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Export performance of chilli and cumin from India: An empirical analysis

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Abstract
Spices have been closely connected to enchanted, cultural traditions, preservation, medicine and embalming since early human history. The foremost aim of the present study was to disclose the growth and instability under area, production, yield and export volume and value of chilli and cumin in India. Composition and direction of trade of chilli and cumin from India during study period Markov was analysed using Markov Chain to find out the stable and reliable markets for Indian chilli and cumin. Projection of quantity export of chilli and cumin from India up to 2022 was calculated by using the transitional probability of retention values. Revealed Comparative advantage was calculated to know the export performance of chilli and cumin in global market. Multiple linear regression was carried out to find out the factors influencing export of chilli and cumin from India by using production, international price, and domestic price as independent variables. From the study it had revealed that chilli area under cultivation showed negative growth. Whereas cumin showed positive and significant growth in area, production and productivity at national level. Export quantity and value of chilli and cumin had shown significant positive growth. Vietnam was found to be the most reliable and stable market for Indian chilli and cumin export during study period (2005-06 to 2017-18). Export projections of chilli and cumin had shown positive trend. Chilli and cumin enjoyed the positive and increasing trend of comparative advantage in international market in exports. International price, domestic price and production of chilli and cumin had positive influence on export of chilli and cumin from India.

Keywords: Growth, instability, revealed comparative advantage, international trade, factors influencing export

1. Introduction
Spices have been closely connected to enchanted, cultural traditions, preservation, medicine and embalming since early human history. Spices were a key component of India's external trade with Mesopotamia, China, Sumeria, Egypt and Arabia, along with perfumes and textiles as far back as 7000 years ago much before the Greek and Roman civilisations. India is known as the home of spices and boasts of a long history of trading with the ancient civilisations of Rome and China. Indian spices are the most sought-after globally, given their exquisite aroma, texture and taste. India has the largest domestic and international market for spices in the world. Out of the 109 varieties of spices listed by the International Organisation for Standardisation (ISO), the country produces more than 65. The varying climatic conditions in India provide ample scope for the cultivation of a variety of spices. Almost all Indian states produce spices, with the total area under spice cultivation pegged at around 3.15 million hectares. India is a prominent producer of different spice oils and oleoresins from spices of various grades. During the course of time, India has been successfully manufacturing and exporting value added spice products. There are stringent quality control measures in place, including pre-shipment inspection, validation of quality checks and mandatory inspection by the Spices Board. There are strict checks on physical, chemical and microbial parameters including pesticide residues, aflatoxins, heavy metals and other contaminants/adulterants. Over the years, the Indian spice community has evolved and matured as a technology-led, quality-conscious, customer-centric and market-driven industry. This makeover has led to a rapidly growing variety of value-added spices in ground, crushed, cracked, blended, dehydrated forms in bulk, in brine and in consumer packs (curry mixes, natural food colours, spice extracts, mint oils, menthol crystals, menthol powder and several spice-based industrial raw materials). Indian spice oils and oleoresins continue to dominate the international processed food market.

2. Methodology
The study was based on secondary data. The secondary data on area, production, productivity was compiled from Spice Board and indiastats.com for a period of 19 years (1999-00 to 2017-18).

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Price and volume of trade of export data for a period of nineteen years from 1999-00 to 2016-17 was compiled from UN comtrade website. Based on the volume of export over the last five years, major minimum of two crops were considered for the detailed study viz., Chilli and Cumin.

Exponential growth function was used to study the growth in area, production, productivity and export of selected spices from India. In order to analyse instability in area, production, productivity and export of selected spices Cuddy-Della Valle index corrects the coefficient of variation. The coefficient of variation (CV) was calculated by using the formula coefficient of variation. Markov chain analysis was employed to examine the composition and direction of trade of selected spice export. Revealed Comparative Advantage (RCA) analysis was employed to examine the export performance of selected spices. Multiple linear regression analysis was used to examine the factors influencing on export of selected spices from India.

Compound growth rate model
The growth in quantity of export of coffee was analyzed using the compound growth rate (CAGR). CAGR was computed using log-linear model.

$$\ln y_t = \alpha t + \beta t + u_t$$

Where,
y_t = Quantity (tons) of coffee in year t.
t = Time element which takes the value 1, 2 ……….... n for various years.
αt = Intercept
βt = Regression coefficient
Annual compound growth rate (r) = [(Antilog βt)]×100

Instability analysis
The formula suggested by Cuddy and Della was used to compute the index of instability. Instability index was used to study the stability of exports over the years.

$$\text{Index Instability} = \frac{\text{Standard Deviation } (\sigma)}{\text{Mean } (X)} \times 100 \times 1 - R^2$$

Markov Chain Analysis
The trade directions of Indian selected spices exports were analyzed using the first order Markov Chain Approach. Central to Markov Chain Analysis is the estimation of the Transitional Probability Matrix 'P' whose elements, P_{ij} indicate the probability of exports switching from country 'i' to country 'j' over time. The diagonal element P_{ij} where i=j, measures the probability of a country retaining its market share or in other words, the loyalty of an importing country to a particular country's exports.

Annual export data for period 2005-06 to 2017-18 was used to analyze the direction of trade and changing pattern of major Indian spices export. In this context, five major importing countries of selected spices i.e. were Vietnam, Malaysia, United States of America, United Kingdom, United Arab Emirates, Saudi Arabia, Bangladesh, Iran, Nepal, and along with others countries were considered. The average exports to a particular country was considered to be a random variable which depends only on the five years past exports to that country, which can be denoted algebraically as

$$E_{jt} = \sum_{i=1}^{n} \left[Ei_{t-1} \right] P_{ij} + e_{jt}$$

Where,
E_{jt} = Exports from India to the jth country in the year t
E_{it-1} = Exports of ith country during the year t-1
P_{ij} = The probability that exports shift from i^{th} country to j^{th} country
e_{jt} = The error term which is statistically independent of E_{it-1}
n = The number of importing countries

The transitional probabilities P_{ij}, which can be arranged in a (c x n) matrix, have the following properties.

$$\sum_{i=1}^{n} P_{Ij} = 1 \quad \text{And } 0 \leq P_{Ij} \leq 1$$

Thus, the expected export share of each country during period 't' is obtained by multiplying the exports to these countries in the previous period (t-1) with the Transitional Probability Matrix. The probability matrix was estimated for the period 2005-06 to 2017-18.

Thus, the Transitional Probability Matrix (T) is estimated using linear programming (LP) framework by a method referred to as minimization of Mean Absolute Deviation (MAD).
Min, OP* + I e
Subject to
X P* + V = Y
GP* = 1
P* ≥ 0
Where
P* is a vector of the probabilities P_{Ij}
O is the vector of zeros
I is an appropriately dimensional vectors of areas
E is the vector of absolute errors
Y is the proportion of exports to each country.
X is a block diagonal matrix of lagged values of Y
V is the vector of errors
G is a grouping matrix to add the row elements of P arranged in P* to unity.

Using the estimated transitional probabilities, the exports of selected spices to various destinations was predicted by multiplying the same with the respective shares of base year. The export shares of Indian selected spices to different countries was predicted for the years 2018 to 2022 by using 2 step, 3 step, 4 step and 5 step transitional probabilities.

Revealed Comparative Avantage (RCA) Analysis
The performance of selected major spices done using the RCA analysis. Revealed Comparative Advantage (RCA) was first introduced by Bela Balassa (1965) [4]. It is an economist's tool that uses the trade pattern to identify the business sectors in which an economy has a comparative advantage, when comparing the country of interests' trade profile with the world average. The objective of using RCA is to analyze a competitive advantage of each business section in the country of interest. The study uses information related to an export value. RCA had been transformed several times by Balassa (1986) [5]. The original RCA measures export performance by country and its industry or commodity. Its

formula defined as a country's share of world exports of a commodity divided by its share of total world exports.

The index for country *i* and commodity *j* is calculated as follows:

$$RCA_{ij} = (X_{ij}/X_{ik})/ (X_{nj}/X_{nk})..........\quad(1)$$

Where,
X_{ij} = Exports of country 'I' of commodity 'j'
X_{ik} = Exports of country 'I' of a total agricultural commodities 'k'
X_{nj} = Exports of a world 'n' of commodity 'j', and
X_{nk} = Exports of a world 'n' of a total agricultural commodities 'k'

In the present study, country 'i' refers to India, commodity 'j' refers to any of the selected agricultural commodities, set of commodities 'k' refers to the total agricultural commodities and 'n' refers to world. When RCA assumed the value greater than unity for a given country in a given commodity, the country is said to have a revealed comparative advantage in that commodity. However, RCA suffers from the problem of asymmetry as pure 'RCA is basically not comparable on both sides of unity. If the index ranged from zero to one, a country is said not to be specialized in a given sector and if the value of the index ranged from one to infinity, the country is said to be specialized. The index is made symmetric, following the methodology suggested by Dalum *et al* (1998) [7] and the resultant index is called as 'Revealed Symmetric Comparative Advantage' (RSCA).

Mathematically, it can be expressed by the following equation (2).

$$RSCA = (RCA-1) / (RCA+1)........\quad(2)$$

This measure ranges between -1 and +1 and is free from the problem of skewness. A commodity is said to have comparative advantage in its exports if the corresponding RSCA value is positive and vice versa. In the present study, the RSCA was used to look into the comparative advantage of the selected commodities.

Regression Analysis
Multiple linear regression was employed to identify the factors influencing the export of major spices. The model used was of the type

$$Y = a + b_iX_i + e ....\quad(3)$$

Where,
Y = Export (Tonnes)
a = Constant or intercept
b_i = Regression coefficients
X_1 = Price in domestic market (₹/Kg)
X_2 = Export price of the spice (₹/Kg)
X_3 = Production (Tonnes)
e = Disturbance term

To identify the factors influencing the export of major spices, multiple linear regression was made use of by placing export quantity as dependent variable (Y) and price in domestic market (X_1), export price of the spice (X_2) and production (X_3) as independent variables (X_i) in the above model.

3. Results and discussion
Growth and instability in area, production and productivity of chilli in major states of India
The growth and instability in area, production and productivity of chilli in major states of India is represented in Table 1. The production and productivity of chilli during the study period from 1999-00 to 2017-18 showed a significant positive annual growth rate of 3.64 per cent and 3.98 per cent respectively. The productivity of chilli seems to be higher, which is similar to the observations made by Krishnadas (2010) [12] during the period from 1999-00 to 2017-18. The growth in production was mainly contributed by high productivity which was probably attributed to introduction of high yielding varieties coupled with Integrated Nutrient Management.

The major states growing chilli showed positive growth in area. Tamil Nadu showed significant negative growth in area, production and productivity. The reduction in area and production in Tamil Nadu could be ascribed to competing crops like cotton and sugarcane.

The area, production and productivity under chilli cultivation in India was quite stable indicated by low coefficient of variation at 8.20, 12.84 and 10.70 per cent respectively. Similar results were reported by Krishnadas (2010) [12]. As a commercial crop confined to agro-climatic zones, the scope of variability in area and production is generally low.

Among the major growing states, Karnataka and Andhra Pradesh showed highest instability in production of 37.42 per cent and 33.24 per cent respectively. While other states were stable. Karnataka and Andhra Pradesh showed highest instability in productivity also. This instability is mainly contributed by high productivity of high yielding varieties used.

Table 1: Growth and instability in area, production and productivity of chilli in major states of India (1999-00 to 2017-18)

Chilli (Per cent per annum)					
Sl. No.	Major states		Area	Production	Productivity
1	Andhra Pradesh	CAGR	0.56	0.61	2.34**
		Instability	17.79	33.24	20.95
2	Karnataka	CAGR	-1.99	1.64	1.98**
		Instability	29.03	37.42	20.48
3	Orissa	CAGR	-0.69	0.02	1.20*
		Instability	10.94	10.03	3.00
4	Tamil Nadu	CAGR	-3.49*	-7.01*	-2.72*
		Instability	9.11	19.41	14.19
5	India	CAGR	-0.42	3.64*	3.98*
		Instability	8.20	12.84	10.70

Note: * Indicates significance at 1 per cent level
** Indicates significance at 5 per cent level

Growth and instability in area, production and productivity of cumin in major states of India

Table 2 states that the area under cumin grew at the rate of 5.40 per cent per annum. The expansion in area could be attributed to the better income realised by farmers versus the cultivation of other crops. The production of cumin had also shown significant positive growth of 9.97 per cent per annum during the study period. The productivity of cumin had shown significant positive growth which was contradicting to the observations is made by Krishnadas (2010) [12] during the period from 1979-80 to 2006-07.

The major states growing cumin Rajasthan and Gujarat showed highest growth rate in area and production and productivity of cumin. This could be ascribed as a result of better irrigation facilities available in Gujarat and congenial weather conditions in the Rajasthan.

The instability analysis of cumin witnessed that area, production and yield in India was low with coefficient of variation of 17.26, 18.27 and 18.02 per cent respectively. Among the major states Rajasthan showed high instability in area, production and productivity. This could be attributed as a result of shifting crop from cumin to fenugreek cultivation.

Table 2: Growth and instability in area, production and productivity of cumin in major states of India (1999-00 to 2017-18)

Cumin (Per cent per annum)					
Sl. No.	Major states		Area	Production	Productivity
1	Gujarat	CAGR	6.31*	12.80*	5.92*
		Instability	21.07	21.94	6.67
2	Rajasthan	CAGR	4.15**	6.91*	2.12
		Instability	36.31	46.16	27.93
3	India	CAGR	5.40*	9.97*	4.05*
		Instability	17.26	18.27	18.02

Note: * Indicates significance at 1 per cent level
** Indicates significance at 5 per cent level

Growth and instability in export of chilli and cumin in India

It was noticed from table 3 that the growth in quantity and value of export of chilli from India showed 11.65 per cent and 19.88 per cent per annum respectively. The remarkable growth in both quantity and value of chilli export recognised was mainly due to increased demand in the world market. The rigorous quality measures implemented by the Spices Board, viz. mandatory sampling and analysis for the presence of aflatoxin in export consignment of chilli had made Indian chilli more acceptable in the international markets. The lower output by other competing countries like China and Pakistan had also helped India to achieve record performance. The results of the study were in line with that of Yogesh and Mokshapathy (2013) [11].

The chilli exports had shown instability in terms of volume and value of 11.37 per cent and 13.59 per cent respectively. There was a less variability in both volume and value of chilli exports from India hence India maintained its stability in international market.

The quantity and value of cumin exported from India increased at an annual rate of 18.44 per cent and 24.34 per cent per annum respectively. The exports had increased significantly in the past few years due to strong demand from the overseas markets. India is one of the major producer, exporter and consumer of cumin in the world. Almost 80 per cent of the crop cultivated is consumed in India itself. Krishnadas (2010) [12] observed similar result for cumin exported from India.

The cumin exports had shown instability in terms of volume and value of 31.32 per cent and 34.10 per cent respectively. The variability was the consequence of incredible growth in quantity of cumin exported and value realised was mainly due to increased demand in the world market.

The quantity of total spice exported had shown instability of 8.65 per cent while export earnings had shown instability of 19.81 per cent. India maintained its stability in export of total spices with respect to both quantity and value terms.

Transitional Probability Matrix of Chilli exports to major importing countries

It was noticed from the Table 4 that, Vietnam was found to be the most stable importer of Indian chilli as it retained its original share of around 86.30 per cent which was the highest among the chilli importing countries. It lost its minor share of 13.70 per cent to Sri Lanka, Thailand and Bangladesh. Vietnam was the largest buyer of Indian chilli followed by other traditional buyers like Sri Lanka, Thailand, Bangladesh and Malaysia.

Malaysia was also found to be stable with 75.90 per cent of retention of its shares while losing a major share of 24.10 per cent to other countries. Thailand was also found to be stable with 74.20 per cent of retention of its shares while losing a major share of 25.80 per cent to Vietnam alone.

Other countries were also found to be stable with 65.70 per cent of retention of their shares while losing a share of 34.20 per cent to Sri Lanka and Thailand. Contradictory findings were reported by Krishnadas (2010) [12]. The rigorous quality measures implemented by the Spices Board of India, viz. mandatory sampling and analysis for the presence of aflatoxin and adulterant sudan in export consignment of chilli had made Indian chilli more acceptable in the international markets. The lower output by other major producers like China and Pakistan had also helped India to achieve record performance.

Table 3: Growth and instability in export of chilli and cumin in India (1999-00 to 2017-18)

Sl. No	Spices	Export quantity		Export value	
1	Chilli	CAGR	11.65*	19.88*	
		Instability	11.37	13.59	
2	Cumin	CAGR	18.44*	24.34*	
		Instability	31.32	34.10	
3	Total spices	CAGR	9.76*	16.82*	
		Instability	8.65	19.81	

Note: * Indicates significance at 1 per cent level
** Indicates significance at 5 per cent level

Table 4: Transitional Probability Matrix of Chilli exports to major importing countries (2005-06 to 2017-18)

Country	Vietnam	Sri Lanka	Thailand	Malaysia	Bangladesh	Others
Vietnam	0.863	0.002	0.089	0.000	0.045	0.000
Sri Lanka	0.023	0.168	0.000	0.000	0.700	0.109
Thailand	0.258	0.000	0.742	0.000	0.000	0.000
Malaysia	0.000	0.000	0.000	0.759	0.000	0.241
Bangladesh	0.055	0.000	0.239	0.000	0.143	0.563
Others	0.000	0.342	0.001	0.000	0.000	0.657

Projections of Chilli exports to major importing countries

The export projections of chilli to major importing countries were computed up to 2022 using the transitional probability of retention values and presented in the Table no.5. The projected market share, Sri Lanka was expected to decrease marginally from 12.10 percent to 9.71 percent during 2017-18

to 2022-23 and similar trend was seen in the case of Bangladesh and Other countries. Keeping in view of the foregoing discussions, the threat becomes intense to India when the competitors were increasing the share of sustainable chilli in the world markets, especially China.

Table 5: Projections of Chilli exports to major importing countries

Chilli												
Country	Vietnam		Sri Lanka		Thailand		Malaysia		Bangladesh		Others	
Year	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
2018	140551.97	138853.33 (31.32)	51291.60	53714.36 (12.10)	60725.48	60809.82 (13.70)	27702.67	29633.33 (6.68)	12868.46	42271.19 (9.52)	150759.82	118617.98 (26.72)
2019		139076.93 (31.33)		46928.60 (10.57)		67711.31 (15.25)		31505.13 (7.10)		43891.14 (9.89)		114786.90 (25.86)
2020		140989.49 (31.76)		45851.15 (10.33)		73232.27 (16.50)		31786.09 (7.16)		39149.05 (8.82)		112891.98 (25.43)
2021		143782.57 (32.39)		44529.39 (10.03)		76363.54 (17.20)		31818.36 (7.17)		38480.92 (8.67)		108925.26 (24.54)
2022		146935.82 (33.10)		43084.28 (9.71)		78772.35 (17.75)		31620.92 (7.12)		37681.47 (8.49)		105805.21 (23.84)

Note: Figures in the parenthesis indicate export share in per cent

Transitional Probability Matrix of Cumin exports to major importing countries

It could be inferred from Table no.6 that, the Vietnam was the most stable and reliable country with the retention of its share of 78.00 per cent. Vietnam lost its 22.00 of minor share to U.S.A and other countries. Whereas Vietnam was the largest buyer of Indian cumin, followed from U.S.A, U.A.E, Brazil, Egypt and other countries. While U.S.A was also found stable market for Indian cumin export with the retention of 32.60 per cent share. U.S.A lost its major share of 67.40 per cent to U.A.E, Egypt and other countries. U.A.E was also one of the stable and reliable importer of Indian cumin with retention of its share 30.70 per cent. U.A.E lost its major 69.30 per cent share to Egypt, Brazil and other countries.

Other countries retained 83.40 per cent share and lost its minor 16.6 per cent to U.S.A and Brazil. Vietnam was the growing market for Indian commodities especially with respect to Indian spices and India was the top most producer, exporter and consumer of cumin in the world.

Table 6: Transitional Probability Matrix of Cumin exports to major importing countries (2005-06 to 2017-18)

Country	Vietnam	U.A.E	U.S.A	Egypt	Brazil	Others
Vietnam	0.780	0.000	0.014	0.000	0.000	0.206
U.A.E	0.000	0.307	0.000	0.372	0.065	0.253
U.S.A	0.000	0.460	0.326	0.018	0.000	0.196
Egypt	0.770	0.000	0.000	0.230	0.000	0.000
Brazil	0.000	0.685	0.000	0.066	0.249	0.000
Others	0.000	0.000	0.092	0.000	0.074	0.834

Projections of Cumin exports to major importing countries

It could be inferred from Table no.7 that, the export projections of cumin to major importing countries were computed up to 2022 using the transitional probability of retention values. U.A.E was expected to increase marginally from 6.26 percent to 8.63 percent during 2017-18 to 2022-23 and similar trend was seen in the case of U.S.A, Egypt and Brazil.

Table 7: Projections of Cumin exports to major importing countries

Cumin												
Country	Vietnam		U.A.E		U.S.A		Egypt (A.R.E)		Brazil		Others	
Year	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
2018	29697.42	25970.79 (18.08)	10817.03	8991.78 (6.26)	10771.44	12371.73 (8.61)	3631.00	4603.85 (3.20)	5887.50	8302.14 (5.78)	82865.61	83429.71 (58.07)
2019		23811.28 (16.57)		11382.32 (7.92)		13117.39 (9.13)		4112.80 (2.86)		8826.74 (6.14)		82419.48 (57.37)
2020		21748.03 (15.14)		12084.93 (8.41)		13124.56 (9.14)		5050.04 (3.52)		9037.46 (6.29)		82624.98 (57.51)
2021		20859.22 (14.52)		12232.55 (8.51)		13332.65 (9.28)		5325.51 (3.71)		9150.67 (6.37)		82769.39 (57.61)
2022		20377.62 (14.18)		12405.90 (8.63)		13464.76 (9.37)		5391.59 (3.75)		9199.12 (6.40)		82831.01 (57.65)

Note: Figures in the parenthesis indicate export share in per cent

Revealed Symmetric Comparative Advantage of major spices

It could be inferred from table no.8 that, the study had shown that exports of chilli and cumin from India had responded differently in terms of comparative advantage during the study period. India had enjoyed a comparative advantage in chilli and cumin exports. A gradual increase in India's comparative advantage had been depicted for exports of chilli. India had strengthened its position in the global markets in exports of chilli and cumin. India's status in exports of chilli and cumin been very comfortable. It is assumed to be more due to a growing demand for these products among the international consumers. Similar findings were reported by Ibrahim (2015).

Table 8: Revealed Symmetric Comparative Advantage of major spices

Year	Chilli	Cumin
2000-01	0.84	0.95
2001-02	0.83	0.71
2002-03	0.83	0.45
2003-04	0.85	0.55
2004-05	0.85	0.83
2005-06	0.80	0.86
2006-07	0.87	0.82
2007-08	0.87	0.82
2008-09	0.87	0.92
2009-10	0.87	0.93
2010-11	0.88	0.90
2011-12	0.84	0.91
2012-13	0.92	0.86
2013-14	0.94	0.93
2014-15	0.95	0.94
2015-16	0.95	0.94
2016-17	0.94	0.92

Table 9: Factors influencing export of selected chilli during, 1999-00 to 2017-18

Explanatory Variable	b	P	t	R^2	F
Chilli					
Intercept	-0.81	0.89	-0.13	0.86*	31.16
Domestic price in Guntur market ($₹$/Kg)X_1	0.24	0.42	0.81		
Export price ($₹$/kg)X_2	0.85	0.04**	2.24		
Production (Tonnes)X_3	0.60	0.22	1.25		

Note: * Indicates significance at 1 per cent level
** indicates significance at 5 per cent level

Table 10: Factors influencing export of selected cumin during, 1999-00 to 2017-18

Explanatory Variable	b	P	t	R^2	F
Cumin					
Intercept	-4.02	0.16	-1.4	0.84*	26.94
Domestic price in Unja market ($₹$/Kg)X_1	1.2	0.09	1.77		
Export price ($₹$/Kg)X_2	0.61	0.48	0.7		
Production (Tonnes)X_3	0.49	0.25	1.18		

Factors influencing export of chilli during 1999-00 to 2017-18
It could be seen from the Table no.9 that, The coefficient of multiple determination indicated that 86.0 per cent of the variations in export of chilli were explained by the variables included in the function during study period 1999-00 to 2017-18. Variable like production, domestic price and export price influenced the chilli export significantly. Export of chilli depended upon the level of production, followed by export price and domestic price. Production, export price and domestic price showed the positive influence on export of chilli from India. The export of chilli was highly influenced by international market price, production and domestic price. The remarkable advancement in quantity of chilli exported and value realised was mainly due to increased demand in the world market.

Factors influencing export of cumin during 1999-00 to 2017-18
It could be seen from the Table no.10 that, the coefficient of multiple determination indicated that 84.0 per cent of the variations in export of cumin were explained by the variables included in the function. Variables like production, domestic price and export price influenced the cumin export

significantly. Export of cumin depended upon the level of production given the export price and domestic price. All the three variables showed the positive influence towards quantity export of coriander from India. The significant increase in exports could be attributed to the fall in supply from other origins in the world and it pushed up the export price. The exports had increased significantly in the past few years due to strong demand from the overseas markets. India was one of the major producer, exporter and consumer of cumin in the world. Almost 80 per cent of the crop cultivated was consumed in India itself.

4. Conclusion
Since the area under chilli and pepper is showing a decreasing trend over the years, emphasis should be given for promotional programmes to augment the area under these spices. This will facilitate in creating more quality assured exportable produce and hence to take price advantage in the international market. The other competing countries are influencing more on instability in export of spices from India on both volume and value terms in global market. Appropriate measures should be taken to stabilise the export earnings. It is high time that the Indian spice sector should gear up if it has to sustain in the long run in the ever-competitive international arena. The future of the Indian spice sector lies in how to capitalize on its strength and opportunities, overcome the weakness and neutralize the threats in the coming couple of years.

5. References
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