Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

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Export performance of pomegranate in India

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Abstract
The present study entitled "Export Performance of Pomegranate in India" was undertaken to know growth and instability in area, production, productivity and export of pomegranate, competitiveness of pomegranate export and the share of major pomegranate exporting countries of world trade. The nature of data used for the study is entirely based on secondary source of data from 1988-89 to 2018-19.The growth in area, production, productivity and export of pomegranate was measured by Compound Growth Rate, Coefficient of Variation and Coppock's Instability Index were used for working out the instability in area, production, productivity and export of pomegranate. The export competitiveness of pomegranate was measured by Nominal Protection Coefficient. The share of major pomegranate exporting countries of world trade was measured by Hirschman's index. There is increase in agriculture exports (3443.09 to 257204.27) but percentage share of agriculture export to total export was decreasing (18.69 to 13.20) due to increase in share of manufacturing sectors, service sectors etc. There is increase in quantity of India's pomegranate export to world pomegranate export.

Keywords: Pomegranate, area, production, India

Introduction
Pomegranate is an important fruit crop of arid and semiarid regions of the world. It is believed to be originated from Iran. It has both cultivated (*Punica granatum* L.) and wild types (*Punica protopunica*). The cultivated types are adapted to the Mediterranean regions of Central Asia, Africa and Europe. The wild pomegranate (*P. protopunica*) is confined to Socotra islands. 'Daru' is a kind of pomegranate with small sized fruits, sour in taste which grows naturally as wild under Himalayan ranges of India. In India more than 2 lakh hectares of area is under pomegranate cultivation presently and production is 20 lakh MT and productivity is 10 tonne/ha thereby leading in pomegranate production in the country, Spain ranks 1st as an exporter of pomegranate followed by Iran and India. Maharashtra State is the leading producer of pomegranates in India.

Maharashtra is one of the leading State in area under pomegranate fruit crop cultivated in the districts of Solapur, Nasik, Ahmednagar, Pune, Sangli, Dhule, Latur, Osmanabad, Jalna, Parbhani, Aurangabad, Beed and Satara. Main Varieties are Ganesh, Phule Arakta, Mridula, & Bhagwa. The fruits are available for exports mainly from July to September. Area under pomegranate in Maharashtra was 1.36 lakh ha with production of 15.78 lakh MT, and productivity was 11.6 t/ha. (NHB, 2016-017) producing about 70 per cent of the total Indian's production of pomegranate. Solapur district is the highest producer of pomegranate in Maharashtra state and it producing about 85 per cent of the total Maharashtra's production of pomegranate. In Maharashtra state, Solapur district is famous for juicy pomegranate fruit known as Anar, the area under pomegranate is concentrated in Sangola, Pandharpur, and Mohol tahsils of solapur district.

Methodology
Nature and source of data
In the view of pomegranate as an important crop and its increased utilization in the industrial application, is traded in domestic and also international market. This market has become more speculative and hence pomegranate is purposively selected for the study.

The nature of data that was used for study is entirely based on secondary source of data. The annual data on area, production, productivity, export quantity, export value and data on world export, country wise export were compiled from Agriculture and Processed Food Products Export Development Authority (APEDA), Food and Agriculture Organization (FAO), Agricultural Produce Marketing Committee (APMC) and other Government publications.

In order to analyze the changes in area, production and productivity of pomegranate in India during 30 years the collected data ware classified into three periods and period I (First 15

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years), period II (remaining 15 years) as well as period III was overall data, annual compound growth rates were estimated. For this purpose, the data were obtained on the aspects such as area, production and productivity of pomegranate in India .The year wise data were drawn from the website of National Horticulture Research and Development Foundation (www.nhrdf.com) and from www.indiastat.com.

Period of study
The data regarding production and export of pomegranate in India was collected from 1988-89 to 2018-19, which includes the data of 30 years. The time series data has been divided into two sub periods and overall period.
▪ Period I (1988-89 to 2003-04)
▪ Period II (2003-04 to 2018-19)
▪ Overall period (1988-89 to 2018-19)

Analysis of data
Tabular analysis
In the present study tabular analysis was carried out to study performance of pomegranate trade in Indian economy in period I and period II periods by calculating the averages and percentages. Tabular analysis was also followed to identify the major destinations for the export of Indian pomegranate by calculating their percent shares, major pomegranate producing, exporting countries and their percentage shares in world pomegranate production.

Functional analysis
The tabular analysis technique seems to be inadequate in certain aspects. In order to support the result obtained by tabular analysis, functional analysis was used. In order to analyze the changes in area, production and productivity of pomegranate in India during period I and period II as well as overall period, annual compound growth rates were estimated. Similarly, in order to know the variability in export of Indian pomegranate to various countries over the period, the coefficients of variation in exported quantities of pomegranate were estimated.

Compound growth rates
In order to analyze the changes in area, production and productivity of pomegranate in India, the compound growth rate was used. In the present study, the compound growth rates in area, production and productivity of pomegranate in India were estimated by fitting exponential type of equation

Where,
Y = Area/production/productivity of pomegranate a = Intercept
b = Regression co-efficient or trend value t = time variable
CGR = [(Antilog (log b) – 1)] x 100

Coefficient of variability
Coefficient of variation around the mean was used as a measure of instability in quantity of export of Indian pomegranate to different destinations.

Coefficient of variation was calculated as, ─────────

Nominal protection coefficient
NPC will be computed to determine the extent of competitive advantage enjoyed by the commodity in the context of free trade NPC is defined as the ratio of the domestic price pomegranate to the world reference price pomegranate of the commodity under consideration. Symbolically,

$$NPC = Pd/Pb$$

Where,
Pd - Domestic Whole sale price of pomegranate.
Pb - World reference price of pomegranate.

Share of major exporting country
The share of major exporting countries in the world will be calculated using Hirschman`s Herfindahl Index and Entropy Index any.

Hirschman`s herfindahl index

$$HHI =$$

Where,
Pi = Market share of ith country in world export
n = number of exporting countries

Where,
Xi = export from ith country ΣXi = Total world exports
Pi = Market share of ith country in world export

Hirschman`s herfindal index, its value ranges between 0 and 1.

Results and Discussion
The present investigation had been undertaken with a view to study "Export performance of Pomegranate in India". This chapter deals with general information regarding export, growth, instability and export performance of pomegranate, Trend in domestic and international prices of pomegranate and Export Competitiveness of pomegranate.

India's share in world export
India's share in world export at different points of times is worked out and presented in Table 1.

Table 1: India's share in world export

Sr. No.	Year	World export	India's export	India's share in world export (Percent)
1	1988-89	3992699.09	18417.89	0.46
2	1993-94	11571274.26	65780.15	0.57
3	1998-99	22705604.82	137959.06	0.61
4	2003-04	35338422.12	274669.11	0.78
5	2008-09	70326934.54	847603.11	1.21
6	2013-14	111046622.28	1844940.01	1.66
7	2018-19	115472735.47	1948926.68	1.69

Value in (Rs. crores)

In overall, India's share in world export was near about 1 per cent. It could be seen from the Table 4.1 that India's export during 1988-89 was ₹ 18417.89 crores which increased to ₹ 1948926.68 crores during 2018-19. India's export share in world export was 0.46 per cent in 1988-89 and it increased upto 1.69 per cent in 2018-19.

India's share of agricultural export to total export
The total exports of agriculture and allied products and also a share of agricultural export to total export of the country is presented in the Table 2.

It is observed from the Table 2 that, India's total export in 1988-89 was Rs. 18417.89 crores which have increased up to Rs. 1948926.68 crores in 2018-19. However the agricultural export in 1988-89 was ₹ 3443.09 crores which increased up to Rs. 257204.27 crores in 2018-19. Whereas percentage share of agricultural export to the total export have decreased from 18.69 per cent in 1988-89 to 13.20 per cent in 2018-19. This decline in the share was due to the income in per cent growth of other sectors like service and Manufacturing etc.

Table 2: India's share of agricultural export to total export

Sr. No.	Year	Total export	Agricultural export	Percent share of agriculture export to total export (Percent)
1	1988-89	18417.89	3443.09	18.69
2	1993-94	65780.15	12706.56	19.32
3	1998-99	137959.06	25725.24	18.65
4	2003-04	274669.11	33563.27	12.22
5	2008-09	847603.11	92452.90	10.91
6	2013-14	1844940.01	261844.27	14.19
7	2018-19	1948926.68	257204.27	13.20

Value in (Rs. crores)

Percent share of pomegranate export to production
The details of quantity of Pomegranate exported from India over the years are presented in Table 3.

Table 3: Percent share of pomegranate export to production

Year	Production	Export	Percent share of India's pomegranate export to production (In percent)
1988-89	83.40	8.33	0.09
1993-94	110.40	26.23	0.23
1998-99	151.10	42.31	0.28
2003-04	664.90	103.15	0.15
2008-09	807.20	348.11	0.43
2013-14	1345.70	313.28	0.23
2018-19	2650.00	473.35	0.17

Quantity ('000 MT)

It could be observed from the table that, the production was increased from 83.40 thousand tonnes in 1988-89 to 2650 thousand tonnes in 2018-19 and the quantity of pomegranate exported over the years rise from 8.33 thousand tonnes in 1988-89 to 473.35 thousand tonnes in 2018-19. The increase in export was in tune with increase in production. The export of pomegranate in proportion to production was 0.09 per cent in the year 1988-89 to 0.17 per cent in the year 2018-19, still there is a potential to increase its export.

Compound of growth rates
This study attempts to analysis the performance of pomegranate exports with respect to area, production, productivity, export quantity and export value realized through the exports of these products. The exponential function was employed to compute the growth rates and the results are presented in Table 4.

Table 4: Compound growth rate of area, production, productivity and export quantity, export value and unit value

Particulars	CGR	R2	SE	t-value
Area				
Period I	16.57**	0.99	0.00	30.13
Period II	5.24**	0.68	0.00	5.30
Overall Period	9.88**	0.91	0.00	16.96
Production				
Period I	10.71**	0.76	0.01	6.39
Period II	9.64**	0.68	0.01	5.25
Overall Period	13.51**	0.93	0.00	19.28
Productivity				
Period I	-5.11	0.38	0.01	-2.80
Period II	4.17**	0.63	0.00	4.75
Overall Period	3.38**	0.39	0.00	4.22
Export quantity				
Period I	16.30**	0.54	0.01	7.39
Period II	8.12**	0.89	0.01	4.21
Overall Period	15.22**	0.91	0.00	17.63
Export value				

Period I	23.48**	0.91	0.01	11.50
Period II	24.22**	0.93	0.01	13.29
Overall Period	25.29**	0.98	0.00	37.31
Unit value of export				
Period I	6.17**	0.93	0.00	12.98
Period II	14.88**	0.88	0.01	9.88
Overall Period	8.74**	0.90	0.00	15.47

**** -** denotes significant at 1% level**,** *- denotes significant at 5% level

The total study period (1988-89 to 2018-19) was divided into three periods namely, period I (1988-89 to 2003-2004), period II (2003-04 to 2018-19) and overall period (1988-89 to 2018-19). The data presented in Table 4 revealed that in period I growth rate of area and production is 16.57 and 10.71 per cent per annum respectively and growth rate of export quantity, export value and unit value is 16.30, 23.48 and 6.17 per cent per annum respectively and were found to be statistically significant. In period I growth rate productivity is -5.11.

However, in period II growth rate of area, production, productivity is 5.24, 9.64 and 4.17 per cent per annum. Growth rate of export quantity, export value and unit value were 8.12, 24.22 and 14.88 percent per annum shows the growth rate statistically significant at one per cent law of significance. The overall 30 years growth rate of export value of pomegranate in India was highly significant at 25.29 per cent per annum and much higher than the growth rate of area, production, productivity, export quantity and unit value of export of pomegranate for overall period was 9.88, 13.51, 3.38, 15.22 and 8.74 per cent per annum, respectively and significant at one per cent level. Hence, the hypothesis i.e.

there is significant growth in area, production, productivity and export of pomegranate in India is accepted here.

Instability index
In order to study the variability in area, production, productivity, export quantity, export value and unit value of pomegranate exports during the study period, co-efficient of variation was worked out, the total period (1988-89 to 2018-19) was split into three periods *viz*., period I (1988-89 to 2002-03), period II (2003-04 to 2018-19) and over all period (1988-89 to 2018-19). The results are presented in Table 5.
It could be seen from Table 4.5 that, the area of pomegranate exhibited less variability with co-efficient of variation at 63.97 per cent and 30.74 per cent in period I and period II, respectively while it was highest in overall period with co-efficient of variation at 67.04 percent.
The instability in production of pomegranate was estimated with the help of coefficient of variation i.e. less variability as that of area with co-efficient of variation at 66.54 per cent and 58.29 per cent in period I and period II respectively while it was highest in overall period with co-efficient of variation at 106.49 percent.

Table 5: Instability of area, production, productivity, export quantity, export value and unit value of exports pomegranate in India (1988-89 to 2018-19)

Period	Particulars	Area	Production	Productivity	Quantity	Value	Unit value
Period I	MEAN	41.71	163.24	4.38	3518.52	621.62	1589.22
	SD	26.68	108.62	1.62	1918.35	434.19	447.23
	CV (%)	63.97	66.54	36.85	54.52	69.85	28.14
Period II	MEAN	138.81	1242.93	8.43	29847.80	20492.71	6124.22
	SD	42.67	724.53	2.08	12099.03	17568.18	4130.12
	CV (%)	30.74	58.29	24.68	40.54	85.73	67.44
Over all period	MEAN	90.26	703.09	6.41	16683.16	10557.17	3856.72
	SD	60.51	748.73	2.75	15866.00	15849.58	3694.63
	CV (%)	67.04	106.49	42.97	95.10	150.13	95.80

In period II the productivity showed the less variability in with coefficient of variation 24.68 per cent in compare to period I and overall period with 36.85 percent and 42.97 per cent of co-efficient of variation respectively. As regard the Export of pomegranate in term of quantity the highest variation was observed 95.10 per cent in overall period with co-efficient of variation at 54.52 per cent in period I and 40.54 per cent in period II.
Export earnings in terms of Export value showed higher instability in overall period with 150.13 per cent of co-efficient of variation when compared to the period I and period II. However, the instability observed in unit value of pomegranate export was observed highest variation in overall period with coefficient variation at 95.80 per cent and

28.14 per cent in period I and 67.44 per cent in period II.

Coppock's instability index
Coefficient of instability is another measure of instability besides coefficient of variation. The coefficient of variation measures the variation around the trend. Coppock's Instability Index (CII) is close approximation of the average year to year percentage adjust for the trend. Thus variation around the trends are more pronounce than the absolute variation. The Coppock's Instability Index was work out for the total period (1988-89 to 2018-19) was split into three periods *viz*., period I (1988-89 to 2003-04), period II (2003-04 to 2018-19) and over all period (1988-89 to 2018-19). The results are presented in Table 6.

Table 6: Coppock's instability index of area, production, productivity and export pomegranate in India

Sr. No.	Coppock's instability index (%)					
	Particulars	Area	Production	Productivity	Export quantity	Export value	Unit value of export
1	Period I	19.95	16.86	14.66	21.20	26.87	13.20
2	Period II	13.18	16.48	12.58	15.84	27.31	19.36
3	Overall Period	23.84	31.79	16.00	36.77	74.24	21.81

It could be revealed from the Table 6 that, the highest variation observed in export value of pomegranate was 74.24 per cent in overall period and 26.87 per cent and 27.31 percent in period I and period II, respectively. Coppock's Instability Index for area, production, productivity of pomegranate was 19.95, 16.80 and 14.66 per cent during period I. However the instability index for export quantity and unit value of pomegranate export along the period I was 21.20 and 13.20 per cent respectively. In period II it was observed Coppock's Instability Index for area, production productivity of pomegranate was 13.18,16.48 and 12.58 per cent. However instability index for export quantity, and unit value of export were 15.84 and 19.36 per cent respectively. In overall period it was observed Coppock's Instability Index for area, production productivity of pomegranate was 2.84, 31.79 and 16.00 per cent. However instability index for export quantity, and unit value of export were 36.77 and 21.81 per cent respectively.

Export competitiveness of pomegranate
The export competitiveness of pomegranate was analyzed using Nominal Protection Co-efficient. The competitiveness of market depends upon NPC ratio. When NPC ratio is less than 0.5, market is highly competitive, when NPC ratio is in between 0.5 to1, the market is moderately competitive and when NPC ratio is greater than one, then market is non-competitive and it is presented in Table 7. The Table 7 shows that, at an overall level, the NPC values of pomegranate export was worked out to 0.82, it is indicating moderately export competitiveness of pomegranate in international level

and proves commodity is protected in international market but when it was analyzed for the two different periods in period I and period II. It was observed that, the crop was during the period I and period II average NPC values was 0.84 and 0.80, respectively which also indicates moderately export competitiveness for both the period I and period II. Hence, the hypothesis i.e. Indian pomegranate has better competitiveness in International market is accepted here.

Table 7: Export competitiveness of pomegranate

Sr. No.	Particulars	NPC (Pd/Pr)
1	Period I (1988-89 to 2003-04)	0.84
2	Period II (2003-04 to 2018-19)	0.80
3	Overall period (1988-89 to 2018-19)	0.82

Major pomegranate exporting countries in the world export trade
Table 8 represented the country wise export of Pomegranate in the year 2017- 2018 and 2018-2019. Major Pomegranate exporting countries are India, USA, Spain, Iran, Israel, Afghanistan and Turkey. Turkey ranked first with the export quantity of Pomegranate in 2018-2019(86.14 Thousand tonnes) followed by Iran and India. In the year 2018-2019 India and Iran account 7.01 and 9.89 percent, respectively to the total pomegranate export in the world. Turkey ranked first followed by Iran and India in 2017-18 and 2018-19. Netherland's share increased to 18.11 percent while India's share declined to 6.40 percent with export quantity of 18.21 thousand tonnes.

Table 8: Major pomegranate exporting countries '000 (MT)

Sr. No.	Country	2017-2018	2018-2019
1	India	18.21	30.16
2	Iran	28.16	60.00
3	USA	10.53	17.00
4	Spain	5.02	14.00
5	Afghanistan	9.54	30.00
6	Israel	4.00	4.00
7	Turkey	51.55	86.52
	Total export	284.53	430.85

Hirschman's index by major pomegranate exporting countries in the world export trade during 2017-18 and 2018-19

Table 9: Percent share and Hirschman's index by major pomegranate exporting countries in the world export trade during 2017-18 and 2018-19

Sr. No.	Country	2017-18		2018-19	
			Hirschman's index	% Share	Hirschman's index
1	India	6.40	0.082	7.01	0.068
2	Iran	9.89	0.196	13.92	0.269
3	USA	3.70	0.027	3.94	0.021
4	Spain	1.76	0.006	3.25	0.014
5	Afghanistan	3.35	0.022	6.96	0.067
6	Israel	1.41	0.004	0.92	0.001
7	Turkey	18.11	0.660	19.99	0.556

Note: Figure in the parentheses are percentage to the total

The Hirschman's index values exhibited that the market concentrated had increased slightly from the year 2017-18 and 2018-19. The Turkey, India, USA and Israel Hirschman's Index values which had decreased from 0.660, 0.082, 0.027 and 0.004 in the year 2017-18 to 0.556, 0.068, 0.021 and 0.001 in the year 2018-19 respectively.
The Hirschman's Index value exhibited that high market concentration in Turkey and Iran 2017-18 and 2018-19. It also exhibited that India, USA and Afghanistan un- concentrated

market. The Hirschman's Index value should that highly competitive market in Spain and Israel during 2017-18. The further study revealed that, during the year 2018-19 Spain showed un-concentrated market.

Conclusions
From this study it is concluded that, the area and production of pomegranates exhibited less variability in period I than period II, while it was highest in overall period with co-

efficient of variation at 67.04 per cent and 106.49 per cent respectively. There is increase in quantity of India's pomegranates export during whole period of study and percentage share of worlds pomegranates export to India's pomegranates export was also increasing in whole period of study. The study also concluded that there is increase in agriculture exports but percentage share of agriculture export to total exports was decreasing due to increase in share of manufacturing sectors and service sectors etc. The NPC value of pomegranates showed that the crop is protected in international market during the period I, period II and over all period with moderate export competitiveness in international market.

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