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Growth analysis of area, production and productivity of major seed spices in North Gujarat

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Abstract

The study was attempted to analyze the growth performance of area, production and productivity of major seed spices viz., cumin and fennel in North Gujarat region. For the present study, Banaskantha and Mehsana districts were selected purposively. Secondary data were collected for the period of years from 2009-10 to 2018-19. The study showed that, positive and statistically significant growth of area (7.09%) and production (8.76%) of cumin was recorded in Banaskantha district, whereas it was found negative for Mehsana district, because the farmers were forced to migrate towards other agricultural crops due to risk of high incidence of blight disease in the district. For the state as a whole it was found positive but non-significant. In cumin growth rate of productivity in both selected districts as well as in state was found positive and statistically significant. In case of fennel, growth in area and production was recorded positive but non-significant for Banaskantha district *i.e.*, 0.66 and 0.54 percent, respectively and state as a whole *i.e.*, 0.66 and 3.38 percent, respectively; while, it was negative but non-significant for Mehsana district. Productivity of fennel showed positive and statistically significant growth in Mehsana district and state as whole, whereas it was negative but statistically non-significant in Banaskantha district.

Keywords: General trend, compound growth rate, area, production and productivity

Introduction

The history of the Indian spices dates back to the beginning of human civilization. India is known as the “Land of Spices” and produces a large variety and quantity of spices [1] There is no other country in the world that produces as many kinds of spices as India. Out of 109 spices listed by ISO (International Standards Organization), India produces around 75 spices in its various climatic regions [2]. The climate of the country is suitable for almost all spices. The wide variety of spices grown in different part of the country is mainly consumed by a strong domestic market and rest being exported. India has monopoly in spices production and export for a long period. But, the situation is fast changing and we are facing extreme competition from many countries [3]. Generally, India grown major spices are cardamom, turmeric, and chilli. The important minor spices grown in India are ajwain, coriander, cumin, fennel, fenugreek, garlic and onion. In India Kerala, Tamilnadu, Gujarat, Rajasthan, Andhra Pradesh, Maharashtra, and Karnataka are the major state cultivating spices in larger area. As per the National Horticulture Database published by National Horticulture Board, during 2015-16, India produced 6.988 million tonnes of spices from an area of 3.473 million hectares. Out of total production, Gujarat produced 1.077 million tonnes of spices from an area of 0.508 million hectares followed by Rajasthan which produced 1.056 million tonnes of spices from an area of 1.014 million hectares. Rajasthan’s share in total cultivated area was highest, but in the total spices production Gujarat was the leading state of the country [4]. Gujarat produces spices *i.e.*, ginger, chilli, turmeric, garlic, coriander, cumin, fennel and fenugreek. Among them cumin and fennel are of much commercial importance due to substantial production, huge domestic consumption and good demand for export. Hence, these two crops were selected for the present study.

Methodology

Cumin and fennel cultivation in the state of Gujarat is largely concentrated in North Gujarat region. Among the seven districts of North Gujarat, Banaskantha and Mehsana districts together comprising of about 50 and 60 percent of cumin and of fennel’s area, respectively during the year 2016-17 [5] (Directorate of Horticulture, GoG, Gandhinagar). Hence, these two districts were purposively selected for the study. The present study was based on secondary data collected for period of ten years from 2009-10 to 2018-19.

In order to analyze the general trend and compute growth rate of area, production and productivity of cumin and fennel in the study area (Banaskantha and Mehsana district) and in the state as whole, secondary data were collected from the records of National Horticulture Board, Ministry of Agriculture and Farmers Welfare, GoI and Directorate of Horticulture, GoG, Gandhinagar.

Compound Annual Growth Rate

The compound growth rate of area, production and productivity of cumin and fennel was estimated by given formula:

Compound Growth Rate (CGR)

$$Y = AB^t$$

Where,

Y = Area/Production/ Productivity of cumin and fennel

A = Constant/ Intercept

B = 1+ r

t = Time variable in year (1,2,3, n)

The value of B was calculated by using index numbers in log form following formula given below

$$\text{Log B} = \frac{\sum t \log Y - \sum t \log Y/N}{\sum t^2 - (\sum t)^2/N}$$

The compound growth rate (r) was obtained as below

$$r = (\text{Antilog B} - 1) \times 100$$

Significance of growth rate was judged by student t-test.

Result and Discussion

General trend and growth rate of area, production and productivity of cumin

The general trend in area, production and productivity of cumin over the period 2009-10 to 2018-19 is observed through line diagram (Fig. 1 to 3). The area under cumin cultivation in Banaskantha district was increased by more than two times from 33500 hectares in 2009-10 to 75687 hectares in 2018-19. For Mehsana district area under cumin was initially increased and after 2012-13, it was suddenly decreased and recorded 1698 hectares in 2018-19. In the state as a whole, cumin's area was increased up to 2013-14 (454900 ha.), after that it was decreased with some exception and recorded 349552 hectares in 2018-19. Cumin production in Banaskantha district was increased by two and a half times from 30150 metric tons in 2009-10 to 76444 metric tons in 2018-19. For Mehsana district, it was drastically decreased by about ten times from 14050 to 1477 metric tons in ten years. During same period, cumin production in the state was increased from 221906 metric tons in 2009-10 to 319862 metric tons in 2018-19. Cumin productivity for Banaskantha and Mehsana district and for Gujarat state has increased from 0.71 to 0.92 Mt/ha., 0.90 to 1.01 Mt/ha. and 0.71 to 0.87 Mt/ha., respectively during the same period.

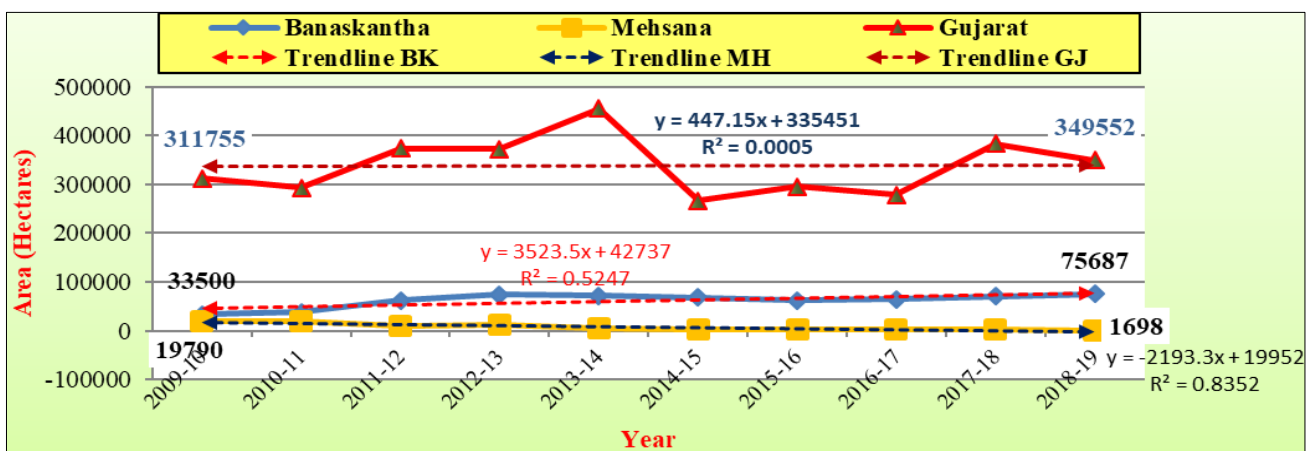


Fig 1: General trends in area of cumin from the year 2009-10 to 2018-19

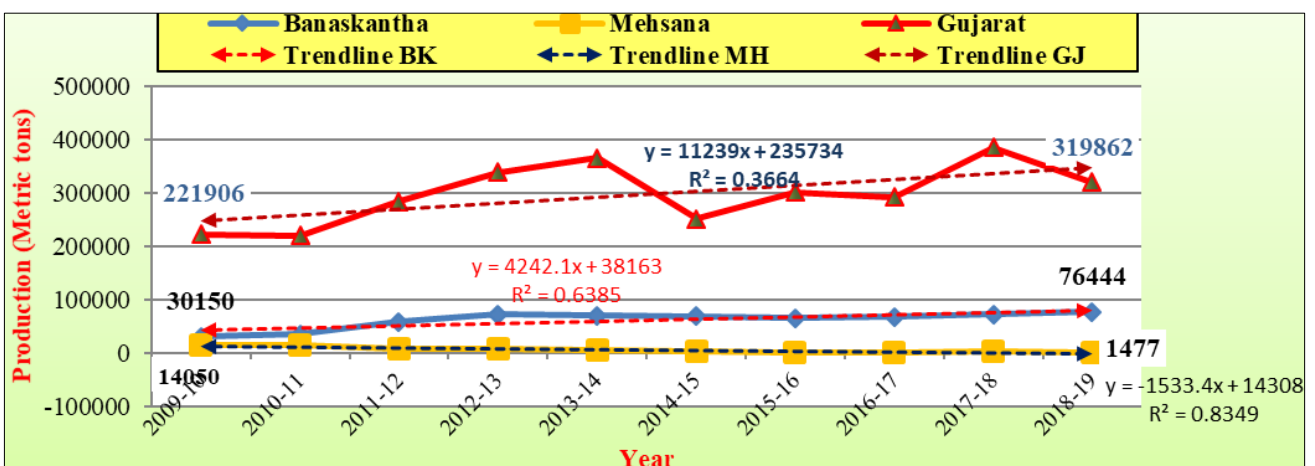


Fig 2: General trends in production of cumin from the year 2009-10 to 2018-19

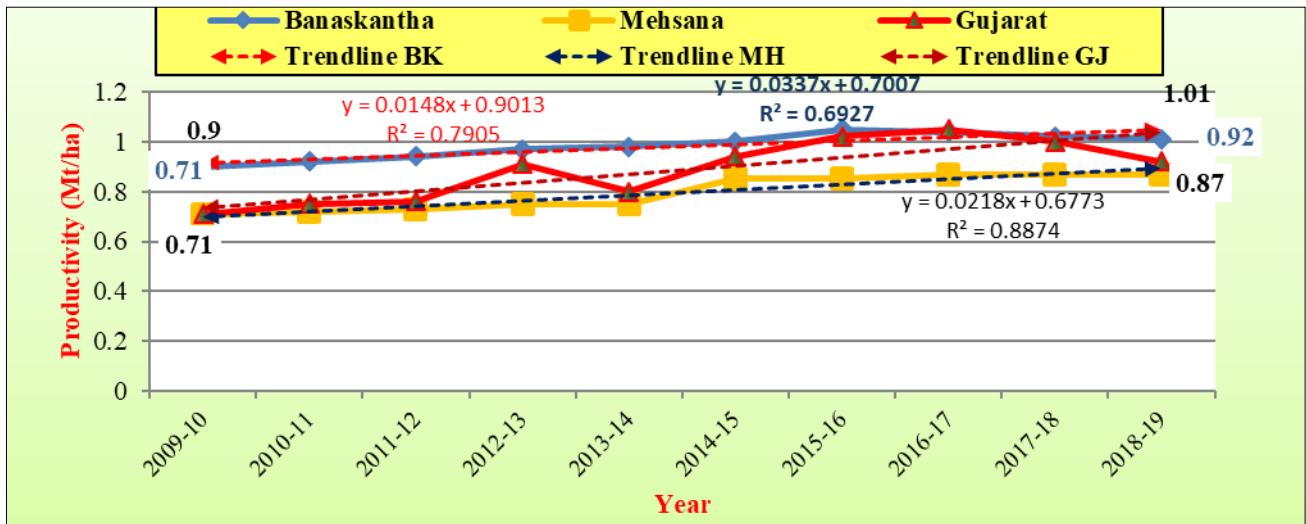


Fig 3: General trends in productivity of cumin from the year 2009-10 to 2018-19

Table 1: Compound annual growth rate of area, production and productivity of cumin (2009-10 to 2018-19) (ha=hectares; Mt= metric tons; Mt/ha= metric tons/hectare)

Year	Banaskantha			Mehsana			Gujarat		
	A (ha)	P (Mt)	Y (Mt/ha)	A (ha)	P (Mt)	Y (Mt/ha)	A (ha)	P (Mt)	Y (Mt/ha)
2009-10	33500	30150	0.90	19790	14050	0.71	311755	221906	0.71
2010-11	38000	34960	0.92	20000	14400	0.72	292847	219215	0.75
2011-12	61800	57812	0.94	10700	7768	0.73	373900	283302	0.76
2012-13	74850	72580	0.97	11400	8550	0.75	372584	338192	0.91
2013-14	71400	69972	0.98	5900	4425	0.75	454900	364648	0.80
2014-15	68500	68500	1.00	3400	2890	0.85	266700	251432	0.94
2015-16	62000	65100	1.05	1800	1530	0.85	295400	300948	1.02
2016-17	64910	67506	1.04	1844	1604	0.87	278751	291488	1.05
2017-18	70514	71924	1.02	2358	2051	0.87	382719	384469	1.00
2018-19	75687	76444	1.01	1698	1477	0.87	349552	319862	0.92
CAGR (%)	7.09*	8.76**	1.54**	-27.01**	-24.97**	2.78**	0.12 ^{NS}	4.11 ^{NS}	3.99**

(Note * = 5% level of significance, ** = 1% level of significance and NS = non- significant)

Source: Directorate of Horticulture, GoG, Gandhinagar

Compound growth rates of area, production and productivity of cumin are presented in Table 1. It is evident from the table that, in Banaskantha district the area, production and productivity of cumin showed positive and statistically significant growth rate of 7.09, 8.76 and 1.54 percent per annum, respectively. The growth in area was significant at 5 percent level of significance, while the growth in production and productivity of cumin were significant at 1 percent level of significance. Production of cumin was significantly increased due to significant increase in both area and productivity over ten years (2009-10 to 2018-19). In Mehsana district, area and production of cumin showed high negative growth rate of -27.01 and -24.97 percent per annum, respectively. This was due to high incidence of blight disease in the district and hence, due to the risk of it, the farmers were forced to migrate towards other agricultural crops. The productivity of cumin showed positive and significant growth rate of 2.78 percent per annum. The compound growth rate of area and production of cumin in the state as a whole was

found to be positive, which were grown at a rate of 0.12 and 4.11 percent per annum, respectively. These values were non-significant at both 1 and 5 percent level of significance. While, cumin productivity in the state showed positive and significant growth of 3.99 percent per annum. The growth in productivity was significant at 1 percent level of significance. Similar findings were observed by Devi and Jadav [6] in case of total spices.

General trend and growth rate of area, production and productivity of fennel

The general trend in area, production and productivity of fennel over the period 2009-10 to 2018-19 is observed through line diagram (Fig. 4 to 6). In Banaskantha district, area under fennel was increased by more than 1 and half times from 8000 hectares in 2009-10 to 14329 hectares in 2018-19. Whereas, in Mehsana district, fennel area was decreased from 23250 to 13987 hectares during the same period.

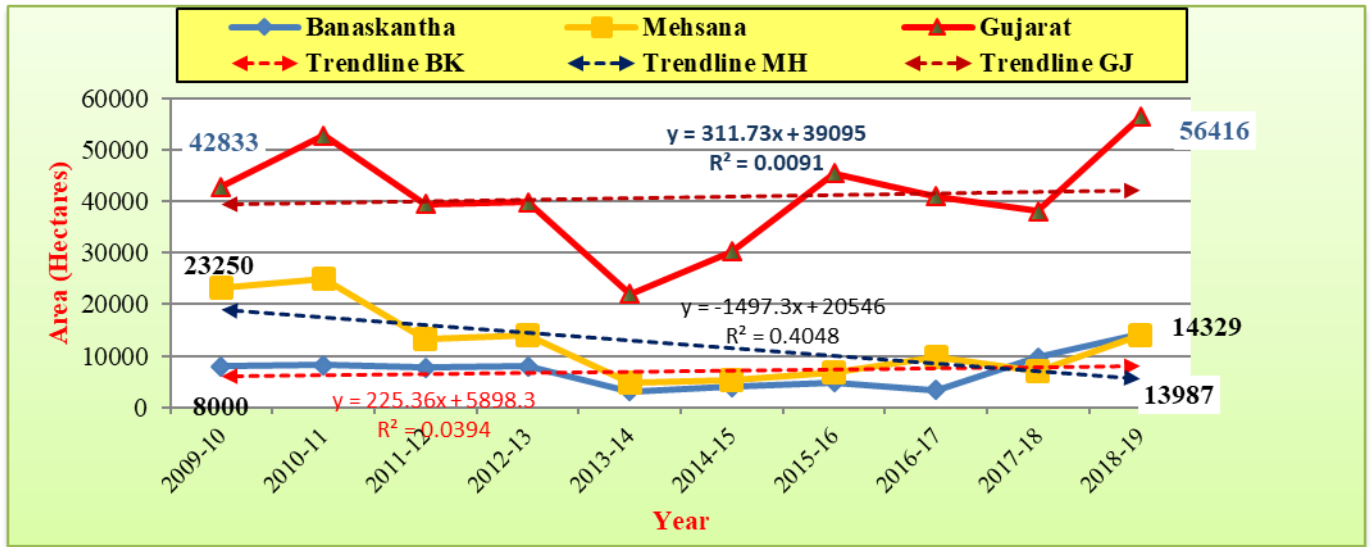


Fig 4: General trends in area of fennel from the year 2009-10 to 2018-19

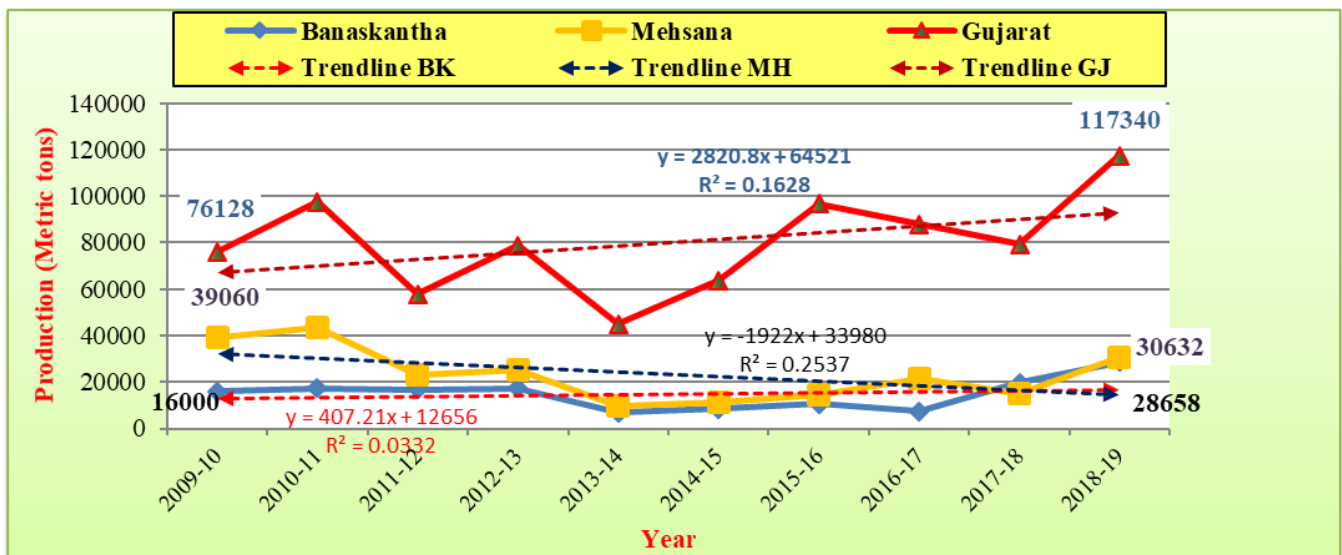


Fig 5: General trends in production of fennel from the year 2009-10 to 2018-19

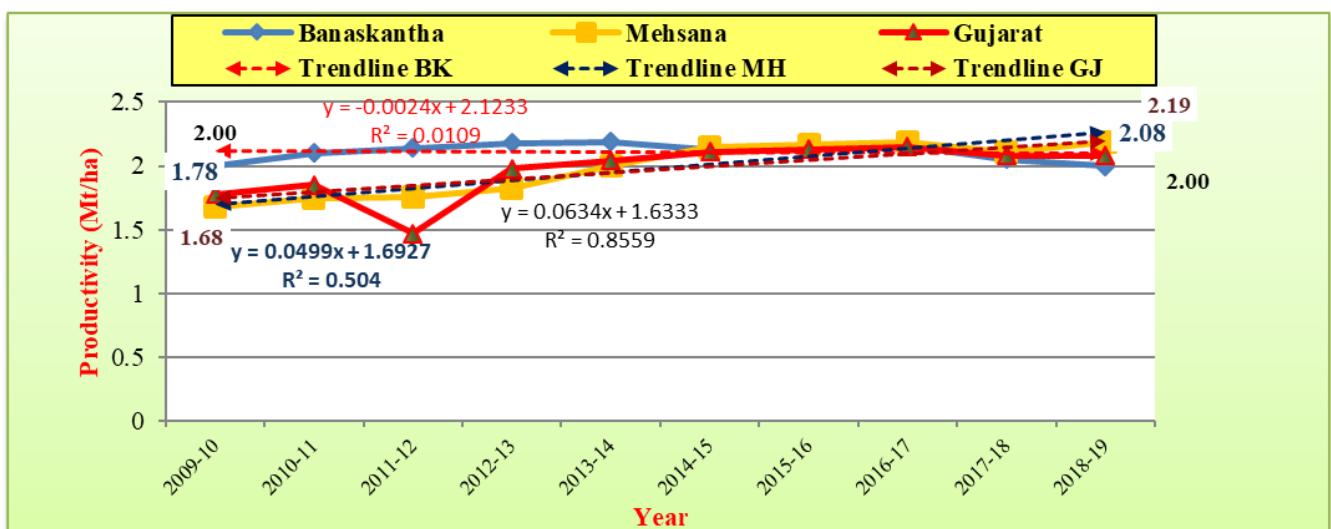


Fig 6: General trends in productivity of fennel from the year 2009-10 to 2018-19

The area under fennel cultivation in the state as a whole was increased from 42833 to 56416 hectares in 2018-19. Production of fennel in Banaskantha district was increased by

more than one and half times from 16000 metric tons (2009-10) to 28658 metric tons (2018-19). During the same period, production of fennel in Mehsana district was decreased from

39060 to 30632 metric tons. Production of fennel in the state was increased through the period of ten years from 76128 to 117340 metric tons. Productivity of fennel was increased for state as a whole (1.78 to 2.08 Mt/ha) and for Mehsana district (1.68 to 2.19 Mt/ha), while it was remain stagnant (2.0 Mt/ha)

for Banaskantha district over the study period. It was also observed from the table 2 that, area under fennel cultivation was increased in the year 2018-19 as compared to previous year, which was due to the higher price of fennel from the previous year.

Table 2: Compound growth rate of area, production and productivity of fennel (2009-10 to 2018-19) (ha.=hectares; Mt= metric tons; Mt/ha= metric tons/hectare)

Year	Banaskantha			Mehsana			Gujarat		
	A (ha)	P (Mt)	Y (Mt/ha)	A (ha)	P (Mt)	Y (Mt/ha)	A (ha)	P (Mt)	Y (Mt/ha)
2009-10	8000	16000	2.00	23250	39060	1.68	42833	76128	1.78
2010-11	8200	17220	2.10	25000	43750	1.75	52809	97504	1.85
2011-12	7800	16680	2.14	13200	23232	1.76	39500	57941	1.47
2012-13	7950	17331	2.18	13945	25380	1.82	39801	78733	1.98
2013-14	3100	6789	2.19	4800	9600	2.00	22100	45020	2.04
2014-15	4000	8520	2.13	5300	11395	2.15	30200	63845	2.11
2015-16	4900	10535	2.15	6800	14756	2.17	45400	96774	2.13
2016-17	3410	7366	2.16	9774	21405	2.19	40909	87822	2.15
2017-18	9689	19862	2.05	7054	14884	2.11	38130	79243	2.08
2018-19	14329	28658	2.00	13987	30632	2.19	56416	117340	2.08
CAGR (%)	0.66 ^{NS}	0.54 ^{NS}	-0.11 ^{NS}	-9.78 ^{NS}	-6.79 ^{NS}	3.32 ^{**}	0.66 ^{NS}	3.38 ^{NS}	2.69 [*]

(Note * = 5% level of significance, ** = 1% level of significance and NS = non- significant)

Source: Directorate of Horticulture, GoG, Gandhinagar

Growth rate of area, production and productivity of fennel Compound growth rates of area, production and productivity of cumin are presented in Table 2. In Banaskantha district, area and production of fennel showed positive growth of 0.66 and 0.54 percent per annum, respectively over the period of ten years (2009-10 to 2018- 19). Whereas, productivity of fennel showed negative growth of -0.11 percent per annum. All these values were non- significant at both 1 and 5 percent level of significance. Production of fennel was positively increased due area expansion over the study period. In Mehsana district, the growth rate of area and production was found to be negative and non- significant *i.e.*, -9.78 and -6.79 percent per annum, respectively. Whereas, the productivity of fennel showed positive and statistically significant growth rate of 3.32 percent per annum. The growth in productivity was significant at 1 percent level of significance. The growth rate of area and production of fennel in the state as a whole was registered positive *i.e.*, 0.66 and 3.38 percent per annum, respectively. These values were non- significant at both 1 and 5 percent level of significance. The growth rate of productivity was significantly grown at a positive rate of 2.69 percent per annum. It indicates that, increasing trend in productivity leads to increase in production of fennel over the period 2009-10 to 2018-19. There was wide variation in the growth rate of area, production and productivity of cumin and fennel crop this may be due to diversification towards other agricultural crops as they are highly weather sensitive crops. Similarly, statistically non-significant growth in area and production of total spices in India was reported by Devi and Jadav [6].

Conclusion

From the above discussion it was concluded that, area, production and productivity of cumin in Banaskantha district showed positive and statistically significant growth rate of 7.09, 8.76 and 1.54 percent per annum, respectively. Production of cumin was significantly increased in Banaskantha district due to significant increase in both area and productivity over ten years. In Mehsana district growth of area (-27.01%) and production (-24.97%) of cumin was

negative because risk of high incidence of blight disease in the district the farmers were migrated towards other agricultural crops. In the state as a whole growth of cumin area and production were positive but non-significant, productivity showed positive and significant growth (3.99%). Area and production of fennel in Banaskantha district showed positive but insignificant growth while productivity showed negative and insignificant growth. The positive growth in production was due to area expansion over the study period. In Mehsana district, the growth rate of fennel's area and production was negative and non- significant, while, productivity of fennel showed positive and significant growth. This may be due to decreased growth in production (-6.79%) was lower as compared to decreased growth in area (-9.78%). The growth rate of area and production of fennel in the state as a whole were observed positive and non-significant, *i.e.*, 0.66 and 3.38 percent, whereas productivity showed positive and significant growth (2.69%). There was wide variation in the growth rate of both the selected crop, this may be due to diversification towards other agricultural crops as they are highly weather sensitive crops.

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