



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(6): 2554-2558

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Received: 30-09-2019

Accepted: 31-10-2019

Aware MR

M.Sc. Student, Department of Agricultural Economics, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

DS Perke

Professor and Head, Department of Agricultural Economics, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

Y Praneetha

M.Sc. Student, Department of Agricultural Economics, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

Growth and instability analysis of production and export of pomegranate from India

Aware MR, DS Perke and Y Praneetha

Abstract

The present study was conducted to assess the growth and instability in export of pomegranate. Compound Growth Rate, Coefficient of Variation (CV) and Coppock's instability index is employed to analyse the time series data for 15 years collected from APEDA and other government publication for a period of 2003-04 to 2017-18. The growth rate of pomegranate production in Maharashtra state is found to be positive and significant at 1 per cent level during I, III and at overall period. Country wise export performance of Kuwait was highest growth rate in pomegranate exported quantity from India was 42.22 per cent which is significant at 1 per cent level. Whereas the lowest growth rate of Netherland for export of pomegranate was found i.e. 3.54 per cent. The production of pomegranate exhibited less variability with co-efficient of variation at 10.69 per cent, 4.54 per cent and 25.26 per cent in period I, II and III, respectively. Coppock's Instability Index shows the highest variation in export value of pomegranate i.e. 203.44 per cent in period I. Country wise export quantity of pomegranate Coppock's Instability Index shows the highest variation in USA and lowest variation in U.A.E. i.e. 257.74 and 32.08 per cent, respectively.

Keywords: compound growth rate, coefficient of variation, instability

Introduction

Pomegranate (*Punica granatum* L.) belongs to family *Punicaceae* and is a favorite table fruit of the tropical and sub-tropical regions of the world. Pomegranate cultivation was started since ancient time. The fruit is native of Iran and extensively cultivated in Mediterranean countries like Spain, Egypt, Iran, Burma, China and India. In India, pomegranate is cultivated in the states of Maharashtra, Gujarat, Karnataka, Tamil Nadu, Uttar Pradesh, Haryana and Andhra Pradesh. It is also cultivated in parts of Arizona and California.

The total production of pomegranate is concentrated mainly in the Western Maharashtra, Karnataka, Andhra Pradesh, Gujarat, Himachal Pradesh, Tamil Nadu and Rajasthan in India. The production of pomegranate in India during 2017-18 was 2670.67 ('000 MT). Maharashtra is the leading State with 151.5 thousands hector area under pomegranate cultivation, followed by Karnataka and Gujarat with 29.1 thousand ha and 22.2 thousand ha respectively, Andhra Pradesh and Rajasthan stood at fourth and fifth position with 7.71 and 2.5 thousand ha of pomegranate cultivation in India. India is the largest producer of pomegranates but export from India fresh fruit during 2017-18 was 1.85 per cent of the total share in world compared to Thailand and Vietnam soc rep which exports 28.37 and 23.73 per cent share in world, respectively of their production. To increase exports, it is necessary to improve the quality at various stages from production, post-harvest, processing and handling, storage and till it reaches the customers.

The fruit is exported to UAE, Saudi Arabia, Netherlands, Oman, Nepal, USA, Kuwait, UK, and Others country. India ranks first in area (220,000 ha) with a production of 2670.67 ('000 MT), but exports quantity 47.33 (MT), including 1.7 per cent export from India to rest of countries. The first season for harvesting pomegranates begins during July-September, while the second harvest season commences in January-February. The export season of the fruit starts in November every year and continues till March-end.

Methodology

The study is based on time series data on production and export of pomegranate from India obtained from various published issues of APEDA and other government publication for a period of 2003-04 to 2017-18. The total period (2003-04 to 2017-18) was split into three

Corresponding Author:**Aware MR**

M.Sc. Student, Department of Agricultural Economics, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

periods viz., period I (2003-04 to 2007-08), period II (2008-09 to 2012-13), period III (2013-14 to 2017-18). For the present study analytical tools Compound Growth Rate, Coefficient of Variation (CV) and Coppock's instability index were used.

Result

State wise production performance of Pomegranate

State wise performance of Pomegranate is presented in the Table 1. It was revealed that in production of pomegranate observed at overall period Gujarat state was highest growth rate i.e. 16.60 per cent, whereas lowest growth was observed in Andhra Pradesh state i.e. 5.60 per cent, which is significant at 1 per cent level. It was observed in pomegranate production Maharashtra and Karnataka is Second and third position, respectively.

Maharashtra state was observed in production of pomegranate highest growth rate i.e. 15.55 per cent in period III which is significant at 1 per cent level, and lowest growth was i.e. 2.85 per cent in period I which is significant at 5 per cent level. At overall period growth rate was observed i.e. 8.25 per cent, which is significant at 1 per cent level. Karnataka state was observed in production of pomegranate highest growth rate i.e. 23.63 per cent in period III which is significant at 1 per cent level, and lowest growth was i.e. 2.63 per cent in period II which is significant at 5 per cent level. At overall period growth rate was observed i.e. 7.35 per cent, which is significant at 1 per cent level. From table it is seen that, the highest variation in production of pomegranate in overall period was observed in Gujarat state i.e. 86.37 whereas lowest variation was observed in Karnataka state i.e. 40.60 per cent. Growth rate of pomegranate production was observed in India i.e. 9.15 per cent, which is statistically significant at 1 per cent level and variation is observed i.e. 57.20 per cent.

Country wise export performance of Pomegranate

Country wise export performance of Pomegranate during (2003-04 to 2017-18) was presented in the Table 2, it was revealed that, highest growth rate of pomegranate exported quantity to Kuwait from India was 42.22 per cent which is significant at 1 per cent level, whereas lowest growth rate for export of pomegranate was found in Netherland i.e. 3.54 per cent. Second highest growth rate of quantity of pomegranate exported to USA from India was 22.96 per cent which is significant at 1 per cent level. The highest growth rate in case of total value of pomegranate exported was found in USA i.e. 63.24 per cent, whereas lowest was found in UK i.e. 8.01 per cent which is significant 1 per cent level. Second highest and lowest growth rate of total value of pomegranate exported was Kuwait i.e. 61.25 per cent and Netherland i.e. 13.43 per cent, respectively which is significant 1 per cent level. The highest and lowest variation in case of quantity of pomegranate export was found in Netherland and U.A.E. i.e. 107.35 and 34.99 per cent, respectively. The second highest and lowest variation in quantity of pomegranate export was found in Nepal i.e. 98.35 per cent and Saudi Arab i.e. 49.44 per cent, respectively.

It was also showed that, the highest variation in case of total value of pomegranate export was found in Oman i.e. 152.56 per cent, where was lowest in UK i.e. 36.80 per cent. Growth rate of India for pomegranate export was found i.e. 8.12 per cent which is statistically Significant at 1 per cent level and variation was i.e. 40.53 per cent.

Compound Growth Rate of Production and Export Quantity and Export Value of Pomegranate

The exponential functional form was employed to compute the growth rates and the results are presented in Table 3. The total study period (2003-04 to 2017-18) was divided into four periods namely, period I (2003-04 to 2007-08), period II (2008-09 to 2012-13), period III (2013-2017) and overall period (2003-04 to 2017-18). In period I production, export quantity and export value realized through Production, export quantity and exports value have growth rate 6.53, 33.47 and 134.46 per cent per annum in period I, respectively. However, in period II production and export quantity observed growth rates negatively significant at the rate of -2.04 and -0.33 per annum, respectively. However, in period III production and export value shows the growth rate positively significant at the rate of 18.19 and 17.29 per cent per annum, respectively.

The overall 15 years (2003-04 to 2017-18) growth rate of export value of Pomegranate in India was highly significant at 31.59 per cent per annum and much higher than the production and export quantity of Pomegranate for overall period was 9.51 and 8.12 per cent per annum, respectively and significant at one per cent level. Hence, there is significant growth in production and export of Pomegranate in India, the hypothesis is accepted.

Instability in production and export of Pomegranate

The co-efficient of variation was worked out and are presented in Table 4. The production of Pomegranate exported exhibited less variability with co-efficient of variation at 10.69, 4.39, 25.26 and 57.17 per cent in period I, II, III and overall period, while it was highest in overall period with co-efficient of variation at 57.17 per cent. As regard the Export quantity of Pomegranate the highest variation was observed 47.18 per cent in period I with co-efficient of variation at 40.53 per cent in overall period 31.60 per cent in period III and 23.66 per cent in period II. Export earnings in terms of Export value showed higher instability in overall period with 85.72 per cent of co-efficient of variation when compared to the period I, II and III. From the above it was clear that instability in production in Pomegranate was less during period II. Findings can be correlated with Kumar (2015).

Coppock's Instability Index of Production, Export Quantity and Export Value

Coppock's Instability Index (CII) is close approximation of the average year to year percentage adjusts for the trend. Thus variation around the trends is more pronounce than the absolute variation. The Coppock's Instability Index was work out for the period (2003-04 to 2017-18) and split into three periods viz., period I (2003-04 to 2007-08), period II (2008-09 to 2012-13), period III (2013-2017). The results are presented in Table 5. The highest variation observed in export value of Pomegranate was 203.44 per cent in period I and 101.04 per cent, 61.81 per cent and 14.62 per cent in overall period, period II and period III, respectively. Coppock's Instability Index for production, export quantity and export value was in period I 8.06, 22.90, and 203.44 per cent, respectively. In period II it was observed in production, export quantity and export value was 5.54, 49.92 and 61.81 per cent, respectively. In period III it was observed in production, export quantity and export value was 13.83, 51.66 and 14.62 per cent, respectively and for overall period it was

19.44, 41.98 and 101.04 per cent, respectively. The discussion thus revealed that instability in Pomegranate export value was higher in period I.

State wise Coppock's Instability Index (%) of Production

The instability in production of pomegranate in India was calculated by Coppock's instability index and presented in Table 6. During the Period-I highest instability in production was observed in Chhattisgarh (108.24 per cent) followed by Himachal Pradesh (90.32 per cent) and Andhra Pradesh (50.93 per cent) while lowest instability was observed in Maharashtra (3.17 per cent) followed by Rajasthan (4.83 per cent), Karnataka (7.28 per cent), As regards to India the instability was 8.06 per cent which mean that all the state of India failed to achieve the stability in Period-I. As regards to Indian production of instability was decreased to 5.54 per cent. During Period-III the highest instability was recorded in Chhattisgarh which was highest among all the study periods i.e. 163.17 followed by Andhra Pradesh and Karnataka state was of 36.53 per cent and 32.77 per cent respectively.

While lowest instability was recorded in Maharashtra (11.49 per cent) followed by Tamil Nadu (16.49 per cent) and Gujarat (25.83 per cent). The instability of India was increased to 13.83 per cent. During overall period of study the highest instability was observed in Chhattisgarh (117.71 per cent) followed by Himachal Pradesh (66.83 per cent) while lowest instability was recorded in Karnataka (19.71 per cent) followed by Gujarat (22.41) Tamil Nadu (23.83 per cent). The instability recorded for India was 19.43 per cent. Thus, the above discussion was concluded that there was no stability in production of pomegranate in India throughout the studied period.

Country wise Coppock's Instability Index (%) of Export quantity

Country wise Coppock's Instability Index (%) of Export quantity was presented in the Table 7. During the Period-I highest instability in exported quantity was observed in USA (408.03) followed by Kuwait (346.27 per cent), Oman (148.65 percent) and Saudi Arab (97.41 percent) while lowest instability was observed in U.A.E. (26.92 per cent) followed by UK (37.69 percent) and Nepal (46.91), As regards to India was failed to achieve the stability of export quantity in Period-I. During Period II the instability of Export quantity to was USA 356.92 per cent which was highest instability throughout

the study period. The degree of instability steeply declined in Oman i.e. 47.90 per cent, the lowest instability index has recorded in U.A.E. 34.41 per cent followed by Saudi Arab (64.50 per cent), the increased instability in UK i.e. 61.60 per cent followed by Netherland i.e.173.50. During Period-III the highest instability was recorded in Oman country which was highest among all the study periods i.e. 117.77 per cent followed by USA and Nepal was 51.44 per cent and 50.59 per cent respectively. While lowest instability was recorded in Kuwait (15.12 per cent). During overall period of study the highest instability was observed in USA (257.74 per cent) followed by Kuwait (227.33 per cent), Netherland (125.49 per cent) while lowest instability was recorded in UAE (32.08 per cent) followed by UK (45.37 per cent). The instability recorded for India was 41.98 per cent.

Table 1: State wise production performance of Pomegranate during (2003-04 to 2017-18)

State	Production		
	CGR	CV	t Value
Maharashtra			
Period I	2.85**	4.92	3.26
Period II	-7.20	12.13	-4.86
Period III	15.55*	22.11	5.85
Overall period	8.25*	54.39	3.94
Karnataka			
Period I	3.49	7.37	1.74
Period II	2.63**	4.46	4.24
Period III	23.63**	31.07	2.85
Overall period	7.35*	44.60	5.35
Andhra Pradesh			
Period I	5.97	27.04	0.64
Period II	-7.22	37.78	-0.50
Period III	11.44	23.02	1.80
Overall period	5.60**	44.74	2.19
Gujarat			
Period I	8.89***	17.83	2.13
Period II	19.35*	27.45	12.16
Period III	30.54*	37.43	4.73
Overall period	16.60*	86.37	8.32
Total			
Period I	6.53**	10.69	3.23
Period II	-2.04	4.54	-1.9
Period III	18.19*	25.26	5.63
Overall period	9.51*	57.20	5.28

Note- (*, **, *** - denotes significant at 1%, 5%, 10% level, respectively.)

Table 2: Country wise export performance of Pomegranate during (2003-04 to 2017-18)

Sr. No	Country	Quantity		Value	
		CGR	CV	CGR	CV
1	U.A.E	7.85*	34.99	28.04*	92.75
2	Saudi Arab	9.68*	49.44	27.03*	96.11
3	Netherland	3.54	107.35	13.43*	82.73
4	Oman	11.07*	90.45	30.57*	152.56
5	Nepal	13.65*	98.35	31.24*	126.83
6	USA	22.96*	96.61	63.24*	144.21
7	Kuwait	42.22*	92.87	61.25*	125.04
8	UK	-10.29	60.81	8.01*	36.80
9	Other	10.29*	6.36	25.30*	81.79
10	India (Total)	8.12*	40.53	24.21*	85.72

Note- (*, **, *** - denotes significant at 1%, 5%, 10% level, respectively)

Table 3: Compound Growth Rate of Production, Export Quantity and Export Value of Pomegranate

Particulars	CGR	R ²	SE	t-Value
Production				
Period I	6.53**	0.77	0.02	3.23
Period II	-2.04	0.55	0.01	-1.94
Period III	18.19*	0.91	0.04	5.63
Overall Period	9.51*	0.68	0.12	5.28
Export Quantity				
Period I	33.47*	0.97	0.03	9.97
Period II	-0.33	0.00	0.14	-0.03
Period III	18.41	0.53	0.12	1.85
Overall Period	8.12*	0.57	0.13	4.20
Export Value				
Period I	134.46**	0.75	0.38	3.01
Period II	17.83	0.35	0.17	1.29
Period III	17.29*	0.92	0.03	6.07
Overall Period	31.59*	0.76	0.30	6.44

Note- (*, ** - denotes significant at 1% and 5% level, respectively)

Table 4: Instability of Production, Export Quantity and Export Value of Pomegranate in India (2003-04 to 2017-18)

Period	Particulars	Production	Export Quantity	Export Value
Period I	Mean	810.4	20.17	55.68
	SD	86.63	9.51	30.39
	CV (%)	10.69	47.18	54.57
Period II	Mean	778.64	30.52	137.35
	SD	34.18	7.22	60.79
	CV (%)	4.39	23.66	44.25
Period III	Mean	2112.34	38.84	421.73
	SD	533.71	12.27	105.35
	CV (%)	25.26	31.60	24.98
Overall Period	Mean	1233.79	29.84	204.92
	SD	705.36	12.09	175.68
	CV (%)	57.17	40.53	85.72

Table 5: Coppock's Instability Index of Production, Export Quantity and Export Value of Pomegranate

Sr. No.	Coppock's Instability Index (%)			
	Particulars	Production	Export Quantity	Export Value
1	Period I	8.06	22.90	203.44
2	Period II	5.54	49.92	61.81
3	Period III	13.83	51.66	14.62
4	Overall Period	19.44	41.98	101.04

Table 6: State wise Coppock's Instability Index (%) of Production

State	Coppock's Instability Index (%) Production			
	Period I	Period II	Period III	Overall period
Maharashtra	3.17	8.05	11.49	26.65
Karnataka	7.28	2.97	32.77	19.71
Andhra Pradesh	50.93	68.86	36.53	51.19
Gujarat	13.15	11.67	25.83	22.41
Himachal Pradesh	90.32	67.07	28.26	66.83
Tamil Nadu	14.83	38.40	16.49	23.83
Rajasthan	4.83	19.70	26.65	23.88
Chhattisgarh	108.24	100.33	163.17	117.71
Other	106.54	243.99	24.28	106.54

Table 7: Country wise Coppock's Instability Index (%) of Export quantity

Country	Coppock's Instability Index (%) Export Quantity			
	Period I	Period II	Period III	Overall period
UAE	26.92	34.41	37.38	32.08
Saudi Arab	97.41	46.50	25.35	68.00
Netherland	90.12	173.50	31.87	125.49
Oman	148.65	47.90	117.77	101.98
Nepal	46.91	58.10	50.59	56.07
USA	408.03	356.92	51.44	257.74
Kuwait	346.27	349.23	15.12	227.33
UK	37.69	61.60	25.54	45.37
Other	36.59	83.34	170.56	94.34

Conclusion

1. The growth rate of pomegranate production in Maharashtra state was found to be positive and significant at overall period.
2. The production of pomegranate exhibited less variability with co-efficient of variation at 10.69 per cent, 4.54 per cent and 25.26 per cent in period I, II and III, respectively.
3. Coppock's Instability Index shows the highest variation in export value of pomegranate i.e. 203.44 per cent in period I.
4. Country wise export quantity of pomegranate Coppock's Instability Index shows the highest variation in USA and lowest variation in U.A.E. i.e. 257.74 and 32.08 per cent, respectively.

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