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Growth and Instability in Production of Selected Major Spices and their Export Scenario for India: A Review

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ABSTRACT

India is known as the land of spices. It is one of the largest producers, consumer and exporter of spices in the world. Even though the spice is a highly demanded commodity in the international market. The export fluctuation is observed for the product. This study trying to identify the reasons of fluctuation for some selected major spices export from India. For that data collected for area production and productivity of major spices mainly chilli, ginger and turmeric and analyzed its growth and variability. These three crops were selected as they covered the highest per centage of production share in the year 2021. In this study data were collected from the year 2010-11 to 2019-20 to analyze the growth and instability in production of major spices and its impact on their export. Compound annual growth rate analysis was done to see the growth in area, production and productivity of the selected spices along with the growth performance of spice export from India. The variability in area, production and productivity along with the export instability was calculated with the help of instability index. Ourstudy examined thatarea and production of spices in India was growing continuously from the year 2010-11 to 2019-20. The compound annual growth rate analysis reflected a positive growth in area under ginger (2.53 per cent) and Turmeric (1.08 per cent), while it was negative for chilli (-0.99 per cent). During the entire period chilli and ginger recorded a positive and significant growth in production and productivity of the crop. Export was found to be related with the productivity of the crop. The export variability was found to be lowest for chilli (3.98), while ginger recorded a very high instability index (33.36) for the period. With increase productivity export of chilli increases. As the quantity exported for chilli was highest among the three crops so the export value of the same was also found highest during the entire period.

Key words: Growth, Instability index, Major spices, Spice export.

Spice is a plant product which is used in cooking to add flavor to food. It comes from a dried plant and is usually used as a powder or seed. From time immemorial India has been known as the Land of Spices. It is one of the largest producers, consumer and exporter of spices in the world. India on an average exports around 546 thousand tonnes of spices annually. The country produces about 75 of the 109 varieties of spices listed by International Organization for Standardization (ISO) (www.ibef.org). The chilli, black pepper, turmeric, ginger, cardamom, coriander and cumin were the major exporting spices from India (Bagal *et al.,* 2020). Almost all of the states in India produces spices. The area of spices at around 3.15 million hectares (Chaitra and sonnad 2019) in the country. Out of the total spices production, Indian households consume about 70-75 per cent either in whole form or in value added form (powder or masalas), 5-10 per cent is utilized by oleoresins, pharmaceuticals and cosmetics companies, 15-20 per cent is exported and the remaining 5 per cent goes for seed purposes (www.commodityindia.com). Despite the COVID-19 Pandemic, export of spices from India continued its upward trend during 2020-21 and crossed the 3.5 billion US $ mark. Estimated export of spices/spice products from the country during 2020-21 is 15,65,000 tons valued Rs.27193.20 crores (US $3624.76 million) against the 12,08,400 tons valued Rs.22062.80 crores (US $3110.63 million) of the previous financial year. Export of spices attained an all-time record in terms of both volume and value in the year registering an increase of 30% in volume, 23% in rupee terms and 17% in dollar terms of value compared to the previous year (source: Spice Board of India). The world consumption of spices is growing steadily year after year. Expansion of spices export is important to maintain the share of spices export at the same level. For that increase productivity of spices and their quality management is important.

This increase export indicates the high demand of spices in the international market. Even though the demand for the spices from India is growing continuously but the export scenario reflected variation for some of the spices over the years. The study was conducted to analyze the growth in area production and productivity of some selected major spices and its variation, along with the impact of those factors on the export scenario of the selected spices. In India chilli, ginger and turmeric recorded

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highest production share in the year 2021 (Spice Board of India). For that these three spice crops were selected for the study.

Data sources

The study was conducted based on secondary data which was collected for 2010-11 to 2019-20 from Annual Reports of Spice Board of India, Handbook of Indian Spice Board and from various publications which is cited in the references, official records and web sources.

Compound annual growth rate analysis

Compound annual growth rate analysis was done to see the growth rate of area, production and productivity in major spices of India. Calculation was done by using the exponential function of the following specification:
Growth analysis:

$$Y = ab^t$$

Where,
Y = Dependent variable (area/production/productivity/export quantity/export value).
a = Intercept.
b = Slope.
t = Time variable in years taking the value of 1, 2, 3,..., n.

The compound annual growth rate (CAGR) derived from the logarithmic form of the equation as:

$$\ln y = \ln a + t \ln b$$

The CAGR (%) will be estimated using the following relationship.

$$r = (\text{Anti log of } b - 1) \times 100$$

The significance of 'r' was tested by working out t-value.

$$t = b/SE(b)$$

Where 't' follows student's t-distribution with (n-2) degrees of freedom.

Instability index

The instability index was calculated by using cuddy-Della Valle index formula to see the variation in area production and productivity of selected spices with export variation.

$$CV = \frac{SD}{Mean} \times 100$$

Where,
CV = Coefficient of variation.
SD = Standard deviation of area, production and productivity/ export quantity/export value.
Mean = Average of area, production and productivity/export quantity/export value.

The formula used to compute the degree of variation around the trend:

$$\text{Instability index} = CV \times \sqrt{1-R^2}$$

Where,
R^2 = RSS/TSS = Goodness of fit.
RSS= Regression sum of square
TSS= Total sum of square.

Area and production of spices for India and World from 2010-11 to 2019-20

Table 1 represented the area and production of spices from 2010-11 to 2019-20 for India and the World. It is found that the growth in area and production for spices are slightly increasing for both the cases. Compound growth rate analysis represented a positive and significant growth in area and production for India (2.91 and 0.66 per cent) and the world (3.15 and 1.74 per cent). The instability index for area and production of spices in India was 6.67 and 3.22. It was found to be 2.76 and 4.67 for area and production of spices in the entire world. This means that farmers are interested in cultivation of spices as the production of spices brings good return to them.

Table 1: Area and production of spices for India and World from 2010-11 to 2019-20.

Year	India		World	
	Area (lakh ha)	Production (lakh MT)	Area (lakh ha)	Production (lakh MT)
2010-11	7.77	14.75	10.39	21.96
2011-12	7.41	17.00	10.08	25.21
2012-13	7.4	14.97	10.12	23.68
2013-14	6.8	15.00	9.51	24.4
2014-15	7.37	15.04	10.14	24.37
2015-16	7.68	12.92	10.56	22.44
2016-17	8.96	15.28	11.85	25.44
2017-18	8.92	14.35	12.17	26.12
2018-19	9.01	15.46	12.45	26.75
2019-20	9.25	15.75	13.01	27.12
CAGR	2.91*	0.66*	3.15*	1.74*
Instability index	6.67^{NS}	3.22^{NS}	2.76^{NS}	4.67^{NS}

Source: Spice Board of India.
*Significant at P≤0.05; NS- Non significant at P>0.05.

Table 2: Growth and instability in area for chilli, ginger and turmeric in India from 2010-11 to 2019-20.

Year	Chilli ('000 ha)	Ginger ('000 ha)	Turmeric ('000 ha)
2010-11	716.4	167.4	232.0
2011-12	793.9	125.3	251.8
2012-13	787.5	134.4	194.3
2013-14	791.9	148.0	207.5
2014-15	766.6	153.1	178.4
2015-16	742.9	156.9	183.4
2016-17	859.7	171.7	247.6
2017-18	678.8	168.9	231.6
2018-19	721.1	173.5	245.2
2019-20	682.5	172.0	245.9
CAGR	-0.99	2.53*	1.08^{NS}
Instability index	6.87^{NS}	7.98^{NS}	12.37^{NS}

Source: Spice Board of India.
*Significant at P≤0.05; NS- Non significant at P>0.05.

Growth and instability in area for chilli, ginger and turmeric in India from 2010-11 to 2019-20

In Table 2, we are trying to represent the growth in area for chilli, ginger and turmeric in India considering these three as the major spices as they hold a major share in overall spices exports from India. From the year 2010-11 to 2019-20 the growth in area for chilli was found to be declining (716.4 thousand ha to 682.5 thousand ha). But for ginger (167.4 thousand ha to172.0 thousand ha) and turmeric (232.0 thousand ha to 245.9 thousand ha) the area under the crop was observed to be increasing. The compound growth rate analysis reflected that the area under ginger is found to be positive and significant (2.53 per cent) but for chilli the growth rate was negative and non-significant (-0.99 per cent). Turmeric presented a positive growth rate in area under the crop (1.08 per cent). Instability index showed that a high variation of area under the turmeric crop (12.37) as compared to chilli (6.87) and ginger (7.98) during the entire period.

Growth and instability in production of chilli, ginger and turmeric in India from 2010-11 to 2019-20

Table 3 represented the growth and instability in production of chilli, ginger and turmeric in India from 2010-11 to 2019-20. It was observed from the Table that chilli and ginger recorded a positive and significant growth (3.88 and 12.25 per cent) in production throughout the years, while production of turmeric was negative but significant (-3.92 per cent) during the period. It is due to the instability in area under the turmeric for the entire period. The instability index for the production of chilli, ginger and turmeric all are found to be very high. This may be due to bad weather condition or non-adoption of high yielding varieties by the farmers.

Growth and instability in productivity of chilli, ginger and turmeric in India from 2010-11 to 2019-20

Growth and instability in productivity of chilli, ginger and turmeric in India from 2010-11 to 2019-20 was represented in the Table 4. From the table it was clearly observed that productivity was increasing for ginger crop after 2016-17, while turmeric reflected a negative growth in productivity of the crop. Productivity of chilli was found to be slowly increasing during the entire period. Compound growth rates for productivity was highest for ginger (12.56 per cent) but negative and significant for turmeric (-4.95 per cent). Chilli recorded a positive and significant growth (4.88 per cent) in productivity throughout the period. Ginger showed high instability rate due to environmental conditions like flood, poor weather, landslides *etc*.

Export scenario of chilli, ginger and turmeric from India in quantity (In '000 tonnes) during 2010-11 to 2019-20

Table 5 represented the export scenario of chilli, ginger and turmeric from 2010-11 to 2019-20. At present spices export from India continued its upward trend and has crossed the US $ 4 billion mark for the first time in the history of Spices export (Spices Board 2020-21). This reflected that compound growth rate of export was increasing for all the three spices. But the instability index represented high variability in export of ginger (33.36) throughout the years. Export instability for turmeric and chilli was 11.12 and 3.98. This represented that export of chilli was growing continuously from India because of high demand in the international market. Chitra GB and JS Sonnad (2019) study also reflected that chilli enjoyed the positive and increasing trend of comparative advantage in international market in exports.

Export scenario of chilli, ginger and turmeric for India in values (Rupees in Crores) from 2010-11 to 2019-20

In Table 6, export scenario of chilli, ginger and turmeric for India in value term from 2010-11 to 2019-20 was trying to represent. As quantity exported increases for all the three crops so export values also increases at the same level.

Table 3: Growth and instability in production of chilli, ginger and turmeric in India from 2010-11 to 2019-20.

Year	Chilli (Lakh tonnes)	Ginger (Lakh tonnes)	Turmeric (Lakh tonnes)
2010-11	12.9	9.37	12.68
2011-12	14.48	9.24	13.98
2012-13	13.78	6.69	9.86
2013-14	13.76	6.83	10.92
2014-15	16.21	7.95	8.46
2015-16	14.97	10.25	9.67
2016-17	24.11	18.30	9.25
2017-18	17.18	17.94	8.63
2018-19	16.89	18.45	9.29
2019-20	17.02	18.43	9.38
CAGR	3.88*	12.25*	-3.92*
Instability index	15.01^{NS}	27.67^{NS}	13.44^{NS}

Source: Spice Board of India.

*Significant at P≤0.05; NS- Non significant at P>0.05.

Table 4: Growth and instability in productivity of chilli, ginger and turmeric in India from 2010-11 to 2019-20.

Year	Chilli (tonne/ha)	Ginger (tonne/ha)	Turmeric (tonne/ha)
2010-11	1.81	5.59	5.46
2011-12	1.82	7.37	5.55
2012-13	1.75	4.97	5.07
2013-14	1.73	1.00	5.26
2014-15	2.11	5.19	4.74
2015-16	2.01	6.53	5.27
2016-17	2.80	10.6	3.73
2017-18	2.53	10.61	3.72
2018-19	2.34	10.63	3.79
2019-20	2.49	10.71	3.81
CAGR	4.88*	12.56^{NS}	-4.95*
Instability index	9.35^{NS}	36.99^{NS}	7.52^{NS}

Source: Spice Board of India.

*Significant at P≤0.05; NS- Non significant at P>0.05.

Table 5: Export scenario of chilli, ginger and turmeric from India in quantity (In '000 tonnes) during 2010-11 to 2019-20.

Year	Chilli	Ginger	Turmeric
2010-11	240.0	15.7	49.2
2011-12	241.0	21.5	79.5
2012-13	301.0	22.2	88.5
2013-14	312.5	23.3	77.5
2014-15	347.0	40.4	86.0
2015-16	347.5	24.8	88.5
2016-17	400.2	24.9	116.5
2017-18	443.9	22.6	107.3
2018-19	468.5	18.1	133.6
2019-20	484.0	50.4	136.0
CAGR	8.62^{NS}	5.67^{NS}	9.51*
Instability index	3.98^{NS}	33.36^{NS}	11.12^{NS}

Source: Spice Board of India.

*Significant at P≤0.05; NS- Non significant at P>0.05.

Table 6: Export scenario of chilli, ginger and turmeric for India in values (Rupees in Crores) from 2010-11 to 2019-20.

Year	Chilli	Ginger	Turmeric
2010-11	153.5	12.1	70.2
2011-12	214.4	20.4	73.4
2012-13	238.0	18.7	55.4
2013-14	272.2	25.6	66.6
2014-15	351.7	33.1	74.4
2015-16	399.7	27.5	92.1
2016-17	507.0	25.7	124.1
2017-18	425.6	21.6	103.5
2018-19	541.1	19.6	141.6
2019-20	622.1	44.9	121.6
CAGR	15.64^{NS}	7.58*	9.35*
Instability index	9.61^{NS}	26.86^{NS}	14.98^{NS}

Source: Spice Board of India.

*Significant at P≤0.05; NS- Non significant at P>0.05.

In value term also highest instability in export was observed for ginger crop (26.86), while turmeric (14.98) and chilli (9.61) recorded less variability in export as compared to ginger during the period. Due to high instability in production and productivity of the ginger highest export variation was also observed for the crop in that period.

CONCLUSION

The study conducted on growth and instability of production for major spices and its impact on their export scenario for India from the year 2010-11 to 2019-20. Chilli, ginger and turmeric are the major spices for India as they contribute highest share of export among the spices. Growth in area for chilli was found to be declining (716.4 thousand ha to 682.5 thousand ha) but for ginger and turmeric the area under the crop was observed to be increasing. Chilli and ginger recorded a positive and significant growth (3.88 and 12.25 per cent) in production throughout the years, while production of turmeric was negative but significant (-3.92 per cent) during the period. Even though the high production instability was observed from all the three crops but productivity was found increasing for ginger after 2016-17. Likewise, chilli recorded a positive and significant growth in productivity throughout the period. Export was found to be related with the productivity of the crop. The compound growth rate of export was increasing for all the three spices. The variability of export was found to be lowest for chilli, while ginger recorded a very high instability index for the period. With increase productivity export of chilli increases. Due to high demand of chilli in the international market instability index for export of chilli was very low (3.98). As the quantity exported for chilli was highest among the three crops so the export value of the same was also found highest during that period. The export scenario of the three crops showed that chilli export was increasing with less variability while ginger reflected a huge variation in export which was related with the production and productivity of the crop in the country. Export variability of Turmeric was found lower than the ginger.

Policy suggestions

- Farm incentives should be made available to farmers through the agriculture ministry's scheme in order to improve production and productivity of spices in India.
- Suitable warehouse facility is very much important for storing spices in accordance with the weather conditions to minimize loss.
- Farmers encouragement by different level extension workers is required to go for production of high export demand commercial crops (*i.e.* King Chilli).
- Contract farming may be one of the choices available to farmers in the future to increase quality of commodity available for export by the traders.
- Government should set up spice parks at different region to encourage value addition and support farmers to go for bulk production of spices at their level.
- Introduction of export orientated course curriculum at different level of education can encourage people to go for export oriented crop production.

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