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RESEARCH ARTICLE

Navigating non-tariff measures and exports of cardamom, pepper and turmeric

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Abstract

India is globally known as the "Land of Spices" and is an important producer and exporter of high-value spices such as turmeric, pepper and cardamom competing with other major global players. The global market for spices is $46 billion (2023) and holds significant potential for further growth. The study examines market shifts, market outcomes and production trends in the three dominant spices especially the key role that Non-Tariff Measures (NTMs) play for exporters. NTMs define parameters under Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) under which exporter certifications must be obtained related to quality/safety measures that can make it particularly challenging for exporters to navigate compliance. In this study we look specifically at the impacts of NTMs as they affect the export of spices from India and specifically, the assessment focus on the impact of compliance measures on both the volume of product traded and its market value. Analysis of export data using Markov Chain and CAGR reveals that turmeric and cardamom show positive trends, while pepper faces decline due to SPS/TBT barriers and global competition. The dataset underscores the need for India to boost quality systems and align exports with international standards for sustained market access. Future paths should address the issues and challenges imposed by NTMs to improve compliance with relevant SPS and trade regulations, retain trading opportunities and explore prospects to further expand spice exports from India.

Keywords: export trade; non-tariff; sanitary and phytosanitary regulation; spices trade

Introduction

Spice crops are a significant contributor to the agricultural economy of the countries in South Asia and especially India, which is the top producer, consumer and exporter of spices in the world. In 2015-16, India produced approximately 6.9 million tonnes of spices, with a wide variety of spices grown on about 3.5 million hectare (1). Although approximately 30 % of the total spice production in India is accounted for by spices such as black pepper, cardamom, cinnamon, ginger and turmeric, they represent only a portion of the country's diverse spice output (1).

Spices still play an important role in the food culture of India and they also give food in India its unique flavor. The growth of global interest in Indian food can be attributed mostly to the flavor profile added by spices. India has a rich and ancient history with spices, dating back over 5000 years. Known as the "Land of Spices," India has been at the heart of the global spice trade for centuries. Ancient texts like the Atharva Veda mention various spices used for both culinary and medicinal purposes. Spices such as black pepper, cardamom, cinnamon, turmeric and cloves were highly valued and became key commodities in trade with the Middle East, Europe and Southeast Asia. The Malabar Coast in Kerala was a major hub for spice cultivation and trade, attracting traders from Rome, Arabia, China and later, European colonial powers like the Portuguese, Dutch and British. These interactions significantly influenced India's culture, economy and global importance. The spice trade not only brought prosperity but also played a pivotal role in shaping world history through exploration and colonization. Even today, India remains one of the largest producers, consumers and exporters of spices in the world. In fact, this shows how closely connected Indian spices are to traditional forms of cooking, with the extensive array of flavors to enhance or enhance the flavor profiles of many foods (2).

Cardamom is one of the several most expensive spices in the world. The characteristics of Indian cardamom can be attributed to India's warm, humid climate, as well as loamy, organic-rich soils, adequate rainfall and the finesse of farming and processing practices, which work together to produce cardamom with a distinct aroma, taste, size and bright parrot-green color. Furthermore, cardamom is valued for its health benefits; although it has many culinary applications, it is especially used in sweets (3).

Black pepper is the most widely celebrated spice throughout the world and it is also the most well-known. It is cultivated in over 26 countries and was produced in a total of about 315000 to 320000 tons of black and white pepper. The hot flavor is due to an alkaloid named piperine and the unique aroma from the oils produced by the spice (4).

Turmeric is also a popular and widely used spice across the world, especially in eastern cultures. It is a spice but also has a historic traditional medicine of many countries including India, Bangladesh and Pakistan and was valued both for its spice and health properties. In Iran, turmeric is known as Zarchooveh and is used for flavoring as well as for medicines (5).

Trade remains key to global economic growth. India is widely regarded as a major center of origin and diversity for spices. India has produced and traded spices like black pepper, turmeric and cardamom for centuries and they are valuable in both the domestic and international markets. India is leading producer and exporter of spices (6).

India exported a total of 1.08 billion kg (a total value of US$ 3.11 billion) of spices in 2016. From April to October 2018, India exported 621.98 million kg of spices for a total value of US$ 1.84 billion. Some of the top importing countries included US, China, Vietnam, Hong Kong, Bangladesh, Thailand, UK, UAE, Malaysia and Sri Lanka. India's spice exports show a clear trend of value-driven growth. Pepper exports have remained stable in volume with slight fluctuations, but values have increased post-2020-21, indicating better unit prices or a shift toward value-added products despite possible supply constraints. Turmeric exports have consistently grown in value, touching ₹1875.87 crores in 2023-24, even as volumes dipped slightly, reflecting strong global demand driven by its health benefits and preference for natural products. Small cardamom exports, after peaking in 2021-22, have seen a volume decline, but values remain high, suggesting improved pricing and quality-focused exports. The dip in volumes may be due to production issues, weather variability, or rising domestic consumption. The exported spices included chilli, mint products, spice oils and oleoresins, cumin spices, turmeric spices, pepper, curry powders and pastes, cardamom seeds and all other spices including tamarind (7).

Tea, cinnamon, coconut-based items, animal feed, seafood, pepper, herbal products etc. featured in the top ten agricultural export commodities. These Agricultural products grappled mostly with non-tariff measures, for example, SPS, TBT, Pre-shipment Inspections (PSI) and Export Regulatory Measures (ERM) (8). Studying the export growth pattern helps in identifying key trends, emerging markets and shifts in demand, which is crucial for formulating policies and strategies to sustain and expand India's spice exports. Understanding NTMs is essential to ensure compliance, avoid rejections and maintain India's reputation in the global market. The objectives of the study include

1. To examine the export growth pattern of spices in the global market
2. To study SPS in the International Spice Trade
3. To study TBT in the International Spice Trade

An understanding of these objectives will provide stakeholders with an opportunity for identifying major problem areas and develop strategies, such as policy recommendations, infrastructure developments or quality control systems in order to enhance India's ability to export spices. A comprehensive approach can mitigate the negative impacts of NTMs on Indian spice exports.

Materials and Methods

Area of study

This study is categorized under International Trade and Agricultural Economics, examines how NTMs impact the export performance of high-value Indian spices specifically cardamom, pepper and turmeric. It focuses on the role of regulatory standards such as SPS measures, TBT and defined export requirements in shaping trade flows, market access and the global competitiveness of these spices.

Method of data collection

The research project utilizes secondary data to analyze the effect of NTMs on the export capability of cardamom, pepper and turmeric from India. The researcher collected data from various reliable and authoritative sources (Spice Board of India, Ministry of Commerce and Industry) to assure that data were accurate and comprehensive.

Data sources

This study involved the utilization of secondary data sources which included, the report from the Spices Board of India, the Indian Trade Portal and Multinational trade organizations. The study will examine data on spices exports and compliance with regulatory procedures. Statistical data were generated from government records, trade and industry reports. The relevant peer-reviewed journal articles were also referenced with respect to market trends, NTMs and other policy interventions concerning Indian exports of spices.

Market trends were examined via Markov Chain Analysis to assess the principal transition of how the market dominance or export share of Indian spices like turmeric, pepper and cardamom has shifted among different international markets (e.g., from the U.S. to the Middle East or EU), possibly due to changing trade policies, consumer demand, or regulatory standards. The long-term data enabled the estimation of CAGR to estimate anticipated growth relations in spices exports in the future. In conjunction with the analysis, there was consideration of important rejections and rejections for case studies as well as NTMs which currently limit Indian spices through heavier tariffs on trade. All of these techniques provided a different dimension for understanding the evolving trading environment.

The study used triangulation by cross-verifying data from three sources: academic papers, trade reports and government databases. This process was accomplished through a delivery of academic research papers, trade reports and outputs from government databases to provide findings. The outcome of the triangulation was used to make recommendations, on how India can improve its compliance with international trade regulations and to assist in the minimization of the impact of the NTMs on its exports.

Tools for analysis

Markov chain analysis

Markov Chain Analysis can be used to model export behavior and in particular about how the export destination or volume for either a country or product may change over time (9).

CAGR

CAGR measures the CAGR of any investment, value or variable over a specific time period, provided the investment, value or variable grows at a constant rate (10)

$$\text{CAGR}\left(\frac{\textit{Beginning value}}{\textit{Ending value}}\right)^{\frac{1}{n}} - 1$$

ANOVA was used to compare CAGR from different years production and export data.

Trend analysis

Trends in the growth rates of export quantity and value were analyzed by applying an exponential growth function. The compound growth rates were estimated using the formula:

$$Y_{it}=A_i(1+r)^t$$

Where, Y_{it} - the export quantity/value of the i^{th} crop at time t, r - the compound growth rate of Y_{ij}, A_i - the quantity/value of the i^{th} crop exported in the initial year, t - time in years (11)

Results and Discussion

Turmeric

Markov chain analysis

The Markov Chain analysis represents the transitions of export destination of Indian spices- Turmeric, Pepper and Cardamom- in various countries over the span of a decade.

Bangladesh has proven to be a relatively stable importer of Indian turmeric but is now showing some diversification. The export probabilities of turmeric from India show that the UK scored 0.672, Japan at 0.107 and Saudi Arabia at 0.219. From these results, changes are observed in previous trading conditions; these changes can be attributed to various factors, such as import restrictions or changes in the SPS standards. The USA, Malaysia, Morocco and Germany have a self-transition probability of 1, indicating complete retention of Indian imports. Markov chain analysis for Turmeric is displayed in Table 1.

Trend analysis

The information shows an overall increase in turmeric production within the data, with a peak occurring in 2021-2022. The compound growth rate of 4.16 % is representative of moderate, but steady growth. This is in line with the global demand for turmeric health products. The trend line of turmeric production is shown in Fig. 1. The slight drop in 2022-2023 may be due to variations of weather, soil degradation, disease/pest effect, etc. Table 2 presents turmeric production.

Pepper

Markov Chain Analysis

United States shows a strong stability with a self-transition probability of 0.843, indicating strong stability and minimal risk of trade interruption. Canada shows some diversification with a self-transition of 0.681, some diversion of exports to UAE and

Table 2. Production of turmeric

Year	Production
2018-2019	960.72
2019-2020	1153.14
2020-2021	1123.85
2021-2022	1221.78
2022-2023	1130.69

Table 1. Markov chain analysis of turmeric

	Bangladesh	UAE	USA	Malaysia	Morocco	Germany	Netherland	UK	Japan	Saudi Arabia	Other country
Bangladesh	0	0	0	0	0	0	0	0.67	0.107	0.219	0
UAE	1	0	0	0	0	0	0	0	0	0	0
USA	1	0	0	0	0	0	0	0	0	0	0
Malaysia	0	0	0	0	0	0	0	0	0	0	1
Morocco	0	0	0	0	0	0	0	0	0	0	1
Germany	1	0	0	0	0	0	0	0	0	0	0
Netherland	1	0	0	0	0	0	0	0	0	0	0
UK	1	0	0	0	0	0	0	0	0	0	0
Japan	1	0	0	0	0	0	0	0	0	0	0
Saudi Arabia	1	0	0	0	0	0	0	0	0	0	0
Other country	1	0	0	0	0	0	0	0	0	0	0

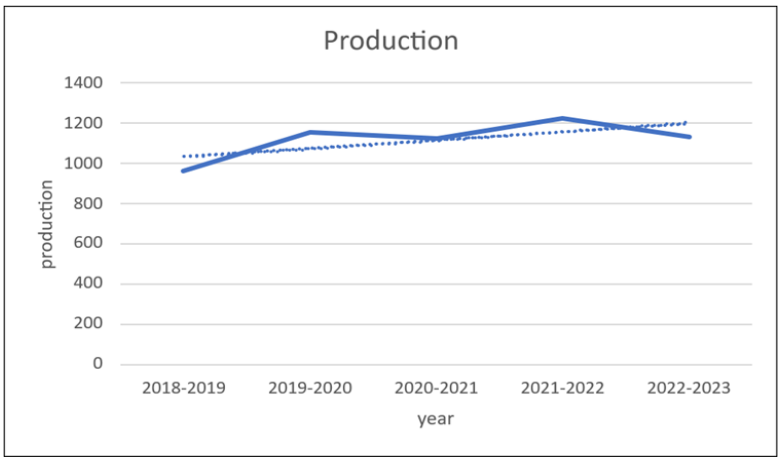

Fig. 1. Trend line of turmeric production.

Other Countries possibly under the auspices of ERM or reshape of product labeling requirements. Sweden and Germany show some degree of trade volatility. Sweden imports some of their Pepper from Australia (0.788); Germany shows quite possibly a significant transition probability (0.292) from the Netherlands. Markov chain analysis for pepper is displayed in Table 3.

Trend analysis

The data indicates a fluctuating trend in pepper production including a spectacular drop in production in 2019-2020 from climatic aberrations/disease/low price that dissuaded harvesting. The significant rise for 2020-2021 indicates fixedness of production due to possibly good weather, or a product of advantageous price recovery when associated with harvest precepts. The trend line for pepper is given in Fig. 2. Above and beyond the recovery in production, the negative CAGR (-8.46 %) of pepper in years 2019-2023 indicates volatility in production with potential fragility in the pepper supply chain. Table 4

Table 4. Production of pepper

Year	Production
2018-2019	137.4
2019-2020	104.09
2020-2021	140.9

presents pepper production.

Cardamom

Markov chain analysis

Saudi Arabia shows strong retention with a self-transition probability of 0.875 and continues to retain preference for Indian cardamom, not withstanding NTMs. Japan and the United States, in addition to lowering self-retention, have exhibited tremendous diversification in their exports. Japan's exports are transitioning to 'Other Countries' with a probability of 0.851, which could reflect Japan's compliance with the strictest SPS standards or possibly geographies are a result of a change in global price markets in the last quarter or countries' respective trade policies. Finally, the United Arab Emirates is also a stable market carrying a self-retention probability of 0.723 black pepper between partners, which identifies relatively low levels of trade friction. The transition probability for cardamom in the Markov Chain analysis is provided in Table 5

Trend Analysis

Cardamom production experienced good growth from 2019-20 to 2021-22 at a five-year CAGR of 11.3 % but declined in the year 2022-23 which may have involved changing rainfall patterns and subsequent crop management challenges or post-harvest crop losses. The trend lines of cardamom production are presented in Fig. 3. In general, it is demonstrating strong recovery and growth and is currently a strong competitor in global cardamom production. Cardamom production captured is presented in Table 6.

Compound Annual Growth Rate (CAGR)

The CAGR indicates the long-term export conditions for selected Indian spices for the study period. The CAGR of Turmeric, Cardamom and Black Pepper is shown in Table 7.

Cardamom shows the highest provided CAGR (6.47 %), indicating growing global demand, a good position in the Gulf market and limited competition in premium markets. Turmeric shows positive growth (4.16 %) based on growing global interest in health and wellness, where turmeric is used for its health benefits. In contrast, black pepper shows negative

Table 3. Markov chain analysis of pepper

	Australia	China	Canada	UK	US	Malaysia	Netherland	Germany	Sweden	UAE	Other countries
Australia	0	0.211	0	0	0	0	0	0	0.788	0	0
China	0	0	1	0	0	0	0	0	0	0	0
Canada	0	0	0.681	0	0	0.005	0	0	0	0.313	0
UK	0	0.037	0	0	0	0.172	0	0	0	0.037	0.752
US	0	0	0	0	0.842	0	0	0.157	0	0	0
Malaysia	1	0	0	0	0	0	0	0	0	0	0
Netherland	0	0	0	0	0	0	0	0.292	0	0	0.707
Germany	0	0	0	0	0	0	0	0	0	0	1
Sweden	0	0	0.043	0	0.183	0.027	0	0	0.745	0	0
UAE	0	0	0.242	0	0.716	0.041	0	0	0	0	0
Other countries	0.368	0	0	0.401	0	0	0.229	0	0	0	0

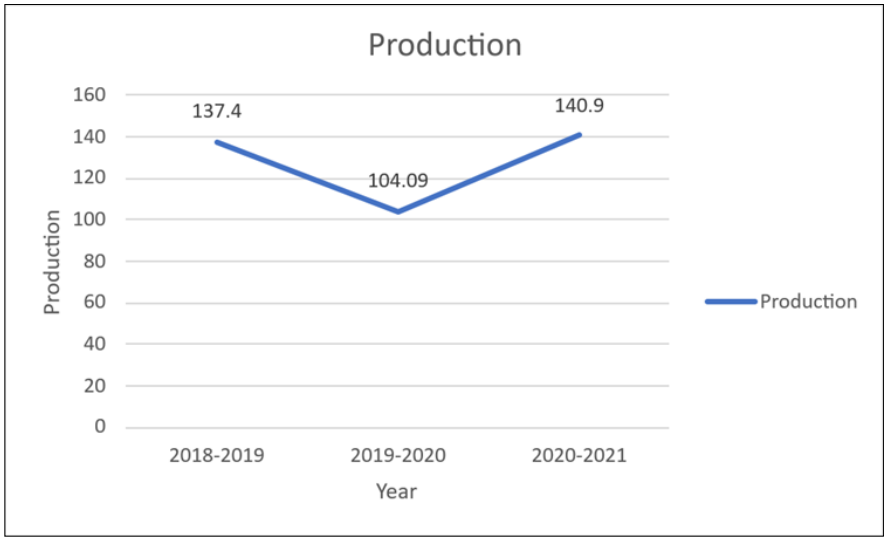

Fig. 2. Trend line of pepper production.

Table 5. Markov chain analysis of cardamom

	Australia	UK	Canada	Saudi Arabia	Japan	Kuwait	Malaysia	Qatar	UAE	USA	OTHER COUNTRIES
Australia	0	0	0	0	0	0	1	0	0	0	0
UK	0	0	0	0	0	0	0	0	1	0	0
Canada	0	0	1	0	0	0	0	0	0	0	0
Saudi Arab	0	0	0.004	0.875	0	0.034	0	0	0	0.012	0.072
Japan	0	0	0	0	0	0	0	0.148	0	0	0.851
Kuwait	0	0	0	0.310	0.051	0.638	0	0	0	0	0
Malaysia	0	0.384	0.060	0	0	0	0	0	0.555	0	0
Qatar	1	0	0	0	0	0	0	0	0	0	0
UAE	0	0	0	0	0	0	0.022	0.029	0.733	0	0.214
USA	0	0.063	0	0	0	0	0	0	0	0.040	0.895
OTHER COUNTRIES	0	0	0	0.119	0	0.077	0	0.018	0.628	0.053	0.102

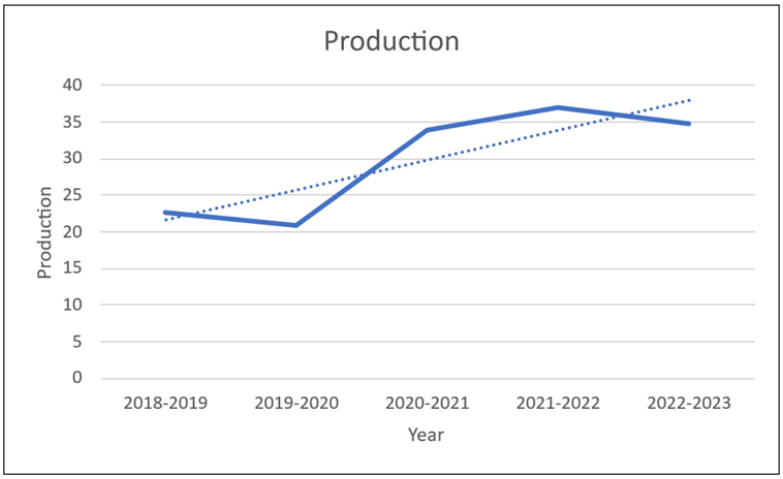

Fig. 3. Trend line of cardamom production.

Table 6. Production of cardamom

Year	Production
2018-2019	22.57
2019-2020	20.91
2020-2021	33.95
2021-2022	37.06
2022-2023	34.81

Table 7. CAGR of turmeric, cardamom, black pepper

S. NO.	SPICES	CAGR
1	Turmeric	4.16
2	Cardamom	6.47
3	Black Pepper	-8.46

growth and a CAGR (-8.46 %), indicating a contraction of exports. Internationally, this could be the result of increased competition from South East Asian produce (Vietnam and Indonesia) and a tighter set of NTMs in major export markets (e.g. EU, USA).

SPS measures serve as a means to ensure safety and quality of spices, in international trade Table 8. presented by the Spices Board of India outlines some significant SPS violations found in Indian spice consignments in total and by commodity type: turmeric, black pepper and cardamom. More specifically, contamination from salmonella, lead, chlorpyrifos, ethylene oxide, aflatoxin in terms of turmeric and pepper products and cardamom's violation related to pesticide residues - quinalphos, cypermethrin, profenofos etc.; which directly contributes to the problems faced for cardamom exports especially to Taiwan. The SPS violations listed above reinforce the importance of swift compliance to international food safety protocols and standards. Exporters can achieve this export potential, avoid or minimize trade barriers, by adhering to good agricultural practice, conducting periodic, random and representative residue testing of their produce and enhance their systems for traceability. Equally important, is to raise awareness and enhance capacity of farmers and exporters regarding the SPS measures and it's requirements to ensure that Indian spices maintain their credibility to remain competitive in global markets. The SPS Requirement for spices compiled with some reference to the risk report in export consignment, is outlined in Table 8.

Table 9 lists the grade designations and quality of whole turmeric, providing examples of how these standards can act as TBTs if exporters do not show conformity. For example, when distinguishing between "Special" and "Standard" grades, the factors of quality involved includes organic/inorganic extraneous matter, defective rhizomes, moisture content, curcuminoids, insect damage, harmful substances eg lead chromate. Admitting countries may simply accept the grade "Special" or require certain criteria be fulfilled eg moisture or levels of curcumin. Non-compliance with standards may result in export delays, retesting costs, or shipment rejections.

Countries importing spices, particularly black pepper, impose strict quality standards in relation to certain parameters of spice quality. Moisture content, amount of volatile oil, extraneous matter and piperine content are a few of the important factors that play a role in the quality of black pepper grade into Special and Standard grades. If the quality requirements (mandatory requirements, determined by importing country's regulatory authorities) do not meet a certain standard, it is possible that the spice consignment could be delayed, rejected, or further testing and certification would be required. Issues such as TBTs can be especially detrimental to small-scale exporters who don't have access to adequate processing and testing facilities. If businesses

Table 8. SPS Requirement for spices compiled based on risk report in export consignment

Product category	Region/Country	Violation/Risk	Applicable limit
Turmeric Products	European unites	Salmonella	Absent in 25gm
Turmeric Products	European unites	Lead	1.5
Turmeric Products	European unites	Chlorpyrifos	0.01
Turmeric Products	European Unites	Ethylene Oxide	0.1
Turmeric Products	European Unites	Aflatoxin	5
Black Pepper products	European Unites	Ethylene Oxide	0.1
Cardamom	European Unites	Chlorpyrifos	0.01
Cardamom	Taiwan	Quinalphos	0.05
Cardamom	Taiwan	Cypermethrin	0.5
Cardamom	Taiwan	Profenofos	0.07
Cardamom	Taiwan	Bifenthrin	0.03
Cardamom	Taiwan	Deltamethrin	0.03
Cardamom	Taiwan	Lambda cyhalothrin	0.03
Cardamom	Taiwan	Imidacloprid	0.05

Table 9. Grade designations and quality of Turmeric (whole)

Grade Designation	Quality						
	special characteristics (Percent By mass)						
	Organic Extraneous matter (max)	Inorganic Extraneous matter (Min)	Defective Rhizomes (max)	Moisture (max)	Curcuminoid content on dry weight Basis (min)	Insect damaged Matter (Max)	Lead Chromate test
1	2	3	4	5	6	7	8
Special	0.3	0.1	3.0	11.0	3.0	0.20	Negative
Standard	0.7	0.3	5.0	12.0	2.0	0.50	Negative

are to address TBT, efforts need to be made to raise the awareness of various stakeholders, adopt international standards and tests, improve testing facilities, train properly trained personnel should be alloted to check for quality, introduce certifications including organic or GI tags. Addressing TBT is necessary to promote the global competitiveness of Indian spices and to ensure seamless market access for exporters. The grades and black pepper whole quality were presented in Table 10.

In line with the metrics in Table 11, a special grade cardamom has to meet minimum bulk density (360 gm/L) requirements, minimum volatile oil (4 %) requirements and the maximum allowable limits of impurities. Failure to meet these criteria may result in rejections, delays and additional testing costs. TBTs can have many ramifications on international markets, but an immense challenge exists to small-scale producers in the spice trade who do not have adequate recognized information or framework to be compliant with international standards. Therefore, the path forward is to educate about these obstacles, align the modes of production to international standards, increase testing and assist with certification in order to enhance the exports of spices, thus improving competitiveness in international markets.

India's spice export dynamics, focusing on turmeric, pepper and cardamom. Using Markov chain analysis, CAGR trends and SPS/TBT insights, it reveals how export stability varies across markets, with strong retention in countries like the USA and the Gulf and emerging diversification in regions like Southeast Asia (12). While cardamom shows strong growth due to premium demand, pepper exports are declining due to international competition and regulatory hurdles (13). SPS measures especially concerning aflatoxin and pesticide residues are key export barriers, particularly in the EU and

Table 10. Grade designations and quality of Black pepper whole

Grade Designation	Quality										
	Special characteristics (Percent By mass)										
	Organic extraneous Matter (Max)	Inorganic extraneous Matter (Max)	Light Berries (Max)	Pinhead/ broken berries (Max)	Bulk Density Gm/litre (Min)	Moisture (Max)	Total ash on dry basis (Max)	Non volatile ether extract on dry basis (Min)	Volatile oil on dry basis percent (v/w) (Min)	Piperine content on dry basis (Min)	Insect damaged matter (Max)
1	2	3	4	5	6	7	8	9	10	11	12
Special	0.5	0.1	3	1	500	11	4	7	2.2	4.5	0.2
Standard	0.75	0.2	5	2	490	12	5	6	2	4	0.5

Table 11. Grade designations and quality of Cardamom

Grade Designation	Quality									
	Special characteristics (Percent By mass)									
	Organic Extraneous matter	Inorganic extraneous matter (Max)	Empty and malformed capsules (Max)	Immature & shriveled capsules (Min)	Size Diameter of holes in mm sieve on which (retained)	Mass in gm/litre (Min)	Moisture (Max)	Total Ash on dry basis (Max)	Volatile oil on dry basis percent (v/w) (min)	Insect damage Matter* (max)
1	2	3	4	5	6	7	8	9	10	11
Special	0.5	0.1	Nil	Nil	8.5	360	12.5	8	4	0.2
Standard	0.75	0.25	Nil	Nil	5	300	13	9.5	3.5	0.5

Japan, affecting smallholders the most(14). Additionally, Technical Barriers to Trade (TBTs) like grading, labeling and moisture/oil content standards often delay shipments or lead to rejections, particularly affecting small-scale exporters (15). Addressing these non-tariff issues through awareness, infrastructure development and alignment with Codex standards is essential to enhance India's spice export competitiveness. The section emphasizes the importance of strengthening quality infrastructure, certification systems and market intelligence to enhance global competitiveness (16).

Conclusion

India's spice exports particularly turmeric, pepper and cardamom demonstrate significant variability in export performance due to shifts in global demand, regulatory environments and production trends. The application of Markov chain analysis has highlighted both market retention and diversification, indicating that while certain countries such as Saudi Arabia and the USA remain stable trade partners, others like Japan and Germany are showing shifts influenced by SPS measures and TBTs. The CAGR analysis supports this view, showing positive growth in turmeric and cardamom exports, whereas pepper exports have declined due to international competition and non-tariff restrictions.

The direction and stability of exports are heavily dependent on consistent surplus production, infrastructure development and trade facilitation policies. Just as their study on Tamil Nadu's agricultural exports underscores the need for strengthening key trade corridors and addressing constraints in market access, the present analysis of spices reaffirms the critical need for India to improve quality assurance systems, traceability and compliance with international standards.

To sustain and expand India's position in the global spice market, it is essential to promote exporter education, strengthen testing and certification infrastructure and align production with global expectations. These efforts will not only help mitigate non-tariff barriers but also enhance India's export competitiveness and long-term market resilience, as emphasized in both this study and the referenced literature.

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Authors' contributions

KCA carried out the survey, analysed the data and formulated the manuscript. MC assisted in data collection and analysis as part of the research study. DN contributed by developing ideas, reviewing the manuscript and assisting with procuring research grants. GSR help to carry out the analysis part. VS contributed to summarizing and provided additional support and contributions to the research study.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None

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