, et al., 2020). The far-reaching impact of these measures extended to international trade, causing disruptions in supply chains, reducing export opportunities, and triggering changes in import and export regulations. Consequently, the dynamics of the Medjool dates market, strategically positioned as an agricultural exporter, were profoundly altered by these global trade upheavals. Changes in import and export regulations can directly impact Medjool dates' accessibility and competitive position in international markets. Governments could introduce new regulations or modify existing ones to protect the domestic industry or address perceived vulnerabilities. For example, countries could introduce stricter sanitary and phytosanitary standards, establish specific labeling requirements, or impose tariffs on imported agricultural products (Abushammala, 2022). These changes could create barriers for Medjool date exporters and affect their competitiveness on the global stage. In addition, the implementation of safeguard measures may have a significant impact on the Medjool dates market. Protectionism, the use of trade barriers such as tariffs, quotas, and subsidies, serves as a mechanism to protect domestic industries from foreign competition (Alnatsheh, et al., 2023).

In times of economic uncertainty, governments may resort to protectionist tactics to protect their local sectors and workforce. These measures have the potential to hinder market access for Medjool dates and impede the path for Palestinian producers on the international stage. The geopolitical context and contours of trade agreements also contribute

to shaping the Medjool date market. The Israeli-Palestinian conflict and the accompanying political tensions have affected trade dynamics and access for Palestinian goods, including Medjool dates (Hamamra, et al., 2021). The contentious issue of labeling Medjool dates as "Made in Israel" has cast a shadow over the visibility and market attractiveness of Palestinian dates (Sultan, et al., 2022). These variables have significant implications for the accessibility and competitiveness of Medjool dates in international trade. Ongoing trade disputes and the evolution of trade negotiations also impact the global trade landscape and, consequently, the market for Medjool dates.

For instance, ongoing trade tensions between the United States and China have led to the imposition of tariffs and retaliatory measures that cause disruptions in trade channels (Alashi, et al., 2023). The impact of these disruptions could permeate global trade in agricultural commodities, including Medjool dates, potentially changing market dynamics and trade patterns. It is critical to emphasize that the impact of disruptions to global trade and fluctuations in import and export regulations extend beyond the borders of Medjool dates. All global agricultural trade is affected by these developments. However, due to the particular geopolitical and economic background that characterizes the Palestinian Medjool dates sector, the impact of these disruptions may be felt with particular intensity by Palestinian producers. In summary, the theory of world trade serves as a navigational tool to interpret the consequences of international trade policies and agreements for the Palestinian Medjool date sector. The rhythm of disruptions in world trade, the ebb and flow of import and export regulations, and the unfolding of protection strategies collectively determine the accessibility and competitive position of Medjool dates in international markets. This understanding is essential for Palestinian producers and policymakers as it helps them navigate the turbulent landscape of global trade, reduce trade barriers, and improve opportunities for Medjool dates to enter the market.

## 2.2 Empirical Literature Review

This section focuses on the empirical research on the impact of the Covid 19 pandemic on the world market for Palestinian Medjool dates. Wakil et al. (2015) conducted a new survey of the arthropod fauna of date palms worldwide and discovered 112 insect and mite species, 22 of which infest conserved dates. Date palm monocultures, climate change, uncontrolled use of chemical insecticides, and widespread international trade all contribute to the impact of the pest complex on date agroecosystems in several date-growing countries. The researchers summarize the sustainable management and biology of key insect and mite pests, address critical issues, and outline future research opportunities tailored to the importance of date palm. The study discusses the increasing importance of semi-chemicals in integrated pest management (IPM) for date palms, as well as innovative methods such as mating disruption, "attract and kill" and "push-pull" technologies. Research also addresses phytoplasma infections and associated insects, as well as novel pest control strategies in date storage. Abd Rabou and Radwan (2017) investigated the status of date palms and their use in the Gaza Strip. Through questionnaires and visits to facilities, they studied the 250,000 date palms in the Gaza Strip, with 40% of the total dates in Middle governorate. The study identified 19 cultivars, with 'Hayani', 'Barhee' and 'Bentaisha' being the most widespread. The average annual production of dates in the Gaza Strip ranges between 12,000 and 15,000 tons and supports more than 40 industries and uses associated with date palms, especially in the handicraft manufacturing and food sectors.

The study suggests improvements in date palm cultivation, production, protection, and marketing, and highlights the need for joint efforts to sustainably develop the date palm sector in the Gaza Strip. Chaudhary and Pankaj (2018) offered a balanced nutritional perspective on dates and their importance in diabetes and addressed the controversy arising from their religious and cultural significance in the Arab Gulf regions. Abd Rabou and Radwan (2018) documented different facets of the date palm sector in the Palestinian Gaza Strip's Deir El-Balah district and provided insights into 150 randomly selected individuals. The study highlighted the prevalence of the Hayani variety, the role of groundwater as a primary source of irrigation, and existing challenges, including the Red Palm Weevil outbreak and Israeli military activities. Al-Nadabi et al. (2020) conducted research to identify common fungal pathogens associated with date palm leaf spot disease in Oman. Their study revealed that the majority of isolates belonged to the genus *Alternaria*, with pathogenicity tests showing the aggressiveness of *Alternaria alternata* most clearly. Different scenarios were used by Abu-Zaineh and Awawda (2021) to evaluate the effects of the COVID -19 pandemic. These scenarios took into account both micro- and macro-level elements, such as labour supply and health capital. Branding, packaging, pricing, customer focus, and promotion were all areas of study for Ahmed's (2021) research on palm date product marketing. Gender-based violence in Palestine is still prevalent due to discriminatory laws, traditional norms, and the ongoing Israeli occupation, as studied by Mahamid, Veronese, and Bdier (2022). Finally, several empirical studies are presented in this part that analyse how the Covid 19 outbreak has affected the international trade of Palestinian medjool dates. These studies shed light on the pandemic's far-reaching effects on this industry as a whole, covering topics as diverse as pest management, agricultural practises, economic implications, health considerations, and gender-based violence.

## 2.3 Hypothesis Development

The cultivation and commerce of the date palm (*Phoenix dactylifera* L.) has a significant impact on many facets of society and economy in many countries, especially those in the Middle East and North Africa. Date palm cultivation has far-reaching effects, touching not just the economy but also culture, diet, and the natural world. Reviewing the existing literature helps shed insight on the wide-ranging effects of the date palm trade and agriculture. Date palm is widely regarded as an economic boon in many parts of the world. Many farmers on the Arabian Peninsula rely heavily on the

sale of date palms for their livelihood, as noted by Al-Khayri et al. (2015). Date palm farming and commerce encourage economic advancement by providing jobs and promoting local industries like food processing and packaging, as described by Marai et al. (2021), lending credence to this view. Significant environmental consequences are linked to date palm production. Al-Hasan et al. (2019) highlighted the role of date palm in combating desertification and mitigating climate change due to its resilience under harsh conditions, contributing to ecological balance. However, suboptimal agricultural practices such as excessive water use and pesticide use can lead to significant environmental impacts, as noted by Benessaiah and Sowers (2020). Cultural and social significance: date palm has great cultural and social significance, especially in Arab societies. Elshater et al. (2016) argue that date palm cultivation and trade reinforce traditional values and foster community ties that create a sense of cultural identity and belonging. Nutritional benefits: The nutritional benefits of date palm have been widely recognized. Taie (2020) provided an overview of the considerable nutritional value of dates, highlighting their richness in essential nutrients and antioxidants that contribute significantly to food security and human well-being. Role in international trade: Date palm production is significantly involved in international trade. According to Al-Abdoulhadi et al. (2022), date palm cultivation is a profitable sector that contributes to the GDP of numerous countries. However, this trade is subject to various influences, including fluctuations in the world market, trade policies, and challenges related to pests, diseases, and climate variability (Khalfani et al., 2021). Technological innovation: recent studies emphasize the role of technology and innovation in improving date palm production and trade. Al-Kaabi et al. (2021) suggested that modern advances such as precision agriculture and IoT applications can optimize date palm cultivation and yield. Based on the collected evidence, this study formulates the following hypothesis:

**H1: *There is Significant Impact of Date-Palm Production and Trade Companies in Palestine***

The consequences of the COVID -19 pandemic have had a significant impact on global production and trade. Pandemic-induced changes in production and trade patterns have led to diverse discussions and research efforts. This literature review focuses on recent studies of post-pandemic production and trade dynamics. Notable changes are taking place in the area of trade. First and foremost, the pandemic has caused many countries to reevaluate their reliance on global supply chains. As Baldwin and Tomiura (2022) point out, a clear trend toward "nearshoring" and "reshoring" is emerging, aimed at reducing dependence on foreign suppliers and avoiding potential future supply chain disruptions. At the same time, the importance of digital commerce has grown exponentially in the post-pandemic period. As He et al. (2023) point out, the pandemic has accelerated the expansion of digital trade platforms, offering companies an alternative way to engage in international markets despite travel restrictions and lockdowns. COVID -19 has also had a significant impact on the extractive industry, which includes oil, gas, and mining. According to Pegg (2022), many extractive companies have had to curtail or cease production due to health-related restrictions and decreased demand. However, as demand recovers in the post-pandemic period, the extractive industry is experiencing a resurgence, albeit accompanied by new challenges and opportunities related to sustainability and ESG (environmental, social, and governance) considerations (Pegg, 2022; Acosta et al., 2023). Finally, the pandemic has sparked a global discourse on cultivating resilience and sustainability in production and trade. As outlined by Barth et al. (2022), increasing supply chain resilience and improving sustainability in production practices have become important issues in the post-pandemic period. In summary, the post-pandemic era has ushered in significant changes in production and trade dynamics that include inclinations toward localized and sustainable production, shifting trade activities, increased digitization, and increased emphasis on resilience and sustainability. Nevertheless, this transition is complicated, and new challenges continue to emerge, underscoring the need for ongoing research and strategic planning. The following hypothesis was formulated.

**H2: *There is Significant Impact of Post-Pandemic Produce and Trade Extractions from the Managers of the Identified Companies in Palestine***

The global economy is undoubtedly affected by COVID -19, and the date palm industry is no exception to this impact. The impact of the pandemic is multi-faceted, affecting various aspects of production, distribution, and consumption patterns. The purpose of this literature review is to present and assess recent studies that address these changes. COVID -19 has caused significant disruption at the production level of the date palm industry. Measures such as cordoning off and social distancing have restricted labor mobility, resulting in labor shortages that have negatively impacted activities such as harvesting and processing (Al-Kaabi et al., 2021). In addition, Al-Abdoulhadi et al. (2022) highlighted how nursery closures and limited access to key inputs have negatively impacted the cultivation process. Despite this, the industry has become more innovative and resilient as a result of the crisis. To combat labour shortages and boost productivity, Al-Kaabi et al. (2021) advocated for the widespread adoption of digital technology like drone monitoring and precision agriculture. Transportation limitations and market closures were the most noticeable effects of the pandemic on the date palm supply chain. As a result, deliveries were delayed and waste increased, both of which fed into price fluctuations (Al-Kaabi et al., 2022). Another change in market dynamics is the emergence of online platforms as an alternate means of selling while markets are closed. Traditional markets were closed, but farmers were able to keep in touch with their customers through online marketplaces (Al-Abdoulhadi et al., 2022). Consumer behavior also changed during the pandemic, with health and nutrition taking a higher priority. Dates, known for their high nutritional value and immune-boosting properties, saw increased demand in certain regions (Marai et al., 2021). Dates may have become more popular during the epidemic since they are seen as a "superfood" (Taie, 2020). The date palm industry's ecological and social

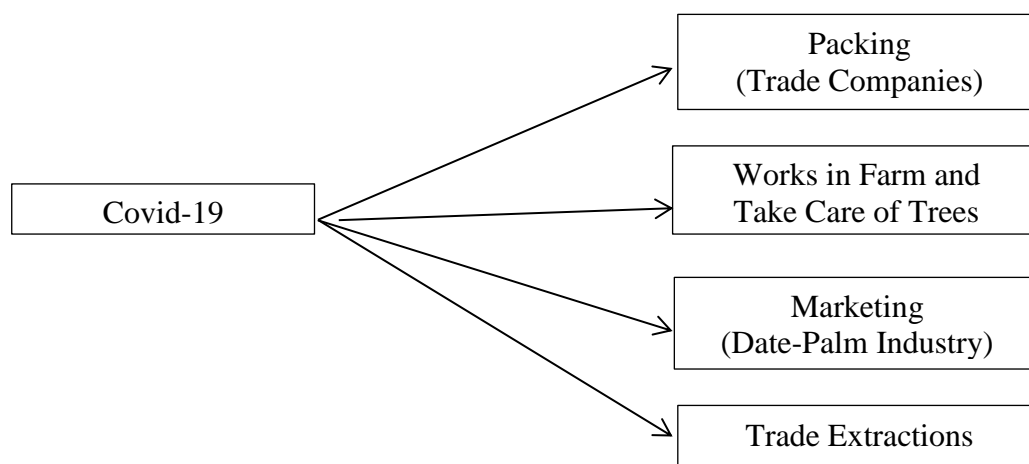
impacts from the pandemic must be taken seriously. Because of the pandemic's complicated environmental impact on date palm farming, Benessaiah and Sowers (2020) devoted an entire article to the topic. On the one hand, the decrease in human activities resulted in less degradation of ecosystems; on the other hand, unsustainable agricultural practices continued due to inadequate monitoring. In terms of social impacts, the pandemic underscored the vulnerability of date palm farming communities, particularly in terms of access to health care and social protection (Fanzo et al., 2022). Nonetheless, the crisis also fostered stronger community ties and mutual support networks within these communities (Fanzo et al., 2022). In summary, the COVID -19 pandemic had a profound impact on the date palm industry, causing disruption and adaptation. The crisis has highlighted the need for resilience, innovative strategies, and sustainable practices within the sector. Further research is essential to fully understand the long-term impact of the pandemic and to guide the industry on a resilient and sustainable path. Therefore, based on the evidence presented, the following hypothesis was formulated.

**H3: There is Significant Statistical Relationships for the Interpretation of Covid-19 Impacts to the Date-Palm Industry**

The global impact of the COVID -19 pandemic has prompted the need for effective global recovery strategies, with optimization methods occupying a significant place in plans formulated for the post-pandemic period. The following analysis of the existing literature focuses on recent research that addresses these optimization techniques. The pandemic highlighted the critical role of digital transformation in business survival, and this strategy continues to be an essential element in recovery plans (Bartik et al., 2022). Many companies have recognized the importance of automating processes, improving online services, and enabling remote work. This shift not only increases operational efficiency, but also strengthens preparedness for future disruptions (Kumar et al., 2023). Another key aspect of post-pandemic recovery plan is improving supply chain resilience. This includes strategies such as diversifying supply chains, localizing production, increasing inventory levels, and using digital solutions to improve supply chain visibility (Ivanov, 2022). The objective is to make it possible for enterprises to weather future storms with minimal disruption. As a result of the epidemic, there have been major shifts in how we manage our workforce. To a greater or lesser extent, companies can save money by allowing their employees to work remotely, and they can get access to a larger pool of qualified candidates by doing so (Brynjolfsson et al., 2022). To keep up with the evolving needs of the digital age, businesses are also investing more in staff education and development (Béland et al., 2023) than ever before. Sustainability and ESG (environmental, social, and governance) factors are once again front and centre in the post-pandemic era. Seeing that better rehabilitation also means more environmentally conscious recovery, businesses are implementing sustainable practises into their recovery strategies, as reported by Rathbone et al. (2023). Financial resilience has also become more important as a result of the pandemic. Companies are optimizing their financial approaches and focusing on managing liquidity, controlling costs, and developing new revenue streams (Gourinchas et al., 2022). This includes refining investment portfolios and ensuring financial stability to withstand future shocks. In summary, the literature points to a multifaceted strategy for post-pandemic recovery in which optimization techniques play a central role. The focus is on building digital capabilities, driving supply chain and financial resilience, optimizing the workforce, and integrating sustainability into the core structure of business strategies. While these actions were primarily triggered by the pandemic, they are likely to continue to shape the development of companies and economies beyond the recovery phase. Therefore, the following hypothesis was formulated.

**H4: There is Significant Optimization Measures as a Post-Pandemic Recovery Plan**

Based on the proposed hypotheses, this study developed the research model shown in Fig 1.



**Fig. 1** Research Model

### 3. Research Methodology

This study uses a quantitative research approach to examine the impact of the COVID -19 pandemic on the global market for Palestinian Medjool dates. A cross-sectional survey is conducted to collect data from farmers, workers and owners of date palm plantations in Palestine. The population of interest includes 80,000 farmers, workers and orchard owners growing date palm in Palestine as reported by the Ministry of Agriculture in 2022. Using the G\*Power (2017) calculator and considering a confidence level of 95% and a margin of error of 5%, the sample size is 382 respondents. The sampling method used is stratified random sampling, which ensures representation from different regions of Palestine. Data were collected through self-completed questionnaires distributed to the selected respondents. The questionnaire was designed to collect information on the impact of the pandemic COVID -19 on different aspects of the Medjool date industry, including packaging, marketing, orchard management and trade extractions. Data collection was conducted in several steps. First, the necessary permissions were obtained from the relevant authorities. Then, the questionnaires were distributed to the selected respondents through personal visits to the orchards. The questionnaire could only be filled out correctly if provided explicit instructions. For this data, we opted for a cascaded method of analysis. Descriptive statistics come first, followed by inferential statistics, in this methodology. Ethical considerations were taken into account throughout the research process, and participants' anonymity, confidentiality, and permission were all protected. Subjects were given detailed information about the study's goals, their rights, and the importance of their informed consent.

### 4. Findings and Discussion

Descriptive statistics for a number of constructs and variables of interest to the study are presented in Table 1. Extractions: Covid\_19\_Pandemic, Packaging, Working in Agriculture and Caring for Trees, Marketing, and Trading. Statistics for each construct are tabulated in the table below, including mean, standard deviation, skewness, and kurtosis. Understanding the distribution of each variable is greatly aided by these comparisons. The mean is the typical value for each dimension. For example, the mean score for the construct Covid\_19\_Pandemic is 4.1871, indicating that, on average, respondents assigned a relatively high score to this factor according to the survey scale. The standard deviation (Std. Deviation) measures the dispersion or variability within responses. A smaller standard deviation means that the responses are more tightly grouped around the mean. Of the constructs in Table 1, Packing has the smallest standard deviation (0.51835), indicating that responses for this construct are relatively consistent. The table also shows skewness, which refers to symmetry or lack thereof in the data distribution. Skewness values close to 0 indicate a symmetrical distribution. A positive skewness indicates a distribution with an elongated right tail, while a negative skewness indicates a distribution with a longer left tail. All constructs in your study have negative skewness, which means that the response distributions tend to have higher values. Kurtosis, another measure in Table 1, provides information about the peak or tail characteristics of the distribution. A kurtosis value close to 0 indicates a distribution that resembles a standard normal distribution. A positive kurtosis value indicates a sharper peak and stronger tails, while a negative kurtosis value indicates a flatter peak and weaker tails. In the context of Table 1, constructs such as Covid\_19\_Pandemic and Packing have a negative kurtosis, indicating that the data distributions tend to be flat (platykurtic) compared to a standard normal distribution. In summary, the skewness and kurtosis values in Table 1 provide insight into the distributional characteristics of the variables. These results show that the data distributions do not perfectly match a normal distribution.

**Table 1** Descriptive Results

Constructs	Mean	Std. Deviation	Skewness	Kurtosis
Covid_19_Pandemic	4.1871	0.59628	-0.347	-0.83
Packing	4.1918	0.51835	-0.132	-0.706
Works in Farm and Take Care of Trees	4.1583	0.67597	-0.72	0.491
Marketing	4.2314	0.59505	-0.670	0.268
Trade Extractions	4.2634	0.58665	-0.598	-0.009

Table 2 shows the results of a cascade regression analysis examining the impact of the Covid 19 pandemic on various dimensions of date palm cultivation and trade in Palestine. These dimensions include packing, farm labor and tree care, marketing, and trade extraction. Four hypotheses (H1-H4) are presented in the table and the corresponding relationships, path coefficients (beta coefficients or slopes in the regression model), t-values, p-values, and support status of each hypothesis are presented. The path coefficient of -0.776 indicates a robust negative correlation, suggesting that there was a decrease in packaging activity as the severity of the Covid 19 pandemic increased. The t-value of 22.961 and a p-value of 0.000 (less than 0.05) demonstrate the statistical significance of this relationship, confirming H1. The path coefficient of -0.642 also indicates a moderately strong negative correlation. This implies that as the impact of the Covid 19 pandemic worsened, engagement in agricultural work and tree care decreased. The t-value of 15.612 and a p-value of 0.000 (less than 0.05) underscore the statistical significance of this relationship, supporting H2. Furthermore, the path coefficient of -0.672 indicates a moderately strong negative correlation, implying that as the severity of the Covid 19 pandemic increased, marketing activity decreased. The t-value of 16.910 and a p-value of 0.000 (less than 0.05) indicate the statistical significance of this relationship, thus confirming H3. Finally, the path coefficient of -0.617 indicates a moderately strong negative correlation. This indicates that as the impact of the Covid 19 pandemic worsened, trade promotion activities declined. The t-value of 14.628 and a p-value of 0.000 (less than 0.05) demonstrate the statistical

significance of this relationship, supporting H4. Thus, the outbreak of the Covid 19 pandemic has led to profound changes worldwide, from which no sector has been unaffected. One such sector that has been significantly affected is agriculture, with the date palm industry in Palestine being particularly hard hit. Cascade regression statistical analysis clearly shows the significant negative impact of the pandemic on various aspects of the industry, including packaging, farm labor and tree care, marketing, and trade extraction. Starting with packaging, this key stage of the agricultural chain faced significant challenges from the pandemic. Packaging ensures the preservation and proper preparation of harvested fruit for transport and sale. However, stringent health measures aimed at containing the spread of the virus and concerns about contagion led to a significant reduction in this activity. This may have led to delays and a decline in overall production, as indicated by the strong negative relationship illustrated by the path coefficient of -0.776. Farm labor and tree care, which are an integral part of agriculture and directly affect the quality and quantity of produce, also had a negative impact. The moderately strong negative correlation reflected in a path coefficient of -0.642 underscores these impacts. Labor-intensive activities were associated with difficulties due to mobility constraints, social distancing imperatives, and fear of contagion. This decline may have contributed to inadequate orchard maintenance, which affected the quality and quantity of date palm yields. In addition, the pandemic significantly disrupted marketing activities in the industry, as indicated by the path coefficient of -0.672. Traditional marketing channels were disrupted, and conventional face-to-face sales, which are common in agriculture, were significantly hindered by social distancing and lockdown measures. The sudden shift to digital marketing methods posed challenges, especially to smallholder farmers who are less familiar with these methods. Finally, trade gains were also affected, as indicated by a path coefficient of -0.617. Trade extraction includes all processes that facilitate the export and import of agricultural goods. The pandemic caused significant disruptions to global trade, with various restrictions and regulations affecting smooth exchanges. As a result, date palm trade likely experienced setbacks that affected the overall profitability of the industry. In summary, these findings underscore the broad and profound impact of the Covid 19 pandemic on the Palestinian date palm industry.

**Table 2** Cascade Regression Results

No.	Hypotheses	Path	Path Coefficient	T-value	P-Values	Supported
1	H1	Covid-19 Pandemic - > Packing	-0.776	22.961	0.000	Yes
2	H2	Covid-19 Pandemic - > Works in Farm and Take Care of Trees	-0.642	15.612	0.000	Yes
3	H3	Covid-19 Pandemic - > Marketing	-0.672	16.910	0.000	Yes
4	H4	Covid-19 Pandemic - > Trade Extractions	-0.617	14.628	0.000	Yes

Table 3 shows the coefficients of determination ( $R^2$ ) and F-values ( $F^2$ ) for the four constructs: Packaging, Farm Work and Tree Care, Marketing, and Trade Extractions. These constructs relate to the variables of interest in your study of the impact of the Covid 19 pandemic on the Palestinian date palm sector. The  $R^2$  values quantify the extent to which the variance in the dependent variables (the constructs) can be explained by the independent variable (in this case, the Covid-19 pandemic). Wrapping up: With an  $R^2$  value of 0.602, approximately 60.2% of the variance in wrapping can be explained by the Covid-19 pandemic. The F-value of 527.18, along with a p-value of 0.000, underscores the statistical significance of the model. Farm labor and tree care: the  $R^2$  value of 0.412 indicates that approximately 41.2% of the variance in farm labor and tree care is due to the Covid-19 pandemic. The F value of 243.75 and a p value of 0.000 confirm the statistical significance of the model. Marketing: the  $R^2$  value of 0.451 indicates that about 45.1% of the variability in marketing efforts can be explained by the Covid-19 pandemic. The F value of 285.96, accompanied by a p value of 0.000, confirms the statistical significance of the model. Trade extractions: With an  $R^2$  value of 0.381, about 38.1% of the variation in trade extractions can be explained by the Covid 19 pandemic. The F-value of 213.99, coupled with a p-value of 0.000, confirms the statistical significance of the model. In conclusion, these results demonstrate that the Covid-19 pandemic has exerted a statistically significant impact on packing, farm labor and tree care, marketing and trade in the Palestinian date palm industry. However, it is important to recognize that the remaining variation in these constructs (between approximately 40% and 60%) can be attributed to other factors that were not included in this model.

**Table 3** Co-efficient of Determination Results

Constructs	$R^2$	$F^2$
Packing	0.602	527.18 (0.000)
Works in Farm and Take Care of Trees	0.412	243.75 (0.000)
Marketing	0.451	285.96 (0.000)
Trade Extractions	0.381	213.99 (0.000)

## 5. Conclusion

The global impact of the Covid 19 pandemic has undeniably caused widespread disruption that has changed various aspects of life around the world. The date palm industry in Palestine has not been spared the far-reaching consequences of this pandemic and faces significant challenges. The key findings of this study highlight the significant negative correlations between the severity of the pandemic and various operational aspects within the industry, which include packaging activities, agricultural work, marketing initiatives, and trade extraction. The lessons learned from these conclusions shed light on the complex difficulties facing the industry and provide the basis for developing comprehensive strategies to ensure recovery and future resilience. The pronounced decline in packaging activity due to the escalating pandemic highlights the vulnerability of this important sector to unforeseen disruptions. However, it also highlights the potential for improvement through the introduction of automation and the adoption of strict health protocols. Adopting operating models that are both adaptable and scalable will be crucial in responding to future crises. The labor-intensive character of agriculture is highlighted by the negative association between agricultural labour and the effect of a pandemic. A paradigm changes towards less labor-intensive and more self-sustaining agricultural practises, such as precision agriculture, is clearly warranted. It also shows how crucial it is to set up safeguards for workers. As marketing efforts slow down during the epidemic, businesses have more time to reevaluate and revamp their conventional methods of promotion. This is crucial in light of the recent movement in consumer behaviour towards online platforms and the rising demand for environmentally friendly and health-conscious goods. The sector may respond to shifting consumer tastes and broaden its customer base by using digital tools. The detrimental effect on trade promotion highlights the industry's exposure to changes in global trade dynamics. This highlights the importance of implementing sophisticated supply chain management software to build a more robust and diverse supply chain. The research results can be used as a starting point for developing a recovery strategy after a pandemic. The adoption of digital transformation across all sectors of the industry has the potential to revolutionize operations. Investing in skills development and training that includes digital literacy, health and safety protocols, and sustainable agricultural practices can ensure compliance with new standards and increase overall productivity. Importantly, the road to recovery cannot be taken in isolation. Actively working with policymakers to advocate for supportive policies that include financial assistance, incentives for digital transformation, and the promotion of fair-trade practices will play a critical role in shaping the industry's path forward.

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