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Research Paper

Trends in Production and Export Potential of Ginger in India

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ABSTRACT

The present study analyzed the position, trend and export performance of ginger in India using temporal data. Statistical techniques like mean, standard deviation, mean, regression and CAGR was employed for analysis. The study revealed that ginger hold 3rd position among the major spices contributed 17.79 percent of the total annual average spices production in India. But the share of quantity and value of export revealed only 2.31 percent and 1.32 percent respectively of total spices export. Over the last eleven years (from 2009 to 2019) the average production of ginger in India was 914.31 thousand metric tons approximately one third of total world production of ginger with highest growth rate (CAGR) compare to major producing countries in the world. The major five countries for ginger export were USA, Morocco, Spain, Bangladesh and UK together constituted around 52 percent of total value of export. The growth rate (CAGR) of area, production and productivity of ginger worked out to be 4.85 percent, 9.17 percent and 4.11 percent respectively over the 16 years (2001-02 to 2016-17). But national average level of productivity revealed very low (4.49 ton/ha). Madhya Pradesh, Karnataka, Assam and West Bengal were the major contributors of ginger production. But in terms of productivity, states like Gujarat (22.08 t/ha), Kerala (19.68 t/ha) and Madhya Pradesh (16.27 t/ha) were the leading states. Enhancement of productivity through use of good variety with scientific management and area expansion might be given importance for increase production and export potential of ginger.

HIGHLIGHTS

- Although around 18 percent of total spices production coming from ginger but the share of export value of ginger among all spices was only 1.32 percent.
- India producing around one third of global ginger production with highest CAGR (15.64).
- In India, the growth rate (CAGR) of ginger production was more or less double than area and productivity over last sixteen years.

Keywords: Export potential, Ginger, Growth rate, Instability

India is known as 'home of spices', the leading producer, consumer and exporter of spices in the world. This land of spices produces around 70 percent of spices in the world (FAO, 2010). Almost all the states of India produce one or more spices, whereas states like Rajasthan and Gujarat contribute around 80 per cent of the total seed spices produced in the country and popularly known as "Seed Spice Bowl of India" The diversified climate of India is conducive to variety of spice cultivation. India has the world's highest number of varieties of spices (Kumar *et al*. 2018). The top export destination for Indian spices is USA followed by Vietnam, China, UAE and Malaysia. Among spices, India is the largest producer and consumer of ginger in the world. About half of its world's production produces India, whereas, its cultivation is extended to China, Australia, Malaysia, Nigeria, Fiji, Brazil and Mexico (Sanderson *et al*. 2002). India holds

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the unique position of being largest producer and exporter of dry ginger in the world. India holds the unique position of being largest producer and exporter of dry ginger in the world. India produced 1788.97 thousand metric tons ginger covering acreage of 164.31 thousand-hectares (2018-19) [Spices Board of India]. Out total global production India alone produced 43.87 percent in 2019 and the leading exporter of ginger in the world (www.tridge.com).The major countries for destination of exports ginger are USA, Morocco, Spain, Bangladesh, UK, Saudi Arabia, UAE. Ginger is grown in almost all parts of India. Indian states of Kerala, Assam, Meghalaya, Arunachal Pradesh and Orissa combined account for over 60 percent of the ginger produced in the country (Mishra *et al*. 2012).

Ginger botanically known as *Zingiber Officinale Rosc.* belongs to the family Zingiberaceae is the oldest known spices, one of the significant commercial crop in tropical and subtropical region (Ambia, 2006). There are two main primary products of ginger, fresh ginger and dried ginger. Fresh ginger is consumed as vegetable and dried products are the major form in which ginger is internationally traded. In international market fresh ginger, dried ginger, pickled ginger, preserved ginger, crystallized ginger and ground ginger are traded (www.spice-trade.com, 2009). Ginger is one of the world's most popular and useful plants, being used for centuries as spices for flavouring food and as a medicinal plant. The major component of Ginger are amino acids, shogaols, gingerols, fibre, essential oils and minerals, and for its flavouring and medicinal value is being utilized as ingredient of different products (Camacho and Brescia 2009). Ginger is used widely in most Eastern forms of medicines like Ayurvedic, Chinese, Unani and Tibetan medicine as it has immune-modulatory, anti-hyperglycaemic and anti-emetic actions. Due to presence of antioxidant effect (Ahmad *et al*. 2006) ginger is useful for traditional medicine whereas for its anticancer and anti-inflammatory attributes (Malu *et al*. 2010) it is helpful for treating cold, heat cramps, diabetes and inflammation (Al-Amin *et al*. 2006 and Afshari *et al.* 2007). The study was conducted with the following specific objectives:

- To examine the status of ginger production and export among major spices in India.
- To assess the ginger production potential and trend with respect global and India.

METHODOLOGY

Secondary data were collected from Agriculture Department, Horticulture department particularly spices board and also from websites to satisfy the specific objectives.

Analytical techniques

To examine the trends in ginger production, productivity, Compound Annual Growth Rate (CAGR) and CV technique was applied.

Compound Annual Growth Rate (CAGR): The Compound Annual Growth Rate (CAGR) in area, production and productivity of ginger was estimated by using the exponential growth function of the following form;

$$Y = ab^t e^u$$

Where,

Y is dependent variable (area/production/ productivity)

a = intercept term

b = (1 + r) and 'r' is the compound growth rate

t = time trend

u = Random error term

The above model in the Logarithmic form is expressed as, Log Y= log a + t log b+ u

Log a and Log b values were obtained using the methods of ordinary least squares and per cent CAGR was computed using the following relationship;

$$CAGR\ (\%) = (Antilog\ of\ (Log\ b) - 1) \times 100$$

Student 't' test was used to test the significance of growth rate.

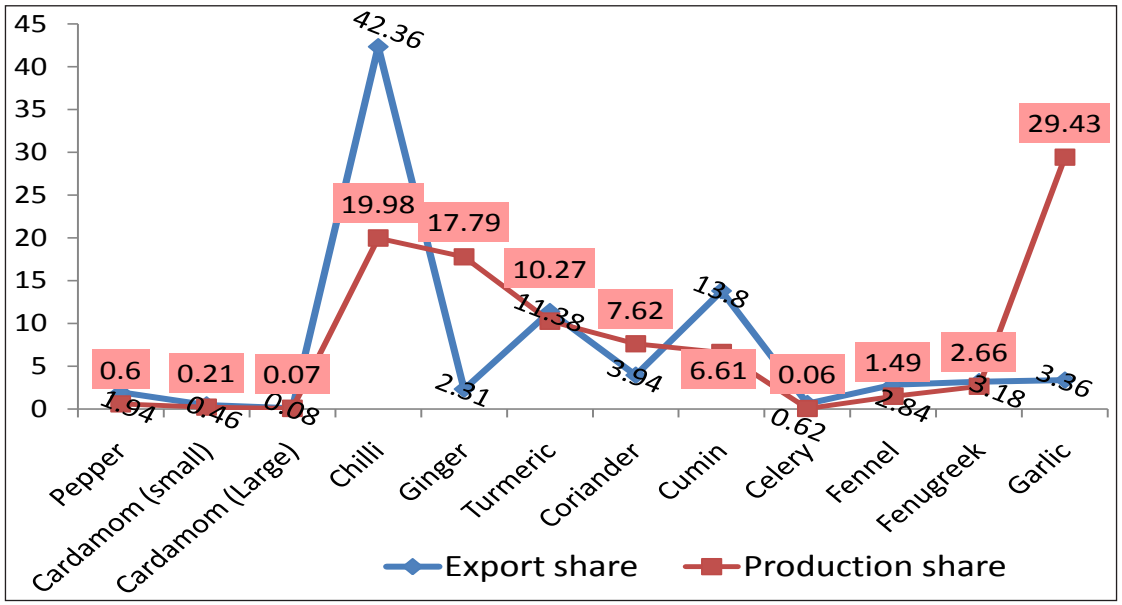
Co-efficient of variation (CV): It is a standardized measure of dispersion of a probability distribution or frequency distribution. It is often expressed as a percentage. It is a measure of relative variability. It was employed to observe the variation and stability in growth rate among the years and calculated by using following formula;

$$CV = (Standard\ deviation/Mean) \times 100$$

RESULTS AND DISCUSSION

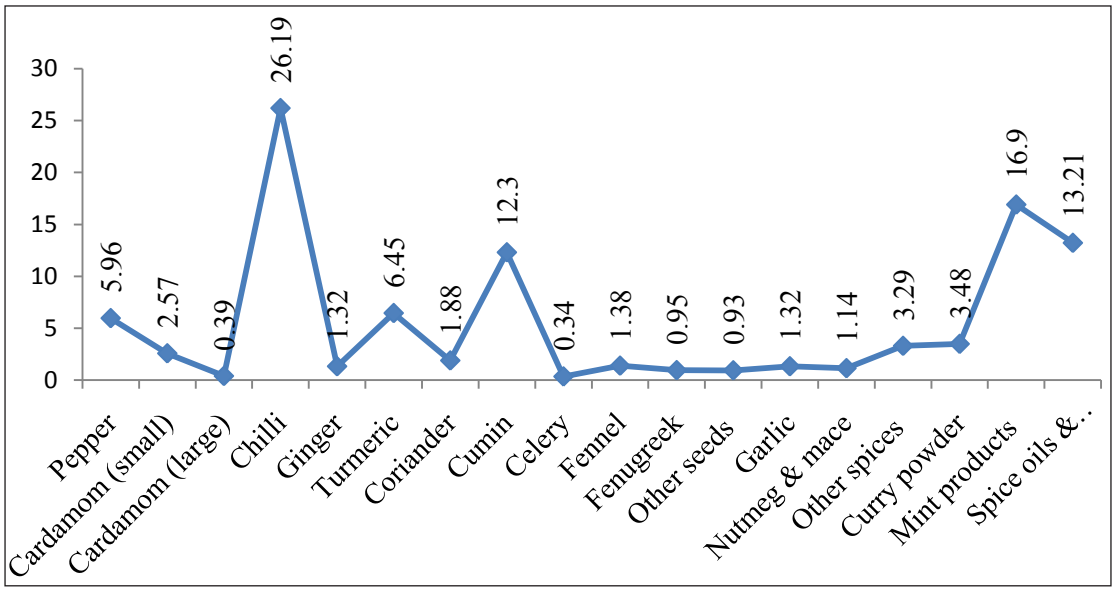
Status of ginger production and extent of export level

The four years (2015-16 to 2018-19) data of the production and export of major spices in India were used to estimate the percentage share average volume production and export of major spices and depicted in Fig. 1 and 2. The major spices produce in India are Pepper, Cardamom small and large, Chilli, Ginger, Turmeric, Garlic, Coriander, Cumin, Fennel, Fenugreek, Tamarind *etc*. It was examined that major contribution to average total production of spices of India during the above specified period came from Garlic (29.43 percent) followed by Chilli (19.98 percent), Ginger (17.79 percent), Turmeric (10.27 percent) and Cumin (6.61 percent). But although in terms of production share Ginger occupied third position but in terms share of volume



Source: *DGCI&S., Calcutta/shipping bills/exporters' returns and Cardamoms: Spices Board of India.*

Fig. 1: Percentage share of Average volume of Production and export of major spices in India (2015-16 to 2018-19)



Source: *DGCI&S., Calcutta/shipping bills/exporters' returns.*

Fig. 2: Percentage share of average value of export of major spices in India (2015-16 to 2018-19).

of export ginger was in 8th position accounting only 2.31 percent of the average total spices export (2015-16 to 2018-19) where Chilly (42.36 percent), Cumin (13.80 percent) and turmeric (11.38 percent) were first three major contributors (Fig.1). Whereas in terms of average value of total export from India over same period, the major share was fetched from Chilli (26.19 percent), Mint products (16.90 percent), Spices oil and oleoresin (13.21 percent) Cumin (12.30 percent) and ginger contributed only 1.32 percent (Fig. 2). Hence, the above outcomes indicated that exportable surplus was very little than other major spices. Therefore, there is huge scope to augment exportable surplus through more expansion of ginger production and value addition.

Global position of ginger production and trend

The Compound Annual Growth Rate (CAGR) is an important tool for determining the growth over multiple time periods to examine the trends and performance of ginger production in major ginger producing countries with respect to India. The eleven years (2009 to 2019) data of ginger production was used for analysis of growth rate and presented in table 1 which shows that the major ginger producing countries are India, Nigeria, China, Nepal, Indonesia, Thailand, Cameroon, Bangladesh and Japan. India is first the largest producer of ginger accounting 32.42 percent share of global ginger production over the average of last eleven years (2009 to 2019). While Nigeria and China occupied 2nd and 3rd position globally in respect ginger production contributing 16.93 percent and 16.76 percent of total average world production over the same period. In respect of CAGR of production of ginger only three countries viz. India, Nigeria and Cameroon achieved more than 10 percent during 2009 to 2019. The growth rate (CAGR) of ginger production in India was worked out to be 15.64 percent which was 64.45 percent higher than global ginger production growth rate. India took also the 1st position in regard to CAGR. The trend line of ginger production in India as well as world showed an increasing trend (Fig. 3) with coefficient of determinant (R^2) value of 0.879 and 0.915. Further, it was revealed that growth rate (CAGR) ginger production in India was significant at 5% level of probability while the global ginger was significant at 1% level of probability. Further, with respect to instability index (Coefficient of variation) of ginger production, the highest variation was also seen in India with 52.75 percent followed by other countries

Table 1: Growth status of global ginger production: (Qty. in 000' Metric Tons)

Year	India	Nigeria	China	Nepal	Indonesia	Thailand	Cameroon	Bangladesh	Japan	Global (ML T)
2009	380.10	168.80	350.00	178.99	122.18	170.13	33.09	72.61	53.20	1.67
2010	385.33	162.22	365.00	210.79	107.74	172.68	39.34	74.84	53.80	1.72
2011	702.00	460.17	420.00	216.29	94.74	152.63	40.53	74.38	54.20	2.37
2012	756.00	380.00	460.00	255.21	114.54	156.07	44.99	72.08	54.60	2.46
2013	683.00	496.92	390.00	235.03	155.29	161.16	48.96	69.00	52.92	2.45
2014	655.00	168.13	469.82	276.15	226.12	161.40	51.04	77.00	50.90	2.30
2015	760.00	413.38	495.92	242.55	313.06	162.40	55.43	83.00	49.40	2.75
2016	1110.00	774.89	550.00	271.86	340.34	166.35	79.27	77.29	50.80	3.62
2017	1076.00	834.63	546.31	279.50	216.59	168.03	88.71	77.48	48.30	3.52
2018	1760.00	700.00	569.52	284.00	207.41	166.20	85.06	79.44	46.60	4.08
2019	1790.00	691.24	581.14	297.51	174.38	166.92	83.43	80.23	45.51	4.08
Mean	914.31	477.31	472.52	249.81	188.40	164.00	59.08	76.12	50.93	2.82
SD	482.32	248.17	83.37	36.70	82.23	5.98	20.84	4.04	3.15	0.87
CV	52.75	51.99	17.64	14.69	43.65	3.65	35.27	5.31	6.18	30.85
R^2	0.879	0.581	0.895	0.817	0.466	-0.021	0.933	0.448	0.846	0.915
CAGR	15.64**	15.58**	5.32***	4.33***	9.28**	0.16NS	10.83***	1.08**	-1.73***	9.51***
	(0.017)	(0.041)	(0.005)	(0.006)	(0.032)	(0.003)	(0.009)	(0.004)	(0.002)	(0.009)

Source: *www.tridge.com, ML T = Million Tons*

Figure in the parenthesis indicate standard error

**** Significant at 1% level of probability, ** Significant at 5% level of probability*

and against global instability index of 30.85. Another interesting finding was that although China ranked 3rd position in respect of average volume of production but the growth rate (CAGR) was only 5.32 percent occupied 5th position.

In light of country-wise value of export of ginger from India, the major countries for destination were USA followed by Morocco, Spain, Bangladesh, UK, Soudi Arabia, UAE, Jermany, Australia and Netherlands accounting 17.94 percent, 12.68 percent, 10.12 percent, 10.00 percent, 6.89 percent, 5.05 percent, 4.77 percent, 3.73 percent, 3.65 percent and 3.20 percent respectively of the average value (2015-16 to 2018-19) of total export (Table 2). It was also examined that around 50 percent of total value of export (four years' average) brought from first four countries.

Area, Production and Productivity of Ginger in India and their trend

The Compound Annual Growth Rate with respect to area, production and productivity of ginger in

Table 2: Major country-wise export of Ginger from India (Value in ₹ lakh)

Country	2015-16	2016-17	2017-18	2018-19	Average	Percentage share
USA	4788.56	3297.40	4182.39	4682.29	4237.66	17.94
Morocco	1426.09	2373.81	4633.14	3550.98	2996.005	12.68
Bangladesh	1878.38	3146.76	1777.61	2649.37	2363.03	10.00
UK	1709.81	1556.36	1585.03	1660.63	1627.958	6.89
UAE	878.61	1095.30	1441.43	1090.32	1126.415	4.77
Australia	934.51	785.76	746.11	979.94	861.58	3.65
Germany	805.03	1314.19	574.24	830.96	881.105	3.73
Nepal	414.07	675.06	384.82	724.50	549.6125	2.33
Netherlands	1117.00	865.27	520.16	519.06	755.3725	3.20
Saudi Arabia	2097.34	1411.09	855.00	413.24	1194.168	5.05
South Africa	542.99	481.75	395.01	401.43	455.295	1.93
Canada	225.07	344.92	368.56	360.63	324.795	1.37
Spain	4449.67	3917.60	976.77	223.12	2391.79	10.12
Other countries	6328.43	4439.58	3167.22	1515.53	3862.69	16.35
Total	27595.56	25704.85	21607.49	19602.00	23627.48	100.00

Source: *DGCI&S Kolkata/Exporters' Returns/DLE from Customs.*

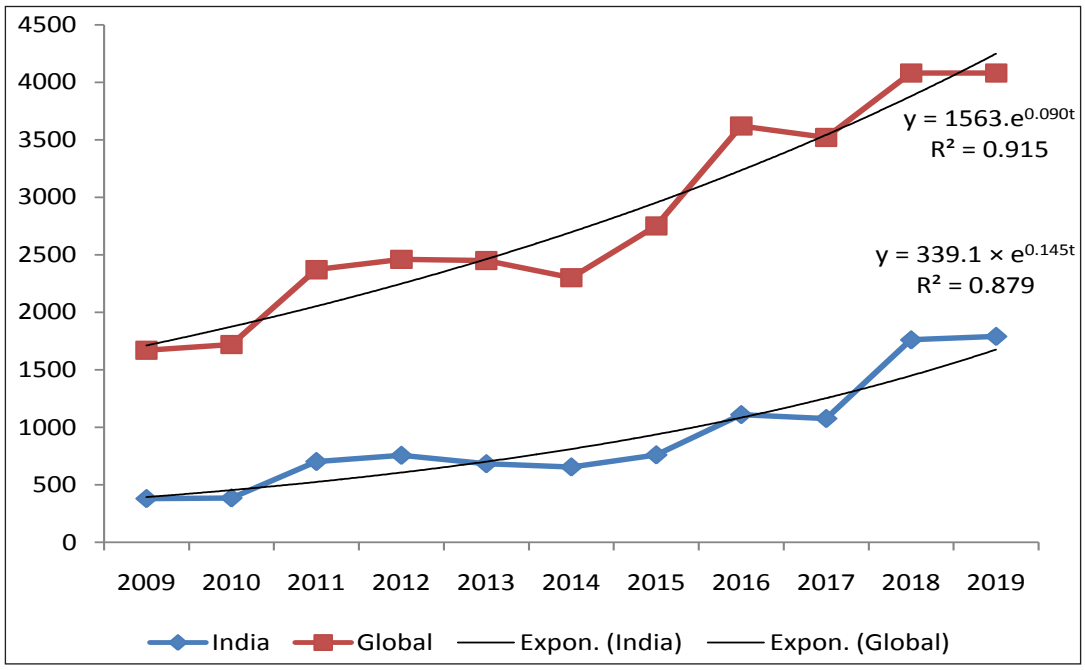


Fig. 3: Production trend of Ginger in Indian and Global

India for the period over 16 years from 2001-02 to 2016-17 was analysed and depicted in the table 3.

Table 3: Growth rate in Area, Production and Productivity of Ginger in India

YEAR	Area (In "000 ha")	Production (In "000 t")	Productivity (t/Ha)
2001-02	84.60	317.90	3.76
2002-03	85.10	307.40	3.61
2003-04	85.10	301.90	3.55
2004-05	95.30	359.00	3.77
2005-06	110.60	391.20	3.54
2006-07	106.10	393.40	3.71
2007-08	104.10	382.60	3.68
2008-09	143.90	610.40	4.24
2009-10	142.10	679.30	4.78
2010-11	167.40	702.00	4.19
2011-12	155.10	755.60	4.87
2012-13	136.30	682.60	5.01
2013-14	132.60	655.10	4.94
2014-15	141.70	760.30	5.37
2015-16	164.00	1109.00	6.76
2016-17	168.00	1076.00	6.40
Mean	126.38	592.73	4.51
SD	30.39	259.11	1.01
CV	24.05	43.71	22.39
R^2	0.803	0.908	0.840
CAGR	4.85*** (0.006)	9.17*** (0.007)	4.11*** (0.004)

Source: Spices Board, India & Ministry of Agriculture and Farmers Welfare, Govt.

Figure in the parenthesis indicate standard error

**** Significant at 1% level of probability.*

The estimated average area, production and productivity of ginger over the said period were found 126.38 thousand ha, 592.73 thousand ton and 4.49 ton/ha, respectively. While the growth rate (CAGR) of area expansion, production and productivity of ginger was worked out to be 4.85 percent, 9.17 percent and 4.11 percent respectively which are all significant at 1% level of probability. The exponential trend line of area and production (Fig. 4) in the country also shown that growth of area expansion and production of ginger was in positive trend and the annual growth rate of production was found to be higher that than area expansion. Whereas, the instability index (coefficient of variation) was found to be highest in production with 43.71 percent variation followed by area with 24.05 percent variation and in productivity with 22.39 percent variation. It indicated that continuity in yield increment and expansion in area is more stable than increase in production.

The major state-wise three years (from 2016-17 to 2018-19) average area, production and productivity was estimated and depicted in Table 4 which shows that Madhya Pradesh, Karnataka and Assam occupied the 1st, 2nd and 3rd position, respectively in area put under ginger cultivation and ginger production respectively. While West Bengal took the forth position in respect to volume of production keeping in 6th position for area under ginger cultivation. But with respect to productivity, the first three position was achieved by Gujrat (22.08 t/ha), followed by Kerala (19.68 t/ha) and Madhya Pradesh

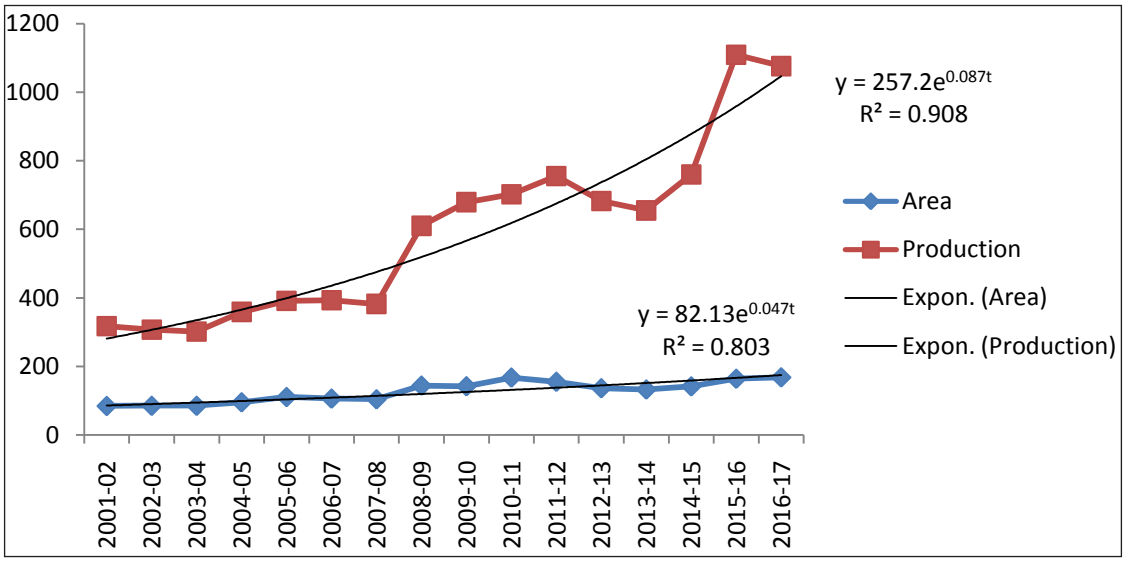


Fig. 4: Trend in Area and Production of Ginger in India

Table 4: State wise area and production of Ginger in India (Area in ha, production in Tons)

State	2016-17		2017-18		2018-19		Average		
	Area	Prod^{n}	Area	Prod^{n}	Area	Prod^{n}	Area	Prod.	Prod^{ty} (t/Ha)
M.P.	23153	372640	23431	377470	24964	414280	23849 (14.17)	388130 (21.51)	16.27
Karnataka	23088	271490	20809	249920	15858	244070	19918 (11.63)	255160 (14.14)	12.81
Assam	17632	156660	18105	161600	17865	166270	17867 (10.61)	161510 (8.95)	9.04
West Bengal	11990	130400	12250	133750	12418	135560	12219 (7.26)	133237 (7.38)	10.90
Odissa	16568	127950	16575	128020	16575	128020	16573 (9.84)	127997 (7.09)	7.72
Gujarat	4651	102850	4870	108250	5037	110401	4853 (2.88)	107167 (5.94)	22.08
Kerela	5151	95220	4370	86270	3275	70330	4265 (2.53)	83940 (4.65)	19.68
Sikkim	12300	55900	12300	55900	15637	85139	13412 (7.97)	65646 (3.64)	4.89
Meghalaya	10349	73290	9944	66200	9953	66270	10082 (5.99)	68587 (3.80)	6.80
Mizoram	8553	62740	8553	60130	8553	60130	8553 (5.08)	61000 (3.38)	7.13
UP	8500	70000	7650	56580	4001	23770	6717 (3.99)	50117 (2.78)	7.46
Uttaranchal	2047	20530	2325	25710	4911	48468	3094 (1.84)	31569 (1.75)	10.20
Telengana	2017	14090	1840	12980	1623	11221	1827 (1.09)	12764 (0.71)	6.99
AP	509	8230	381	1440	296	2492	395 (0.23)	4054 (0.22)	10.25
INDIA	171730	1830590	168989	1794560	164310	1788970	168343 (100)	1804707 (100)	10.72

Source: *Cardamoms: Estimate by Spices Board.*

(16.27 t/ha) where West Bengal was found to be in 5th position by achieving average productivity was10.90 t/ha which was slightly higher than national average productivity.

CONCLUSION

India produced around one third of total global ginger production over the last eleven years (from 2009 to 2019). Even, the growth rate (CAGR) of ginger production of India over the same period found to be highest compare to the major ginger producing countries in the world. Moreover, among the major spices produces in India ginger hold 3rd position accounting 17.79 percent (average from 2015-16 to 2018-19) of the total spices production but its contribution to the total export of spices both in terms of quantity and value revealed very little (2.31 percent of the quantity and 1.32 percent of value). Therefore, it might be inferred that due to high domestic consumption of ginger, the amount of exportable surplus is much lower than other major spices. The major five destinations for export of ginger from India were USA, Morocco, Spain, Bangladesh and UK. The first four countries constituted around 50 percent of total foreign earnings from export of ginger. From the analysis of last 16 years' data from 2001-02 to 2016-17, it was examined that the growth rate (CAGR) of ginger production (9.17 percent) was more or less double than area and productivity. But the instability in growth of production revealed much higher than area and productivity. Whereas Madhya Pradesh, Karnataka, Assam together contributed around 45 percent of total ginger production but in terms of productivity, Gujarat, Kerala and Madhya Pradesh are only looking good. Hence, to increase the export potential in ginger, the vertical expansion by augmenting the level of productivity through adoption of good quality high yielding variety along with scientific package of practices and management as well as horizontal expansion of ginger cultivation area and infrastructural development for ginger processing are highly essential.

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