REASONS FOR THE DECLINE IN IRAN'S AGRICULTURAL PRODUCTION [1] IN THE FARMING YEAR 1963-64

The consequences of atmospheric conditions in Iran in the farming year 1963-64 marked a turning point for an argument going on for many years in connection with the agricultural possibilities of the country both qualitatively and quantitatively. According to Bank Markazi computations, out of a national income of about 271, 984, [2] billion in 1961, about 90 billion or 29 per cent came from the agricultural sector.

Statistics on Iran's exports in 1963 (excluding petroleum), show that agricultural products contributed Rls. 2,198, 303 to the total export, figure of Rls. 9,616,550,439 for that year. This calculation excludes livestock products and the above figure would be greater if we had considered carpet weaving as part of the rural industry. These figures indicate the importance of the part played by Iran's agricultural production in the national income and also its exports.

The rate of population increase in Iran is quite high i.e. about 2.5 per cent. A glance at the following figure will clarify the situation: the calculation is based on the figures of 2.5 as representing the rate of population growth, although scattere studiesp recently made throughout

1. This study was done in the period between the middle of the summer and end of the automn of 1964 by the Research Group on the Problems of Iran's Agricult ural Economics

2. There are numerous factors affecting the rate of increase or decrease in population; mathematically speaking the growth in population does not remain constant over a long period. Hence the population projecti on made here for the period ending in 1961 are only estimates for the said years.

the country indicate a rather higher rate[1] than the above.

Year	Population
1956	19. 200 million
1960	21 »
1964	23.150 »
1971	27.520 »
1981	35.220 »
1991	45.080 »

The feeding of such a population depends on the quantity of the agricultural production. In our present study allusion has been made to the total quantity of farm production although this is not the question under discussion. Our discussion rather concerns, on the one hand, the main causes of the shortage of cereals, as well as some other agricultural and livestock production in the farming year 1963-64, and, on the other, the estimates of the deficit in the consumption of the said products, especially that of wheat, in the above farming year.

The unfavourable weather conditions in the winter of 1963 which lasted until the spring of 1964, were most injurious to agricultural products and livestock in various parts of the country, resulting in a perceptible drop in the yield of agricultural and livestock products, especially wheat and meat, which constitute the staple food of the people of this country.

According to the Bank Markazi calculations about 19 per cent of the 1961 national income of rials 2,719,841 billion, as well as Rls. 67,285,563,748 of the country's 1963 export of Rls. 76,902,114,187, was derived from petroleum products. Therefore the oil income to a great extent, reduces the effects of agricultural production changes on the economic situation.

It also secures foreign exchange which can pay for the wheat requirements of the country and thereby prevents the outbreak of famine resulting from unfavourable weather.

1. This refers to the studies made by the Research Group on the Problems of Agricultural Economics of Iran, in various provinces of the country, the first part of which (Khuzistan) has been published in the issue nos. 9 and 10 of the Quarterey Journal of Economic Research.

As the activity in the industrial sector is much less than that in the agricultural sector, and taking into account the fact that the greater part of the population inhabits the villages whose major activity consists of producing for consumption, the question arises as to what would be the magnitude of the problem in the future in view of the under employment of the majority of the rural population and the insufficiency of agricultural production in Iran, which should feed both the rural and urban population, while the rate of increase in population is more than that of the economic growth, specially if unforseeable events bring about detrimental economic effects causing further reduction in food production?

The unsatisfactory yield of crops in the farming year 1963-64, particularly with regard to cereals, the shortage of which has a decisive effect on the country's economy, has been a subject of discussion causing great anxiety among responsible authorities and others. Although Iran has for years suffered a shortage of foodstuff yet, as already pointed out, the atmospheric conditions of the farming year 1963-64 prompted a serious study of the farming possibilities of the country by interested circles.

While the acute nature of the problem called for immediate action to find a solution to the problem-even if it were an emergency one, it brought to light numerous factors such as the exceptionally severe winter of the previous year and the prolonged and unprecedented drought throughout the said farming year. To these special and decisive factors must be added others resulting from various economic policies, not forgetting the population factor.

Naturally, a study of these factors and the finding of sound solutions which could serve as a basis for future economic policies and point the way to recognising the negative and positive aspects of the agricultural production, would not be in harmony with the hasty measures adopted by government agencies in their search for a temporary remedy for the shortage of food; particularly when the government agencies are so absorbed in administrative matters that they often do

not find the opportunity for the study and appraisal of such problems. Academic research institutions, having more time and possibility for deliberations, could more easily apply scientific methods in their studies, They would reach the desired result in a comparatively longer time, but it would be on a more sound basis and they could place such results at the disposal of the government agencies concerned.

The present study has been undertaken firstly, to bring the matter home to the public and secondly, to provide the government with a guide-line in adopting a general economic policy in the light of the agricultural potential of the country for the coming years.

In view of the fact that grain forms the basic diet of the majority of the people of Iran and that over two-thirds of the quantity of grain of the country is dry-farmed, and therefore directly affected by the degree of atmospheric humidity; it is necessary, first of all, to clarify the popular belief that the climate of Iran is steadily turning drier as time goes by; this point will then help us in our subsequent discussions.

What is biologically termed «aridity» is quite different to the degree of humidity of a locality. As the effect of humidity on the growth of plants varies with temperature, it would be more logical in studies of this sort to investigate changes in temperature as well as in humidity that is to say the combined effect of humidity and heat, which is expressed by the coefficient of aridity. This study relates to the recent years during which period meteorological data has been collected for various parts of Iran. Its objective has been to ascertain whether the climate of these areas is really becoming dry or if this is merely a myth stemming from the observation of minor fluctuations usually occuring in the coefficient of aridity; and finally to find out if the present stagnation in this country's agricultural productivity is due to the severe drought in recent years or if there are other factors involved.

In measuring and comparing the dryness in various months of the year we have used a number of terms which should be defined:

1. **Warm Month.**[1] For the purpose of biological studies a «warm month» is a month during which the average temperature is over 20 degrees centigrade.

2. **Cold Month** 2 A «cold month» is a month during which the average temperature is below zero degree centigrade.

3. **Dry Month**. 3 Generally speaking a «dry month» is one during which the amount of rainfall in millimeters as compared with the average temperature in centigrade for the same month is as follows:
Rainfall less than 10 m.m., average temperature less than 10 degrees;
rainfall less than 25 m.m., average temperature between 10 to 20 degrees;
rainfall less than 50 m.m., average temperature between 20 to 30 degrees; or,
rainfall less than 75m.m. and average temperature over 30 degrees.

In other words a dry month is a month in which the rainfall and average temperature hold true in the equation $P \leq 2t$ in which P represents the monthly precipitation and t the average temperature for the month.

Dry Season[4]

The arid or dry season which is the duration of the dry months of the year, does not depend on the amount of precipitation in that year alone but is a function of the rainfall and temperature combined. For instance, the dry season in Ahwaz city with 169. 5 mm. of rain in the year 1962-63 is almost the same that in Isfahan city with 488. mm. of rain in the same year (refer to Table 1). It does , however, depend on the height above sea level, because with an equal amount of precipitation the higher we go from sea level the more evenly the rain is distributed over the year and therefore we get a shorter arid season.

In order to find out changes in aridity in various parts of the country in recent years and to ascertain whether dryness or cold has been the main cause of the decline in the agricultural production in the current year, we have studied the duration of the dry season and its intensity

1. 2&3. Annalis de Geographie, Bulletin de la Sociétè Geographie. Mai—Juin 1957.

4. This research is based on the new studies conducted and published by F. Bagnouis and H. Gaussen, two eminent French professors at Toulouse University, under the title of "Saison Sèche de l'Indice Xerothermique„ . In this study, aridity, which is a qualitative characteristic has been defined quantitatively so that it can be measured and its changes be drawn up in the form of diagrams mathematically interpretable.

in the townships of Tabriz, Rezaiyeh, Rasht, Hamedan, Kermanshah, Mashad, Shahrood, Ahwaz, Isfahan, Shiraz, Kerman, Zanjan, Gorgan, Babolsar and Tehran since 1956, for which meteorological figures are available, and at the end of this study we will present diagrams showing their changes.

For the purpose of carrying out the study by an alternative method so as to be able to compare the results of the two methods, the «Aridity Index» was also calculated for every year.

The coefficient of aridity is another factor obtained by formula:

$\alpha = \frac{100P}{(M+m)\ (M-m)}$ and it is in inverse ratio with he quantity of dryness; that is to say the greater the aridity the less will be the coefficient . In this formula which has been designed by Professor Emberger, the noted French meteorologist at the University of Montpelier and widely utilized for biological and aridity studies throughout the world is a numerical value directly proportional to the quantity of annual precipitation and inversely with the annual temperature, M denotes the average of the maximum temperatures in the hottest month, m represents the average of the minimum temperatures in the coldest month of the year, and P is the amount of precipitation in the same year.

For determining the length and intensity of aridity for every place where the relation $P \leq 2t$ holds true, data for various townships have been marked on a chart and a diagram made showing changes in aridity. For this purpose the two curves of precipitation and average changes in temperature during various months have been drawn on the same ordinate. The (x) abscissa carries the months of the year and the Y axis the temperature of every month in centigrade as well as the quantity of precipitation of the month in mm. However, the units of the ordinate showing the temperature are twice that depicting the rainfall. In this way two curves have been obtained for every year; one denoting changes in precipitation and the other depicting changes in the average monthly temperature. The portion of the temperature curve situated over the precipitation curve is indicative of the duration of the dry period because, for all these points the relationship

$P \leqslant 2t$ holds good. For every diagram the values of l, P and S have been computed. l represents the length of the dry period (every 10 millimeters denote one month);

P is the annual precipitation in mm.;

S shows the intensity (or severity) of aridity as obtained by comparing the two P and T curves.

Table 1

(P: Total annual precipitation in mm; l : Lenght of the dry period in centimeter; S: Aridity surface in square mm).

	Farming year 1956 - 57			Farming year 1957 - 58		
	P	**l**	**S**	**P**	**l**	**S**
Tabriz	258.4	5.14	1556.15	245.0	4.52	1469.73
Rezaiyeh	441.9	4.75	1562.05	260.0	5.10	1689.30
Rasht	1018.7	0.20	7.40	1510.0	1.96	283.83
Hamedan	457.3	5.09	1583.63	242.0	5.73	1729.66
Kermanshah	558.4	5.66	2036.74	384.1	5.64	2134.40
Mashad	238.0	6.76	2145.48	211.7	6.68	2022.35
Shahrood	225.9	7.17	1987.97	106.3	8.30	2574.54
Ahwaz	212.4	-	-	138.4	8.62	4571.91
Isfahan	173.9	6.92	2411.38	74.2	9.99	3007.41
Shiraz	510.5	5.96	2468.96	526.2	6.19	2896.22
Kerman	269.7	6.85	2330.75	126.4	7.97	2825.13
Zanjan	359.8	5.45	1536.67	288.4	4.60	1283.19
Gorgan	530.9	3.25	574.83	840.7	2.11	371.59
Babolsar	953.5	2.28	329.42	830.7	3.02	511.70
Tehran	233.0	7.32	2731.08	244.0	6.50	2664.90

	Farming year 1958 - 59			Farming year 1959 - 1960		
	P	**I**	**S**	**P**	**I**	**S**
Tabriz	287.6	4.56	1540.54	171.7	7.42	1927.49
Rezaiyeh	280.7	5.68	1687.66	246.0	5.96	2171.50
Rasht	1407.2	2.35	334.90	1386.6	0.0	0.0
Hamedan	423.8	5.56	1976.64	325.2	5.63	1969.83
Kermanshah	351.8	5.93	2202.09	299.4	5.50	2188.00
Mashad	224.7	6.74	2379.00	197.1	7.69	2203.31
Shahrood	196.1	6.15	2173.63	80.3	9.81	2818.32
Ahwaz	146.9	9.02	4448.93	135.7	10.65	4509.70
Isfahan	78.2	8.39	3144.60	44.1	10.76	3361.68
Shiraz	243.8	7.82	3218.02	197.1	8.47	3021.85
Kerman	95.5	9.45	2742.07	300.6	6.56	1885.94
Zanjan	253.9	4.82	1483.38	199.6	6.96	1834.44
Gorgan	1382.1	2.20	393.12	825.6	5.33	1298.19
Babolsar	939.5	3.50	792.15	844.5	4.50	1305.40
Tehran	206.1	7.45	2884.90	156.0	8.08	3017.26

	Farming year 1960 - 61			Farming year 1961 - 62		
	P	**I**	**S**	**P**	**I**	**S**
Tabriz	250.5	5.68	2250.95	252.7	7.14	1509.27
Rezaiyeh	304.6	5.78	2064.46	289.4	6.00	1876.86
Rasht	1075.9	3.40	712.2	904.3	1.25	183.65
Hamedan	454.3	5.43	2191.76	414.0	6.00	1975.20
Kermanshah	402.1	5.70	2412.54	477.1	5.47	2253.00
Mashad	240.8	6.60	2201.40	205.5	8.07	2035.52
Shahrood	77.3	9.42	2940.13	123.8	9.24	2509.56
Ahwaz	213.4	9.20	4472.60	154.6	9.39	4436.84
Isfahan	103.6	8.81	3010.74	83.3	10.60	3033.80
Shiraz	291.8	7.72	3078.34	279.8	7.63	2709.92
Kerman	100.1	8.52	2700.10	159.9	8.32	2478.95
Zanjan	175.7	6.54	2192.20	300.0	7.02	1653.56
Gorgan	672.7	5.20	1170.60	631.4	4.05	1217.51
Babolsar	854.6	2.96	756.27	612.9	4.24	642.96
Tehran	168.7	7.15	2978.15	288.5	7.28	2882.77

	Farming year 1962 - 63			Farming year 1963 - 64		
	P	**I**	**S**	**P**	**I**	**S**
Tabriz	435.6	4.15	1438.70	585.0	4.88	1886.04
Rezaiyeh	411.4	4.18	1489.59	396.5	4.96	1909.42
Rasht	1397.7	2.10	68.20	1396.5	3.07	760.16
Hamedan	286.3	4.95	1747.95	105.1	7.23	2331.80
Kermanshah	641.3	4.36	1775.04	281.8	7.08	2460.48
Mashad	244.1	7.61	1943.72	228.8	6.42	2340.90
Shahrood	130.6	9.90	2545.80	100.6	7.38	2390.78
Ahwaz	169.5	10.98	4114.92	52.7	10.28	5058.21
Isfahan	48.8	10.32	3286.88	61.7	9.00	3136.40
Shiraz	140.7	9.25	3181.25	238.4	7.06	3001.93
Kerman	156.8	8.48	2761.03	173.6	6.78	2688.25
Zanjan	442.1	4.15	1551.25	399.5	5.41	1871.11
Gorgan	488.6	5.63	1140.38	644.6	4.43	1453.66
Babolsar	638.3	4.59	820.91	941.6	3.95	1360.85
Tehran	144.8	10.78	2647.29	147.8	7.46	3069.44

A glance at these curves shows that:

1. The amount of rainfall and its variations over the years, does not, in itself, account for changes in aridity in a given area. To elucidate this point we take the cities of Hamedan and Shiraz as examples. As the curves demonstrate, the precipitation in Hamedan in 1957-58 was 242 mm. while it was almost the same quantity for Shiraz in 1958 59; whereas owing to the changing average temperature of these cities in these two years their aridity over the same period is not anywhere near equal. From the standpoint of the possibility of plant growth and agricultural production the city of Shiraz was drier than Hamedan by a ratio of 5.7/7.8 in the year 1958-59.

2. In the case of Ahwaz the rainfall was 169.5 mm. in 1962-63 and for Isfahan in the same year it was 48.8 mm. or, less than one-third yet, due to their different averages temperatures both cities had almost the same aridity in that year; the duration of the dry period for the two cities is about 10.5 mm. and Isfahan in spite of a smaller amount of rain has not been any drier than Ahwaz.

3. According to the curves on the changing period of aridity in various townships it is not true to say that the country is becoming arid, at least for the years covered by this survey. The only striking thing is the outstanding fluctuations over these years. For a few townships however, there seems a general trend to this phenomenon.

4. For the purpose of studying aridity the coefficient (α) has been computed and its changes have been drawn up in a series of diagrams (see Table 2 and the curves related to α). A careful perusal of the table will show that it is not true that the climate of the country is turning dry - or at least, this has not been the case in the past eight years.

On the whole the last farming year has been an exceptional one in this respect and cannot represent a general trend because, as the curves show, we have had several years with much less rainfall but without as bad consequences. As an instance let us take the curves for the city of Shahrood. Here we find that the coefficient was very low in the years 1959 - 60 and 1961 - 62 and although for last year it was obtained merely by estimation,

Table 2

Computation of the coefficient of aridity for 15 different regions for the period 1960 to 1964 using formula:

$$\alpha = \frac{100\ P}{(M\text{-}m)\ (M+m)}$$

	Farming year 1956-57				Farming year 1957:58			
	P	**M**	**m**	**α**	**P**	**M**	**m**	**α**
Tabriz	258.4	31.7	-8.6	27.75	245.0	32.0	-5.3	24.60
Rezaiyeh	441.9	32.5	-8.6	44.98	26.0	32.5	-2.0	24.70
Rasht	1018.7	30.7	0.6	108.12	151.0	29.7	1.4	171.56
Hamedan	457.3	31.0	-9.9	52.99	242.0	38.2	-4.5	16.81
Kermanshah	558.4	36.5	-7.8	43.91	284.1	37.2	-5.1	28.28
Mashad	238.0	31.4	-6.0	25.05	211.7	34.8	-2.5	17.57
Shahrood	225.9	33.1	-4.0	20.92	106.3	32.3	-1.3	10.20
Ahwaz	212.4	47.1	5.6	9.71	138.4	47.2	8.0	6.39
Isfahan	173.9	35.5	-3.2	13.91	74.2	37.1	-1.7	5.40
Shiraz	510.5	36.3	0.0	38.74	526.2	36.8	0.9	38.87
Kerman	269.7	35.5	-1.7	21.44	126.4	36.0	-0.7	9.75
Zanjan	359.8	31.0	-11.7	43.65	288.4	32.0	-5.1	28.89
Gorgan	530.9	32.0	2.1	52.06	840.7	32.8	5.0	80.00
Babolsar	953.5	30.5	2.6	103.24	830.7	29.3	4.2	98.79
Tehran	233.0	34.9	-4.7	19.48	244.0	36.7	0.1	81.11

	Farming year 1958 - 59				Farming year 1959 - 60			
	P	M	m	α	P	M	m	α
Tabriz	287.6	33.7	-9.2	27.36	171.7	32.0	-3.6	16.98
Rezaiyeh	280.7	33.3	-6.8	26.41	246.0	31.9	-2.9	24.37
Rasht	1407.2	30.8	-1.4	148.64	1386.6	28.5	1.9	171.47
Hamedan	423.8	34.6	-8.0	37.39	325.2	34.9	-4.9	27.23
Kermanshah	351.8	38.0	-6.3	25.05	299.4	37.4	-5.0	21.79
Mashad	224.7	34.3	-7.3	20.00	197.1	33.3	-5.1	18.20
Shahrood	196.1	33.2	-4.0	18.05	80.3	33.4	-2.8	7.24
Ahwaz	146.9	44.9	6.2	7.42	135.7	45.6	7.1	6.68
Isfahan	78.2	38.9	-4.2	5.22	44.1	21.8	-3.6	9.53
Shiraz	243.8	38.6	-101	16.37	197.1	37.3	-1.2	14.18
Kerman	95.5	38.2	-3.6	6.60	300.6	35.6	-6.7	24.56
Zznjan	253.9	32.4	-8.7	26.06	199.6	33.1	-4.8	18.60
Gorgan	1382.1	33.5	2.4	123.78	825.6	22.6	3.7	166.09
Babolsar	939.5	30.1	2.5	104.41	844.5	29.7	4.5	97.98
Tehran	206.1	37.1	-4.0	15.14	156.0	36.3	-0.8	11.84

	Farming year 1960 - 61				Farming year 1961 - 62			
	P	M	m	α	P	M	m	α
Tabriz	25.05	34.47	-4.8	21.20	252.7	35.0	-6.4	21.34
Rezaiyeh	304.6	33.4	-4.2	27.74	289.4	33.9	-5.8	25.94
Rasht	1075.9	31.0	2.1	112.47	904.3	31.5	3.2	92.08
Hamedan	454.3	35.2	-7.1	38.22	414.0	37.3	-3.4	30.00
Kermanshah	402.1	39.9	-3.1	25.41	477.1	39.9	-2.5	30.08
Mashad	240.8	35.1	-3.5	19.74	205.5	34.8	-3.9	17.18
Shahrood	77.3	33.9	-2.5	6.76	123.8	33.0	-2.2	11.41
Ahwaz	213.4	45.6	8.6	10.64	154.6	46.5	7.5	7.34
Isfahan	103.6	37.0	-3.3	7.62	83.3	35.4	-2.4	6.67
Shiraz	291.8	37.8	1.4	20.45	279.8	36.3	-0.6	21.23
Kerman	100.1	35.1	-6.6	8.42	159.9	33.7	-5.7	14.49
Zanjan	175.7	33.8	-6.6	15.98	300.0	33.3	-4.4	27.53
Gorgan	672.7	33.4	5.0	61.68	631.4	36.3	4.1	48.53
Babolsar	854.6	2.99	4.3	97.61	612.9	31.5	4.1	62.83
Tehran	168.7	37.2	-0.7	12.19	288.5	36.3	0.3	21.89

	Farming year 1962 - 1963				Farming year 1963 - 1964			
	P	M	m	α	P	M	m	ν
Tabriz	435.6	33.0	-5.3	41.05	585.0	33.0	-17.0	73.12
Rezaiyeh	411.4	31.1	-4.9	43.61	396.5	32.5	-16.8	51.22
Rasht	1397.7	29.6	1.9	160.18	1396.5	30.3	-4.3	155.23
Hamedan	286.3	35.2	-8.1	24.39	105.1	35.1	-23.5	15.46
Kermanshah	641.3	37.5	-3.7	46.05	281.8	38.1	-13.4	22.15
Mashhad	244.1	34.4	-4.7	21.02	228.8	34.2	-14.0	23.49
Shahrood	130.6	33.5	-3.0	11.73	100.6	33.1	-10.1	10.12
Ahwaz	169.5	46.0	5.9	8.14	52.7	46.1	0.3	2.47
Isfahan	48.8	37.5	-3.8	3.50	61.7	35.0	-8.3	5.33
Shiraz	140.7	38.3	-1.0	9.59	238.4	37.2	-3.4	17.37
Kerman	156.8	35.9	-6.4	12.56	173.6	35.6	-10.2	14.92
Zanjan	442.1	30.1	-6.8	51.42	399.5	32.2	-19.0	59.11
Gorgan	488.6	34.1	1.2	42.07	644.6	32.2	-2.4	62.51
Babolsar	638.3	27.8	6.2	85.91	941.6	29.8	-0.6	106.07
Tehran	144.8	37.3	-1.9	10.43	147.8	36.5	-9.7	11.93

(because meteorological data was not available) it is not appreciably lower than that for the said two years.

It should be noted that this study applies to the whole country, but in view of microclimatic changes the aridity coefficient in some specific areas for last year might have been far lower than in previous years. In some instances the shortage of rain was so perceptible that a number of rivers which flowed for part of the year, dried up completely and even the qanats' water diminished to a bare minimum. It is not, however, right to generalize this point and apply it to the whole country.

It spite of the fact that over two - thirds of Iran's cereals are dry farmed, and therefore atmospheric humidity is a determining factor in their yield; in the light of the present study it can be concluded that the decline in agricultural production in the farming year 1963 - 64 is not basically due to the comparative atmospheric dryness in that year. Among other factors contributing to this decline should be mentioned the exceptionally cold winter of 1964 which dragged on until the middle of the spring. In the following pages we will attempt to elucidate this point.

THE EFFECTS OF THE COLD WEATHER ON PRODUCTION

The severe cold and frost in the winter of 1964, and its duration till mid - spring was rather unprecedented for most parts of the country.

As shown by Table 3 the temperature in the coldest month of the winter in that year was lower than in previous years in most of the recorded areas, and this undoubtedly damaged the crop in the different stages of its growth. Reports collected from various provinces gives the following picture as to the extent of the damages involved:

1. Khuzistan Province

The area under wet and dry cultivation in the township of Shooshtar which expanded by 25 per cent as the result of the land reform and allocation of agricnltural loans to farmers was badly damaged by the cold.

In Dezful township, the cultivated area expanded by 1 per cent, but the cold destroyed 25 per cent of the dry - farmed and 10 per cent of the irrigated cereals.

Table 3

A comparison of m (average minimum temperatures in the coldest month) for 15 important regions of the country for the farming years 1956 to 1964.

	1956 - 57	1957 - 58	1958 - 59	1959 - 60	1960 - 61	1961 - 62	1962 - 63	1963 - 64
Tabriz	-8.6	-5.3	-9.2	-3.6	-4.8	-6.4	-5.3	-17.0
Rezaiyeh	-8.6	-2.0	-6.8	-2.9	-4.2	-5.8	-4.9	-16.8
Rasht	0.6	1.4	-1.4	1.9	2.1	3.2	1.9	-4.3
Hamedan	-9.9	-4.5	-8.0	-4.9	-7.1	-3.4	-8.1	-23.5
Kermanshah	-7.8	-5.1	-6.3	-5.0	-3.1	-2.5	-.37	-13.4
Mashad	-6.0	-2.5	-7.3	-5.1	-3.5	-3.9	-4.7	-14.0
Shahrood	-4.0	-1.3	-4.0	-2.8	-2.5	-2.2	-3.0	-10.1
Ahwaz	5.6	8.0	6.2	7.1	8.6	7.5	5.9	0.3
Isfahan	-3.2	-1.7	-4.2	-3.6	-3.3	-2.4	-3.8	-8.3
Shiraz	0.0	0.9	-1.1	-1.2	1.4	-0.6	-1.0	-3.4
Zanjan	-11.7	-5.1	-8.7	-4.8	-6.6	-4.4	-6.8	-19.0
Kerman	-1.7	-0.7	-3.6	-6.7	-6.6	-5.7	-6.4	-10.2
Gorgan	2.1	5.0	2.4	3.7	5.0	4.1	1.2	-2.4
Babolsar	2.6	4.2	2.5	4.5	4.3	4.1	6.2	-0.6
Tehran	-4.7	0.1	-4.0	-0.8	-0.7	0.3	-1.9	-9.7

In Ramhormoz, too, the area of wet and dry farming had expanded by 20 per cent but the cold severely damaged 20 per cent of the wet-farmed cereal.

In Behbehan township where the dry-farmed area had been augmented by 20 per cent and the irrigated one by 10 per cent, the damage was quite extensive in both cases.

The wet and dry cultivated area in Dashtemishan which had increased by 20 per cent, was not appreciably damamged.

In Ahwaz, too, in spite of the fact that the cultivated area had expanded considerably, the irrigated cereal was badly damaged and the dry-farmed was almost totally ruined.

2. **Kermanshahan Province**

In the cooler areas of the Ghasreshirin township cereal production is satisfactory, but in the hot regions rain water is definitely indispensable. In the Hamedan area, 60 per cenr of the spring crop and 10 pet cent of the autumn crop was frost-bitten.

3. **Eastern Azarbaijan Province**

In the Jolfa district 15 to 20 per cent of the autumn cultivated cereal which had been covered by snow was destroyed. The snow covering of some fields in the Sarab township was scattered by storm and consequently the cereal was badly bitten by the cold wind. The damage thus inflicted was estimated to amount to 967 tons with a value of Rls. 4,837,500.

4. **Western Azarbaijan**

Heavy snow fall and frost destroyed 30 per cent of the autumn crop.

5. **Khorasan Province**

A total of 75,639 tons of beetroot was destroyed by the frost in the towunship of Mashad, Torbate-heydarrieeh and Shirvan.

It can be concluded from the above examples that major part of the damage to crops in the year in question was due to the severe cold and its biological consequences on the growth of the plant or the effect of this factor on the physical properties of the soil.

It should be recalled that the area under wheat and barley cultivation was expanded after the implementation of the Land Reform Law in Iran; and because of the fact that the law had provided for the exemption of mechanized land holdings, a number of large holders purchased tractors and other agricultural machines, and in this way were able to bring new plots of land around their village under the cultivation of wheat and barley. Yet this increase in cultivated area was overshadowed by the severe cold in that year. Thus, if the area under cultivation had not been increased the effect of cold on the production would have been more marked.

The Extent of the Deficit

As no accurate data was available on the production of cereals for this year or for the years 1961 and 1962, we had to use figures on the capita consumption of wheat in order to estimate the extent of per the shortage in cereals.

The 1956 national census gave the population of Iran as 19,200,000 . Therefore, with an estimated growth rate of 2.5 per cent per annum, the population would have reached around 21 million, by 1960, when Iran's agricultural survey took place. According to this survey the country produced about 2,950,000 tons of wheat, and imported another 345,000 tons from abroad. In 1960 bringing the total wheat consumption of the country, roughly speaking, to the neighbourhood of 3,245,000 tons for that year. If we deduct from this figure 450,000 tons used as seeds, and divide the remainder by the 1960 population we obtain a per capita consumption of about 133 kilograms.

Now, with the same calculation, the population of Iran can be estimated at 23,150,000 for the year 1965, and with 133 kg. per head consumption we shall need a total of 3,078,950 tons of wheat for the nation's food. Considering that 2,600,000 tons have been reportedly harvested and that 450,000 tons will be needed as seeds, the aggregate wheat deficit of the country for 1965 canll amount to 928 , 950 tons.

FAO and some national sources have given the more optimistic estimate of 120 kg. as the wheat consumption per head of population of Iran. In the light of the above , however, we are convinced that the figure 130 kgs. is quite a safe estimate.

The estimated shortage can, of course, be overcome by means of adopting improved farming techniques, agrarian laws and sound price policies which will eventually help to expand the area under cultivation. But one should beware of over-optimism, because Iran's wheat production takes place, to a large extent, by dry-farming which is dependent on atmospheric conditions. Thus, if these conditions are not favourable for some consecutive years, the shortage of cereals may create some serious problems for the country's agricultural economy.

Effect of the Cold Weather on Livestock

Reports received from some provinces give a good indication of the extent of the damage caused by last years' cold spell on the livestock :

1. In Khuzistan 25 per cent of the four million head of cattle was lost, and because of the scarcity of forage, the price of a cow dropped to a thousand rials, and that of a sheep to one hundred.

2. In Fars, 60 thousand head of livestock perished.

3. In Eastern Azarbaijan heavy snowfalls along the Arax and Turkish border alone killed 50 thousand sheep and goats.

Almost similar havoc was caused elsewhere in the country about which accurate data is unfortunately not available. Considering, however, that in the above three provinces at least approximately one billion rials worth of livestock was lost, the maguitude of the damage to the whole country can be assessed . As a result of the ensuing meat shortage the government purchased 25 thousand head of sheep from Turkey, but this constitutes only a few days of Tehran's meat consumption. A peculiar feature of this shortage was that prices of meat did not rise in the market, as would have been expected, and this was due to the fact that livestock holders offered their cattle for sale at rather low prices because they could not afford to feed them. But the effect of these losses of livestock on prices may be more obvious in the years to come especially in view of the increase in the population and subsequent demand for meat, and also the limitations of pastures and grazing land in the country.

According to FAO reports, in 1957 the per capita meat consumption in America was 90 kgs. in Europe it was 60 and in Iran about 9 kgs., which is very low compared with other countries. The present condition of

pastures does not promise a brighter future and the importation of meat from abroad is only a temporary remedy. In the long run, however, the most suitable and sound solution seems to consist of promoting investment in the livestock breeding sector, giving governmental technical and financial assistance to cooperative societies and possibly to private firms with a view to forming large-scale livestock raising entreprises which would be more economical; and also protecting and if possible expanding the country's grazing lands.

But the success of a project of this nature calls for efficient organisations and qualified personnel.

How the Citrus Crop was Affected

From the information collected throughout the country the Ministry of Agriculture estimated the total damage to citrous groves to be at least 1,259,100,000 rials. In this estimate the value of damaged fruits is taken as two rials apiece and every hectare of grove with young trees as Rls. 60,000 and that of fruit bearing ones as 80,000 to 600,000 rials.

With regard to damages caused to vinegards and palm trees throughout the country, there is no accurate and reliable information. Should we take into account this damage to these two main agricultural products of the country, the total damage would be considerable.

Summary of the Survey

The results of the above survey may be summarized in the following points:

1. While insufficient humidity in the year 1963-64 has been perceptible to a certain extent, drought and scanty rainfall have not been the main cause of failure of agricultural products in the above farming year, the main cause of being the cold winter of 1963 extending well into the spring of 1964.

2. The argument that the climate of Iran tends towards drought is not a reasonable one as there have recently been years with for less precipitation than 1963-64 but with no such great damage to the crop.

3. The study of the damage to wheat in the 1963-64 farming years shows that if we assume the same quantity of seed being sown as in

previous years, the shortage of wheat in the current year would be 928,950 tons.

4. In any case, with the enforcement of the Land Reform Act, the area under cultivation of cereals has been expanding.

5. Considering the enormous damages caused to the livestock resources of the country by the cold weather of 1963 - 64, the import of a limited number of livestock or some of meat from abroad does not make good the shortage of crops caused by the damages in question.

It is necessary to take effective and vast measures under fundamental projects for promoting livestock breeding and securing sufficient fodder.

The sources utilized for the above study are as follows :

1. Summary Report of the National Population Census of Iran, volumes 1 and 2, published by the General Department of Public Statistics, the Ministry of the Interior, Tehran 1956.

2. Agricultural Survey of the country, by the General Department of Statistics, the Ministry of the Interior, and the Statistics Department, the Ministry of Agriculture, Tehran, 1960.

3. Yearbook of Iran's Imports and Exports a Ministry of Economy publication, 1961, 1962 and 1963.

4. Statistical data obtained from the Foreign Trade Department.

5. Statistical data obtained from the Statistics and Economic Department, of the Ministry of Agriculture and the Department for Improving and Providing Saplings and Leeds.

6. Statistical data obtained from the Syndicates of the bakers and butchers of Tehran.

7. Statistical data obtained from the Economic Researoh Department of Bank Markazi Iran.

8. Statistical data obtained from the Municipality and Tehran; Slaughter-house.

9. Statistical data obtained from the Ministry of Water and Electricity and the Independent Irrigation Institute.

10. Statistical data obtained from the Tehran Chamber of Commerce.

11. Statistical publication of the NIOC.

12. Periodicals the Central Bank of Iran, 1961,62,63.

13. Estimate of the national lincome of Iran in 1958 Economic Affairs Publication of the Plan Organization, 1962.

14. FAO publications on consumption of agricultural foodstuffs and livestock feeds, 1957.

15. Complete series of the yearbook of the Iranian weather forecast, publications of Weather Forecast Department , and utilization of the latest data from the said Department.

16. Surface Water Research Section, Anuual Statistics of the Rivers of Iran, publications of the Independent Irrigation Department ,Tehran.

17. Magazine of Modern Farmer, issue 5, second year, Tehran: « The pastures of the country have deteriorated and tend towards destruction», by Dr. Kaveh.

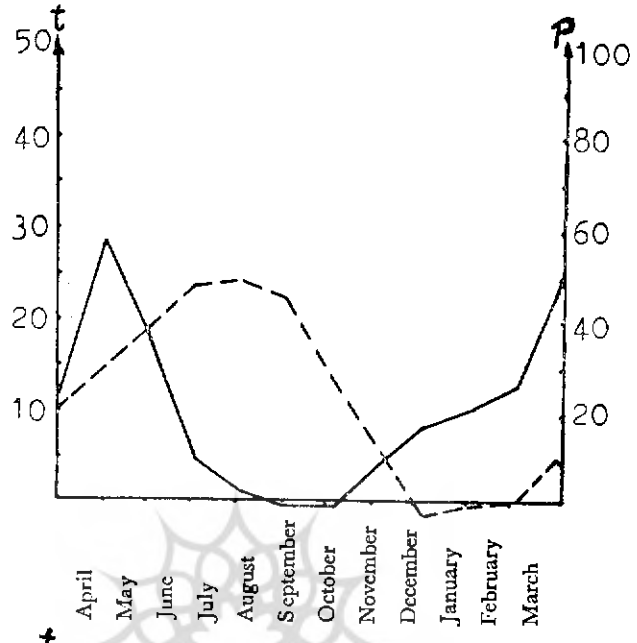
18. Annalis de Geographie, Bulletin de la Sociétè de Geographie, Mai-Juin 1957.

We give below the curves showing the temperature and precipitation of Tabriz , Rezaiyeh, Rasht, Kermanshah, Mashad, Shahrood, Ahwaz, Isfahan, Shiraz Kerman, Zanjan, Gorgan, Babolsar and Tehran in the farming years 1956-1964 as well as the curve showing a(Drought Coefficient) of the said years.

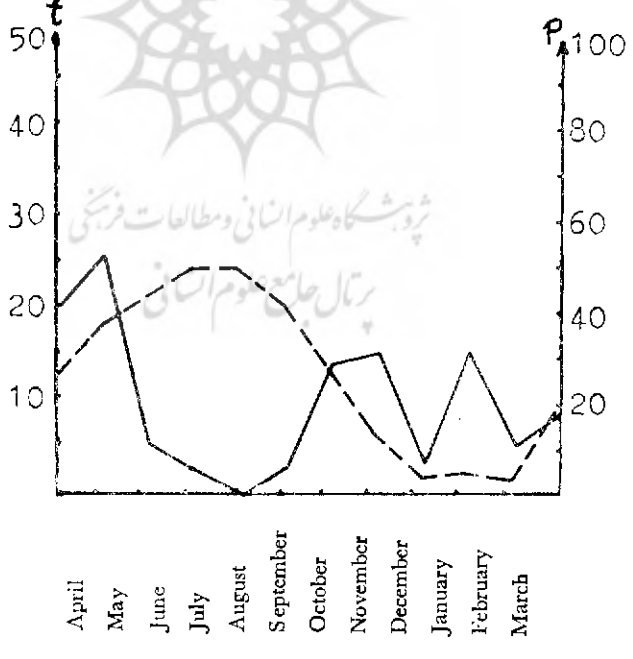
It should be pointed out that by necessary of printing, the curves showing the temperature and rainfall have been drawn on the scale of $\frac{1}{2}$ and those of α on the original scale of $\frac{1}{1}$.

Precipitation and temperature charts to determine length of dry period, for Tabriz

p=258.4mm
s=1556.15mm2
l=5.14cm 1956–57



p=245.0
s=1469.73 1957–58
l=4·52cm



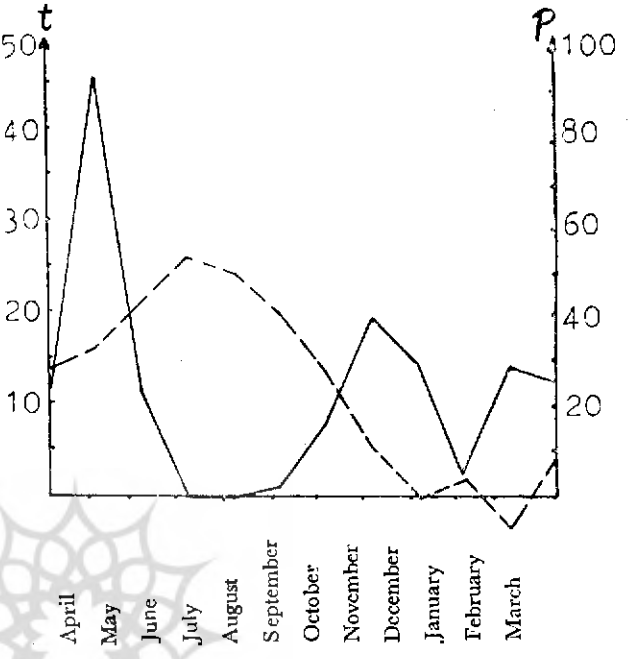
Precipitation (P) ——————

Temperature (t) - - - - - - - - -

p=287.6

s=1540.54 1958–59

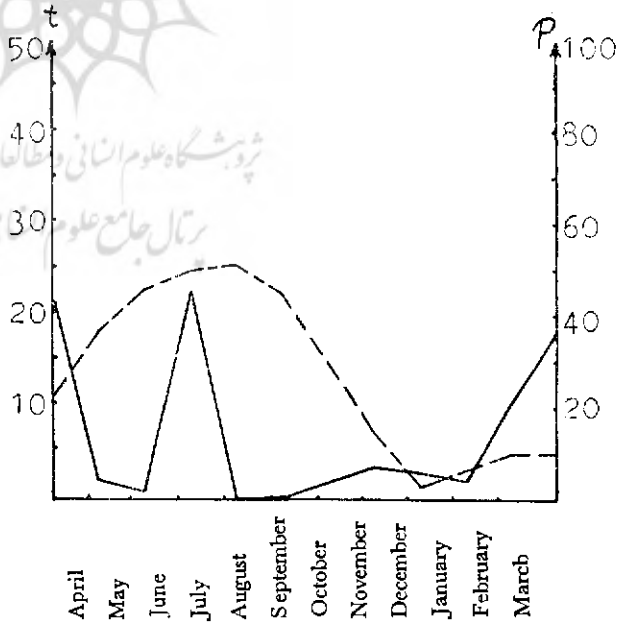
l=4.56cm



p=171.7

s=1927.49

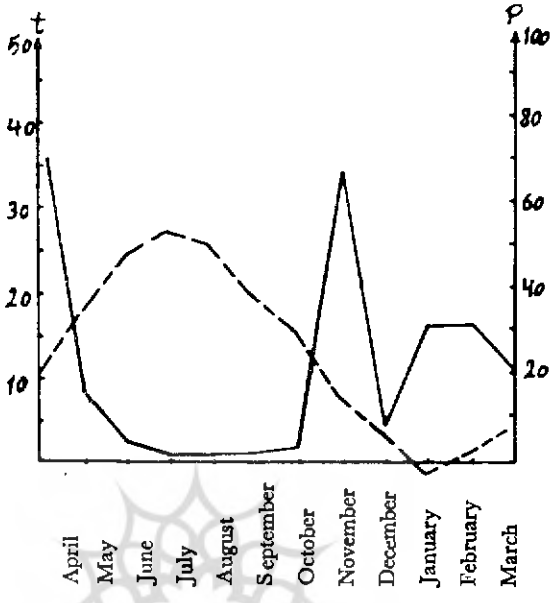
l=7.42cm 1959–60



p=250.5

s=2250.95 1960–61

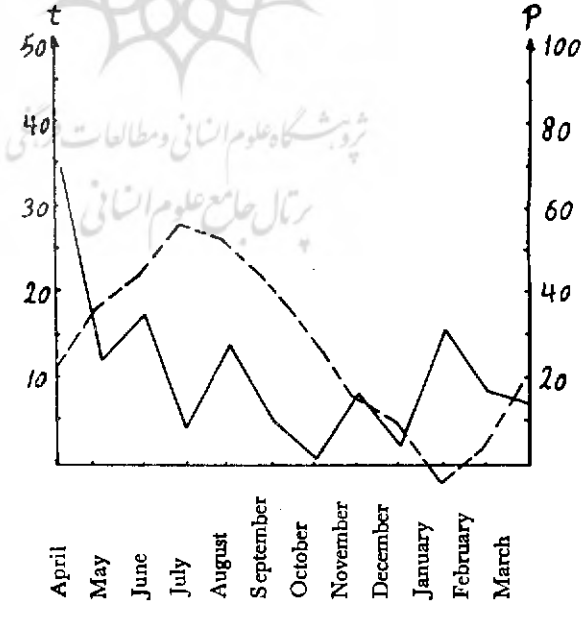
l=5.68cm



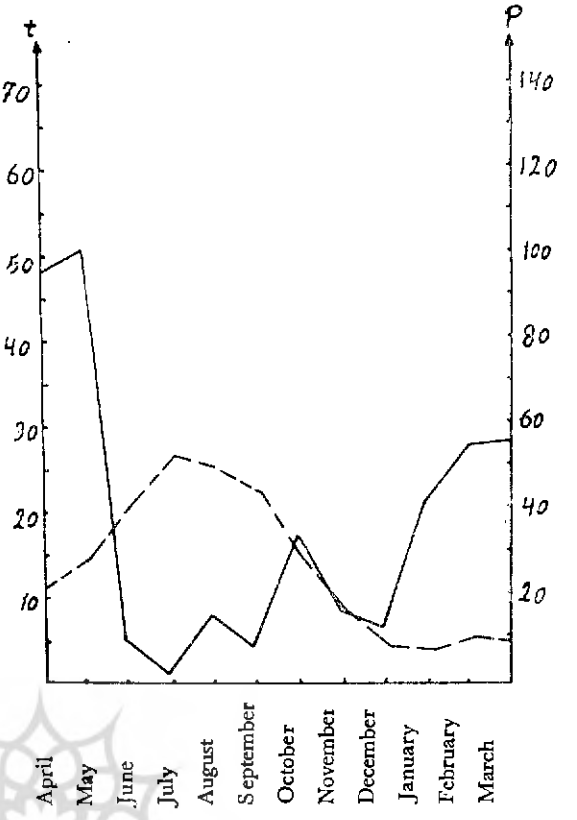
p=252.7

s=1509.27 1961–62

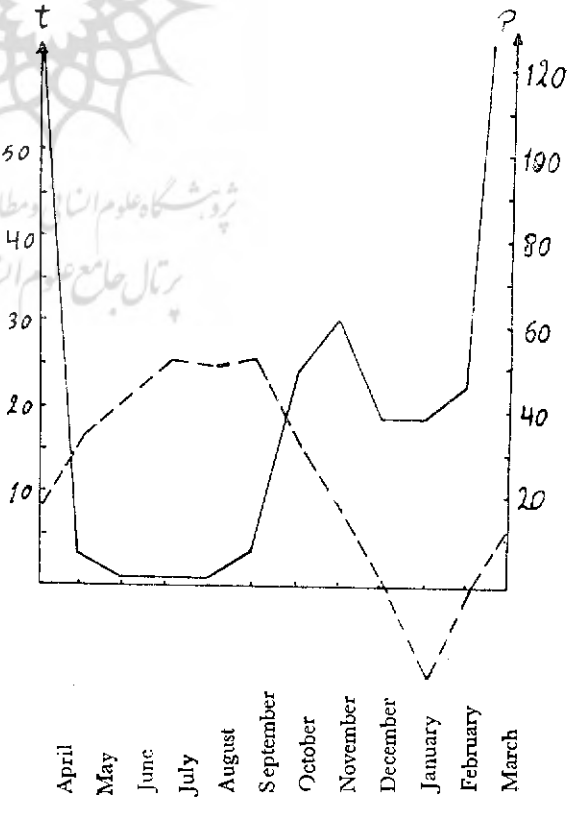
l=7.14cm



p=435.6
s=1438.70
l=4.15cm 1962–63



p=585.0
s=1886.04 1963–64
l=4.88 cm

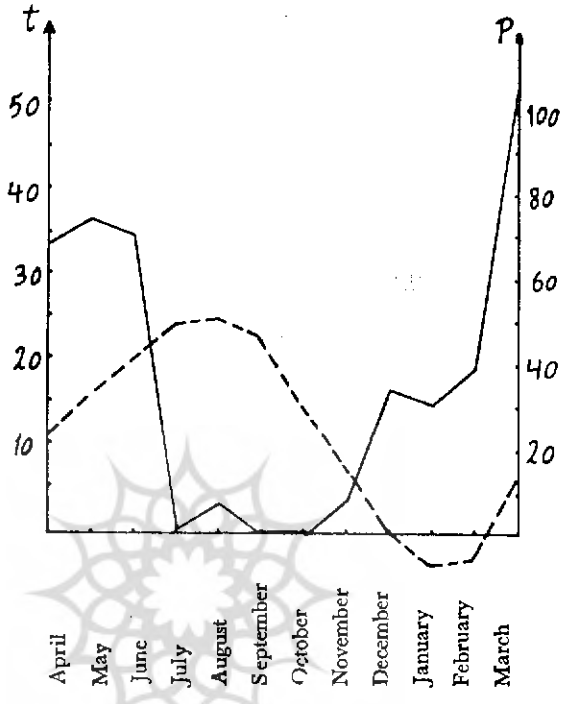


Precipitation and temperature charts to determine length of dry period,for Rezaiyeh

S=1562.05

l=4.75 1956–57

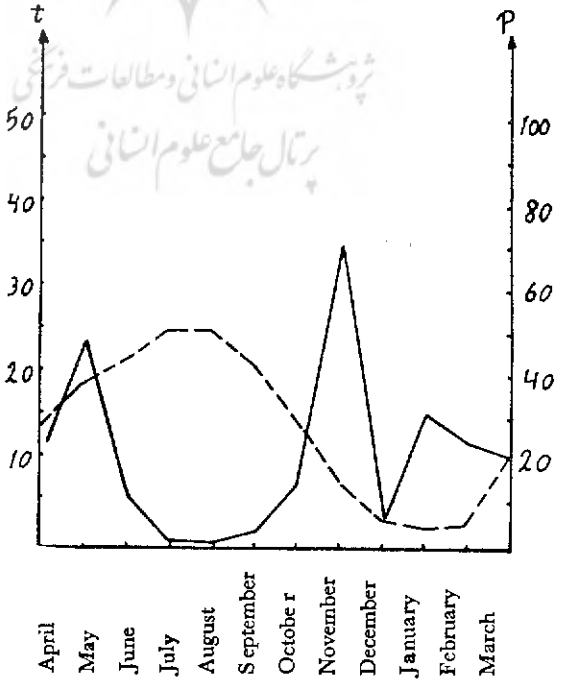
P=441.9



S=1689.30

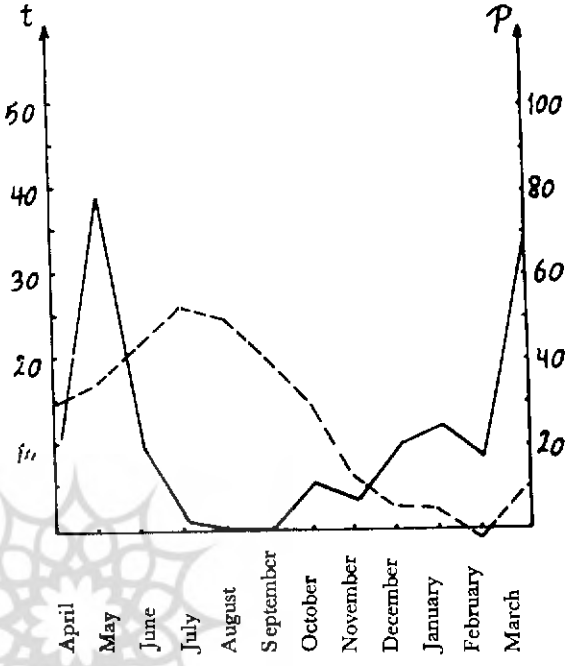
l=5.10 1957–58

P=260.0

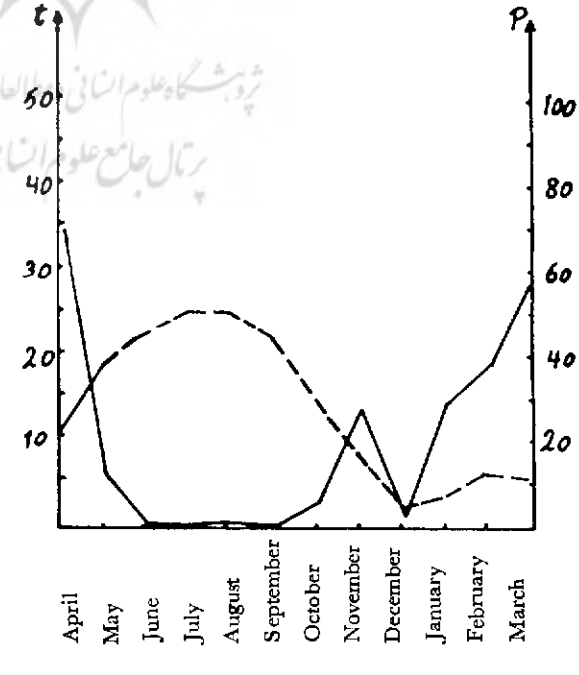


Precipitation and temperature charts to determine length of dry period,for Rezaiyeh

S=1687.66
l=5.68 1958–59
P=280.7

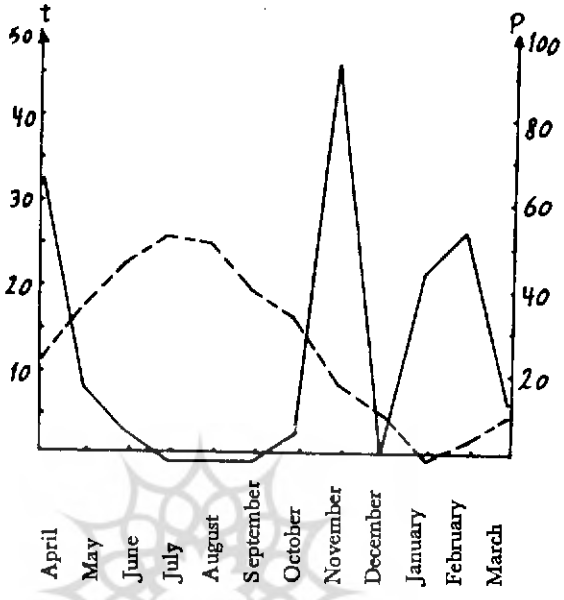


S=2171.50
l=5.96 1959–60
P=246.0

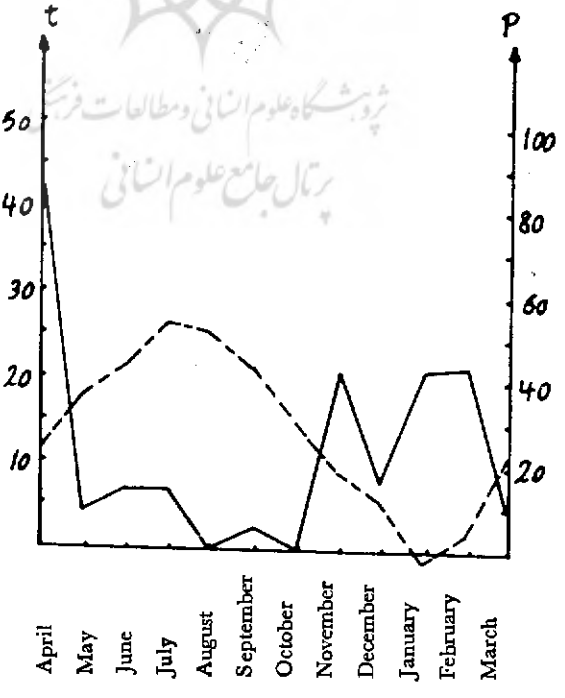


Precipitation and temperature charts to determine length of dry period,for Rezaiyeh

S=2064.46
l=5.78 1960–61
P=304.6

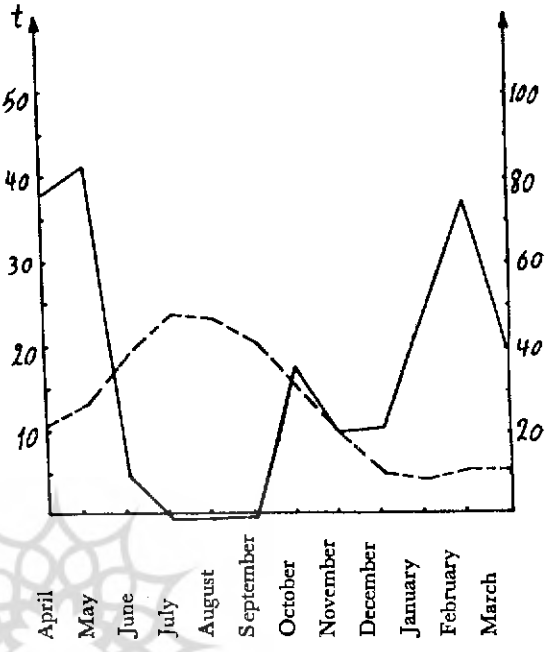


S=1876.86
l=6.00 1961–62
P=289.4

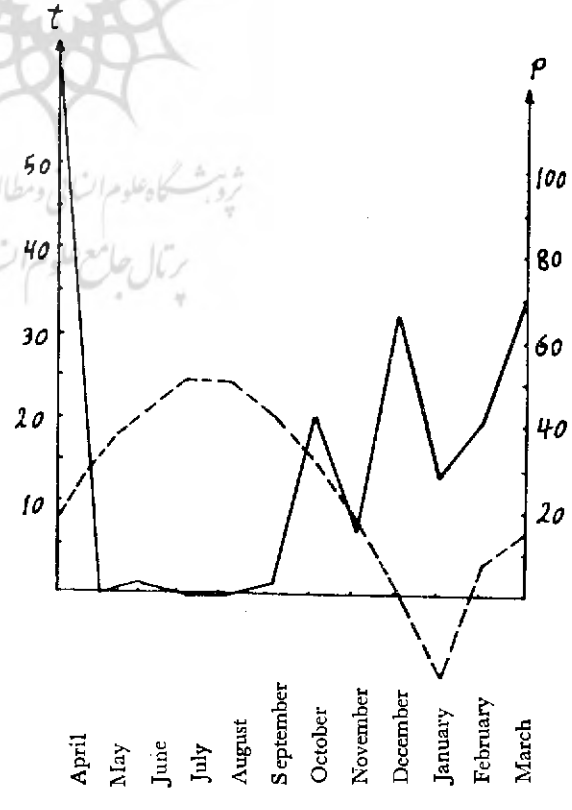


Precipitation and temperature charts to determine length of dry period,for Rezaiyeh

S=1489.59
l=4.18 1962–63
P=411.4



S=1909.42
l=4.96 1963–64
P=396.5



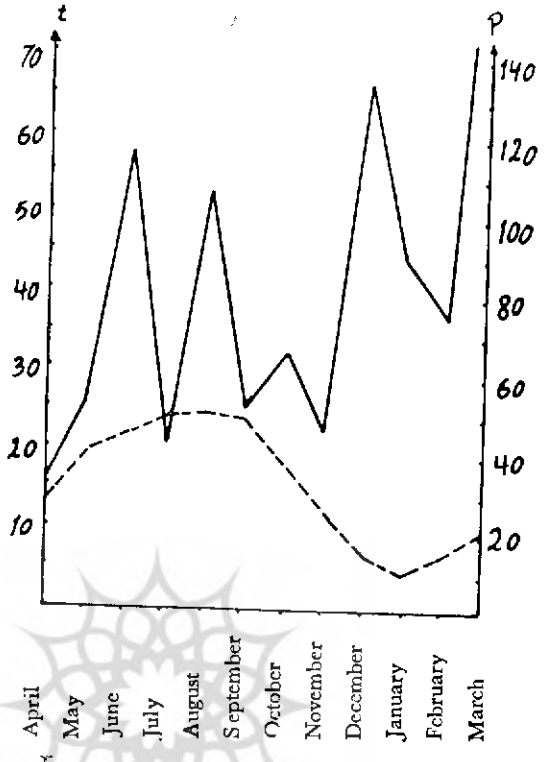
Precipitation and temperature charts to determine length of dry period, for Rasht

March max. 202.2

P=1018.7

S=7.4 1956–57

I=0.2cm

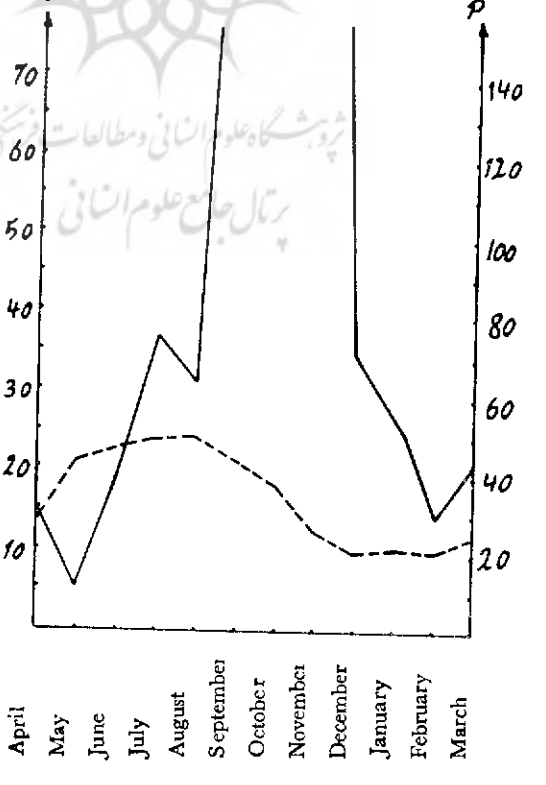


October max. 471.1

P=1510.0

S=283.83 1957–58

I=0.96cm



Precipitation and temperature charts to d etermine length of dry period, for Rasht

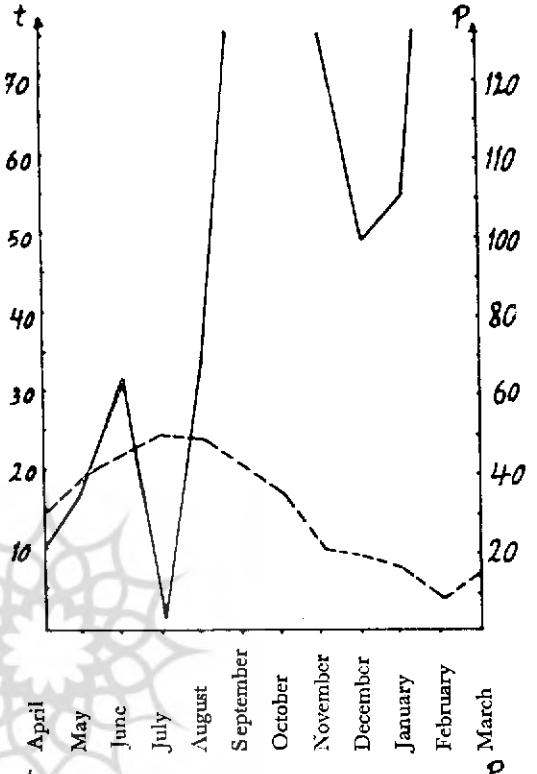
October max. 293.5

February max. 231.3

P=1407.2

S=334.9 1958–59

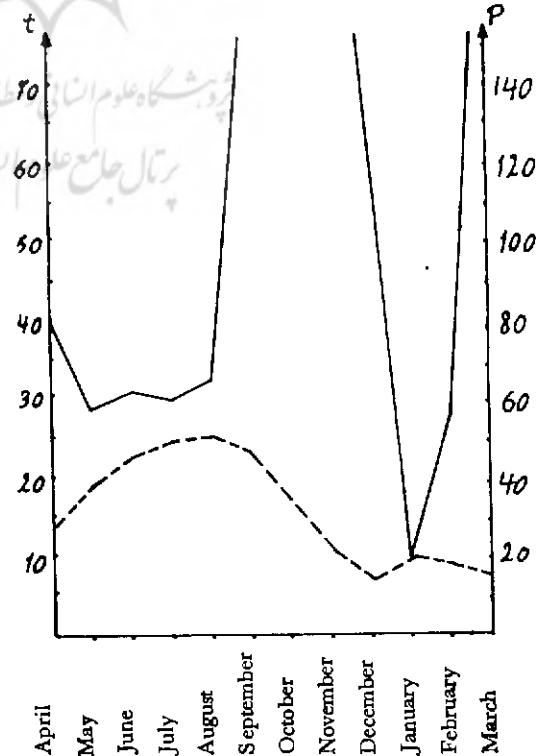
l=2.35cm



P=1386.6

S=0 1959–60

l=0



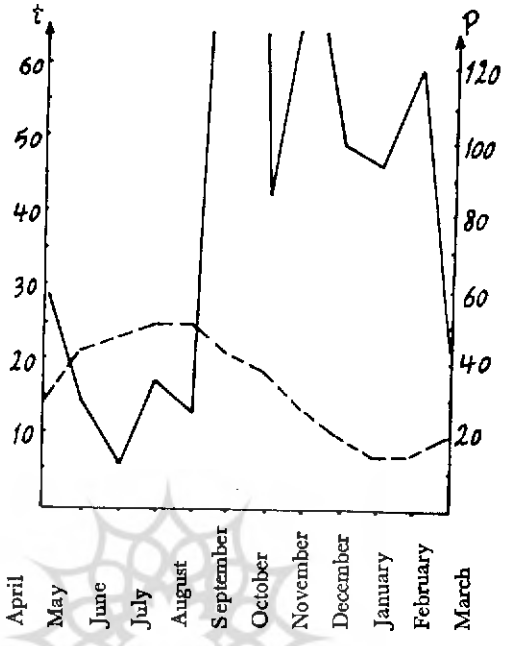
Precipitation and temperature charts to determine length of dry period, for Rasht

September max. 325

P=1075.9

S=712.2 1960–61

I=3.4 cm

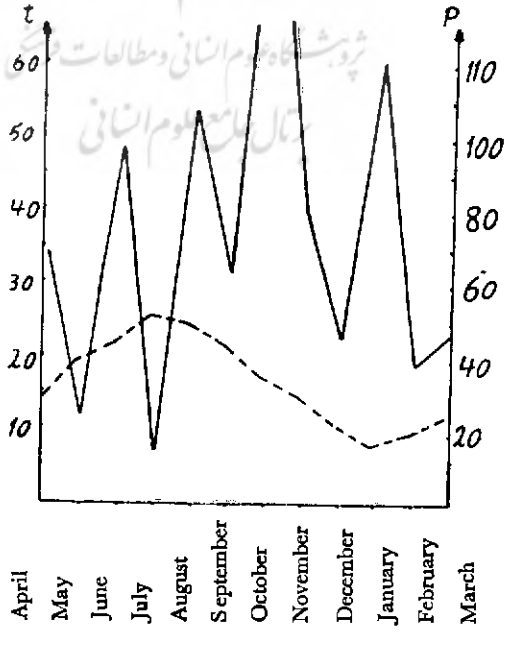


October max. 185.5

P=904.3

S=183.65 1961–62

I=1.25 cm

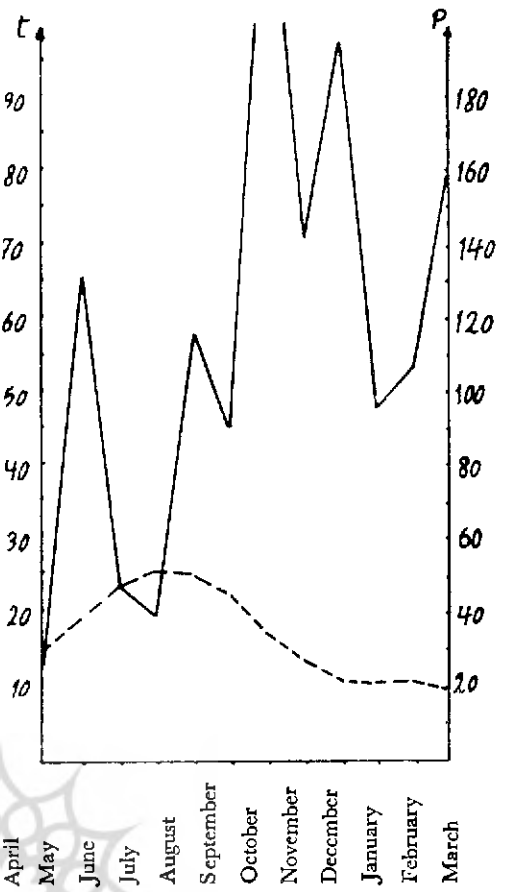


October max. 251.7

P=1397.7

S=68.2 1962–63

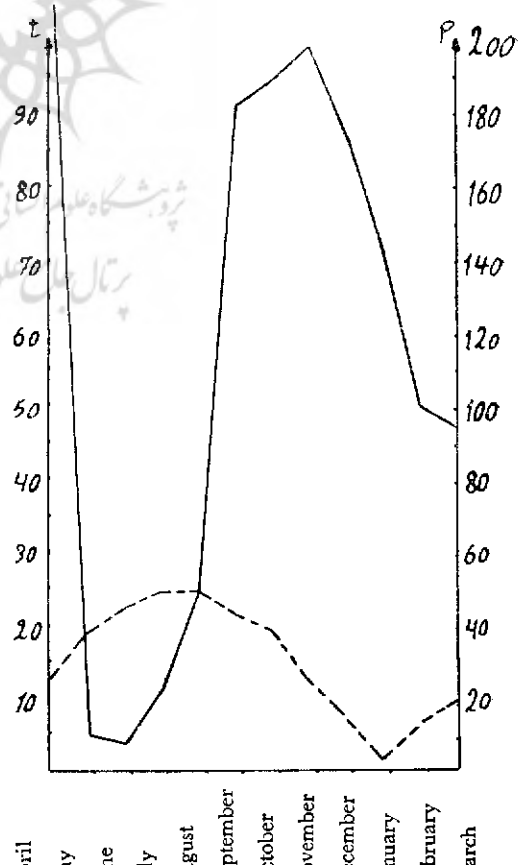
l=2.1cm



P=1396.5

S=760.16

l=3.07cm 1963–64

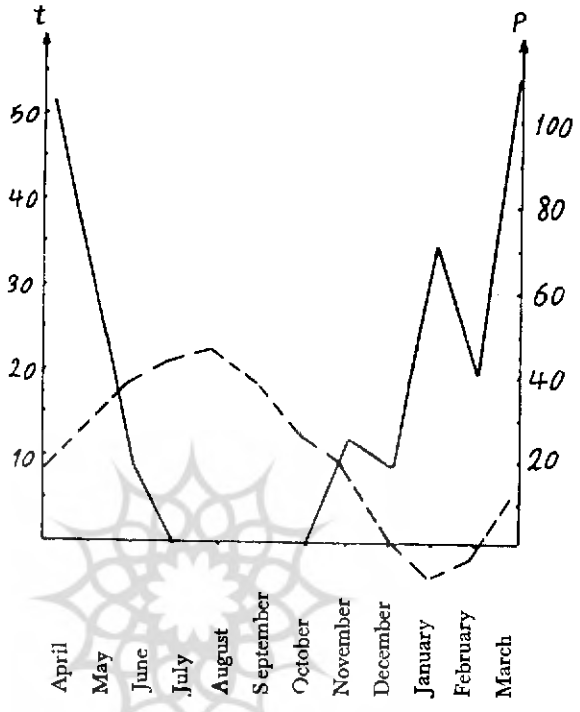


Precipitation and temperature charts to determine length of dry period, for Hamedan

P=457.3

S=1583.63 1956–57

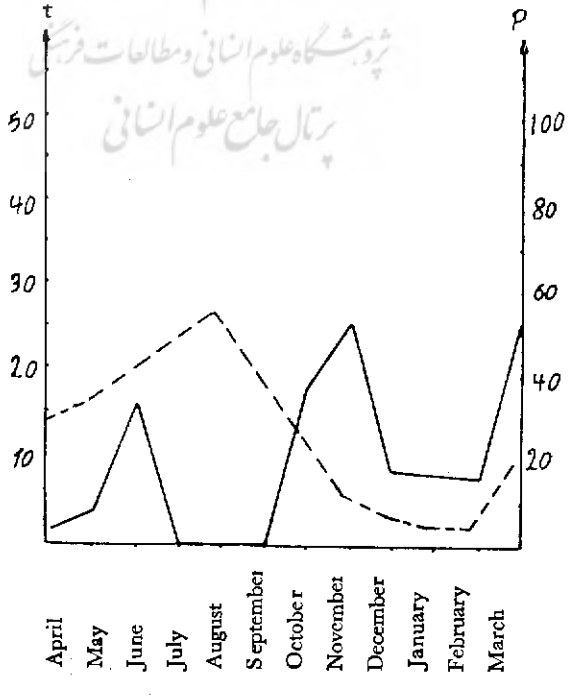
l=35.09cm



P=242

S=1729.66 1957–58

l=5.73cm

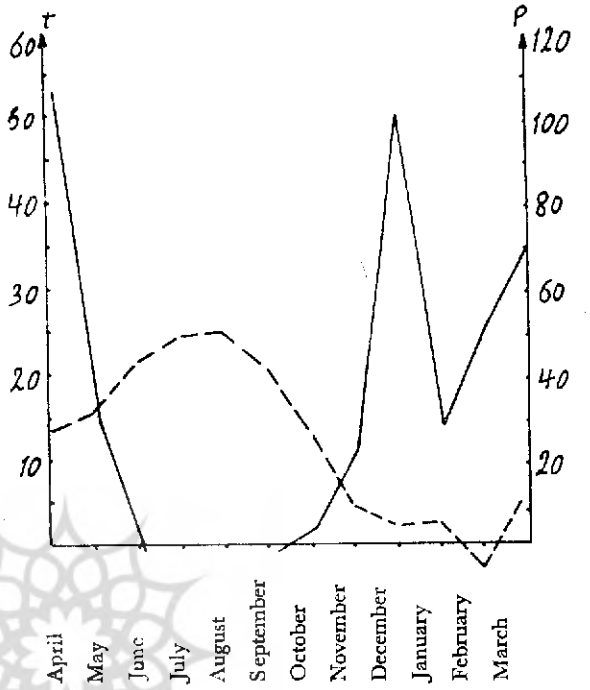


Precipitation and temperature charts to determine length of dry period, for Hamedan

P=423.8

S=1976.64 1958–59

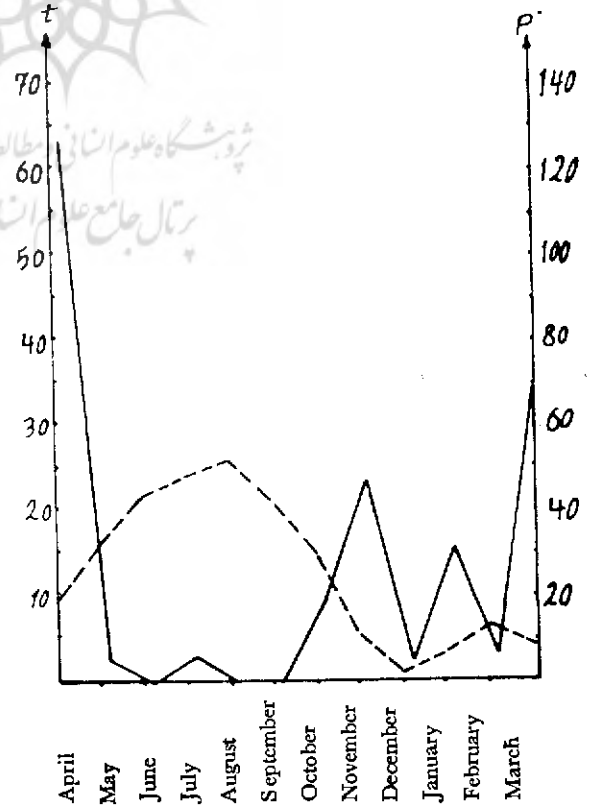
l=5.56cm



P=325.2

S=1982.83 1959–60

l=5.63cm



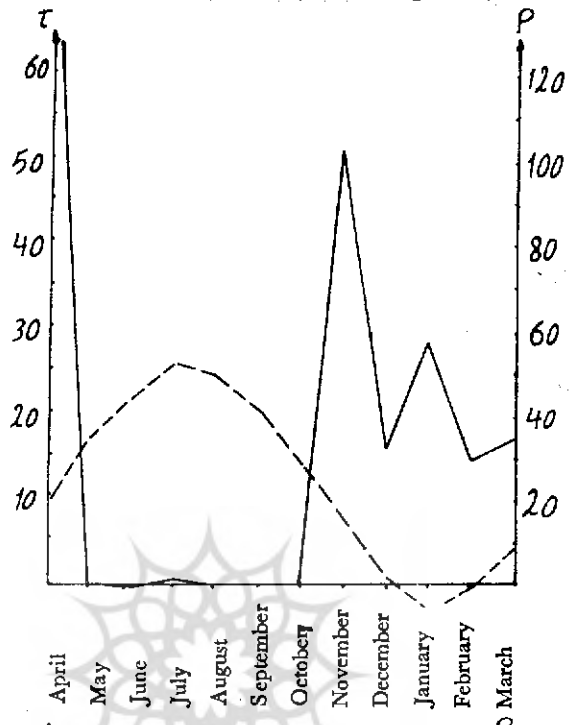
Precipitation and temperature charts to determine length of dry period, for Hamedan

April max. 194.8

P=454.3

S=2191.76 1960–61

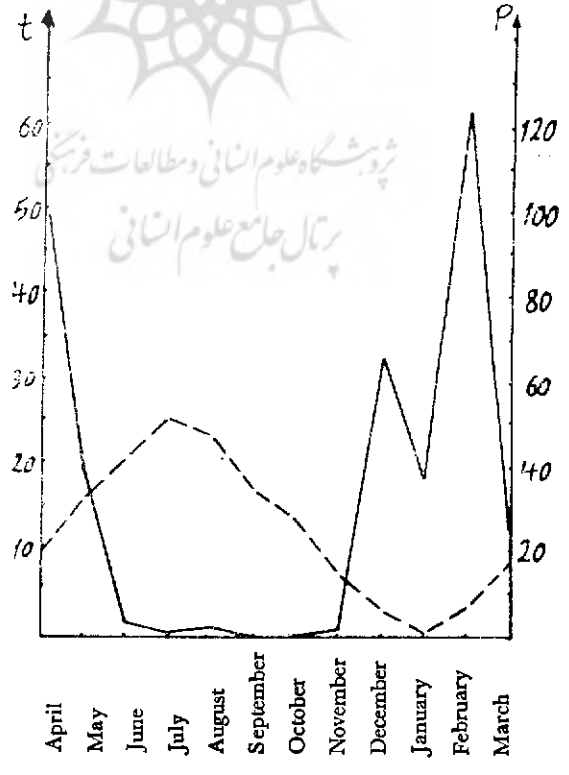
I=5.43 cm



P=414.0

S=1975.20 1961–62

I=6.0 cm

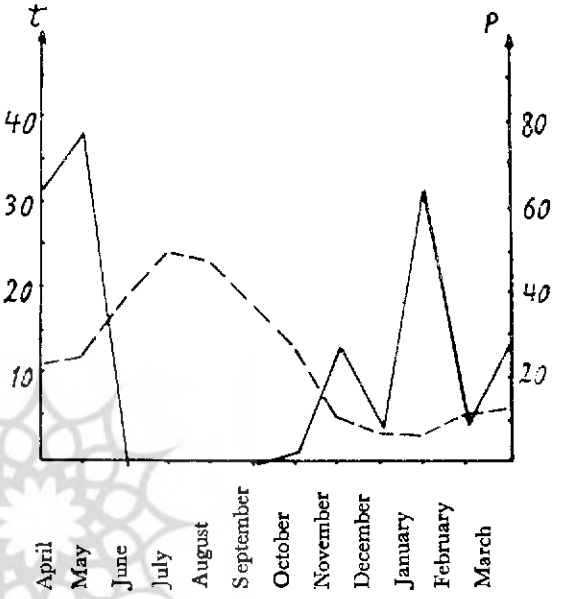


Precipitation and temperature charts to determine length of dry period,forHamedan

P=286.3

S=1747.95 1962–63

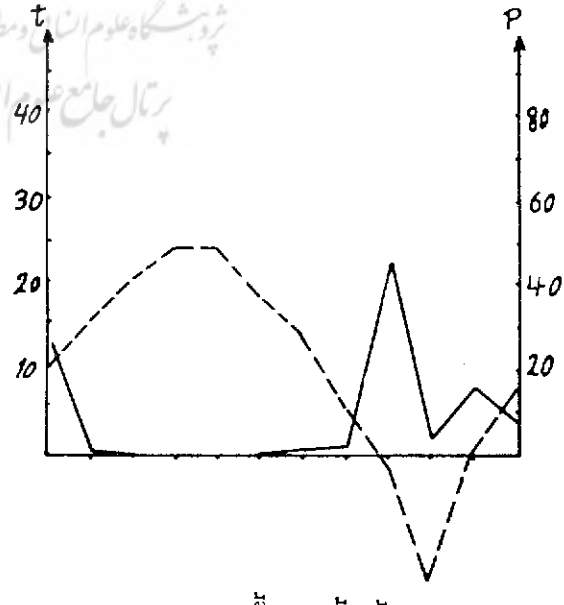
l=3.95cm



P=105.1

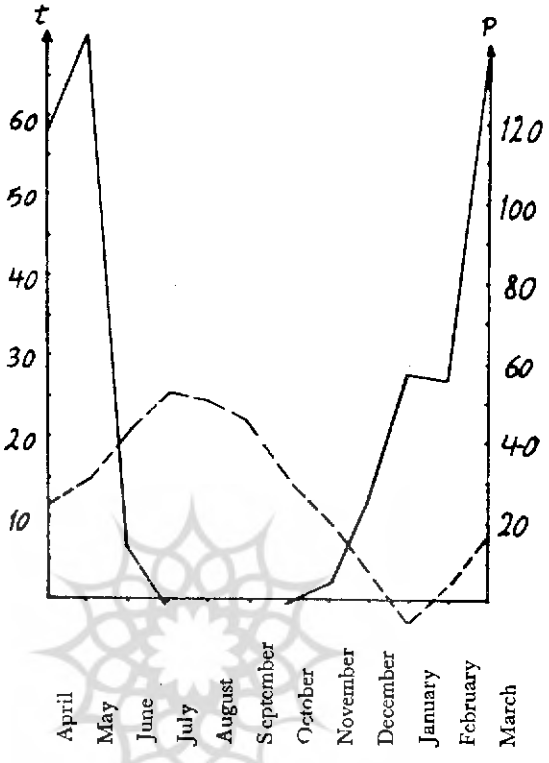
S=2331.80

l=7.23cm 1963–64

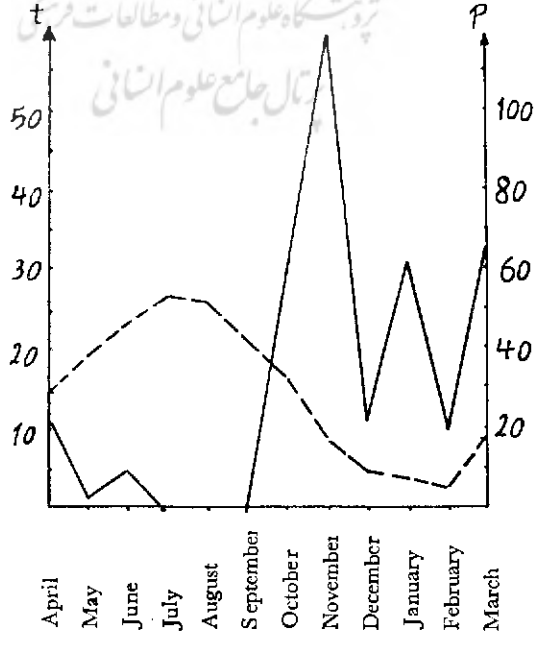


Precipitation and temperature charts to determine length of dry period, for Kermanshah

P=558.4
S=2036.74 1956–57
I=5.66cm



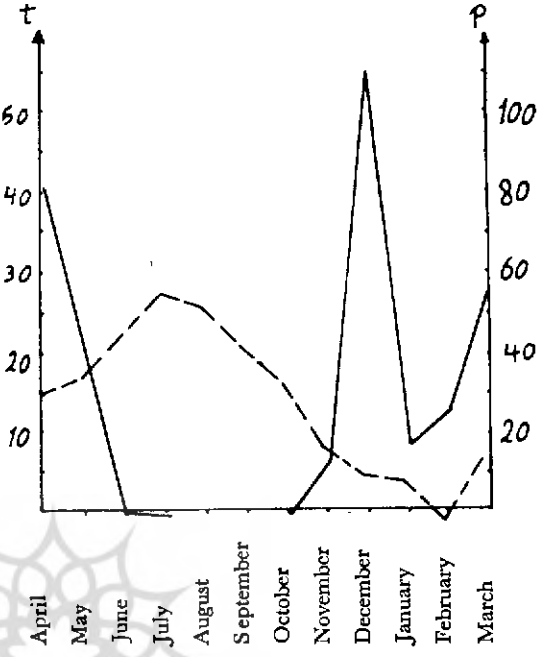
P=384.1
S=2134.4 1957–58
I=5.64cm



P=351.8

S=2202.09 1958–59

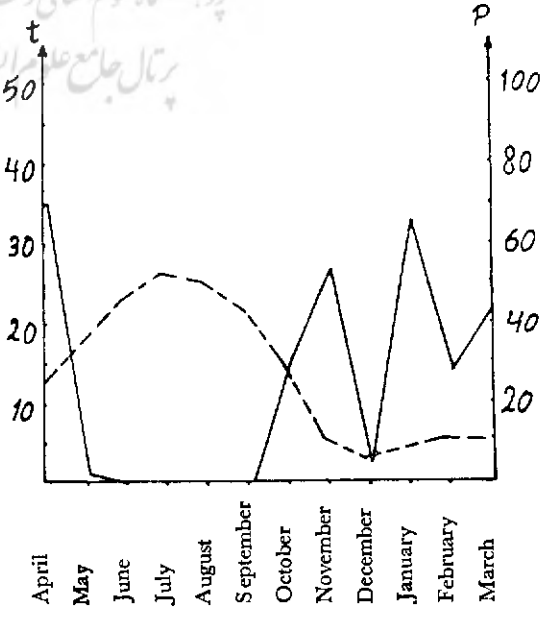
l=5.92cm



P=299.4

S=2188.0 1959–60

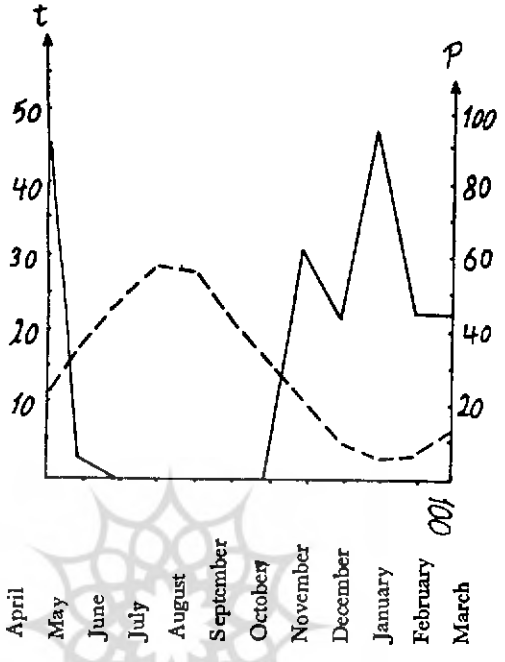
l=5.5cm



P=402.1

S=2412.54 1960–61

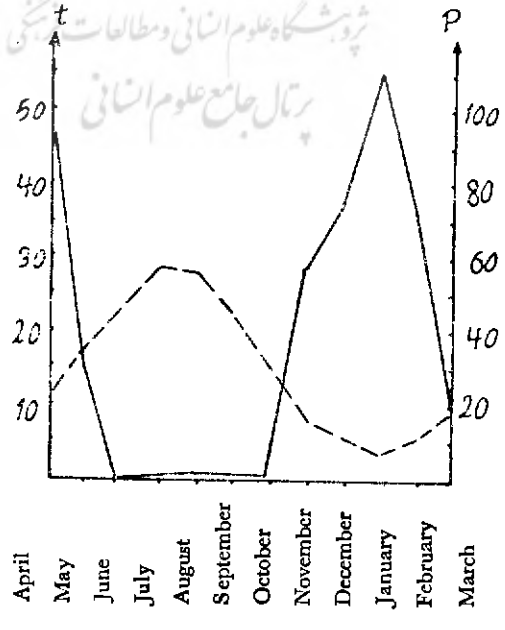
l=5.7cm



P=477.1

S=2253.0 1961–62

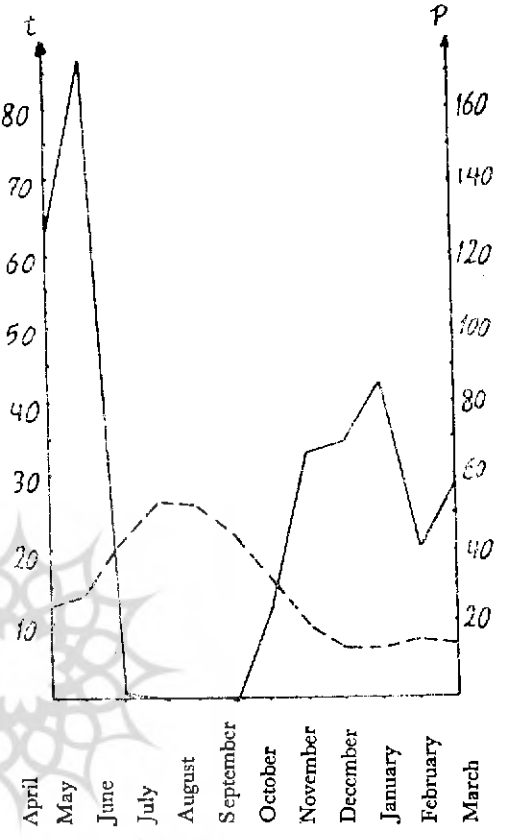
l=5.47cm



P=641.3

S=1775.04 1962–63

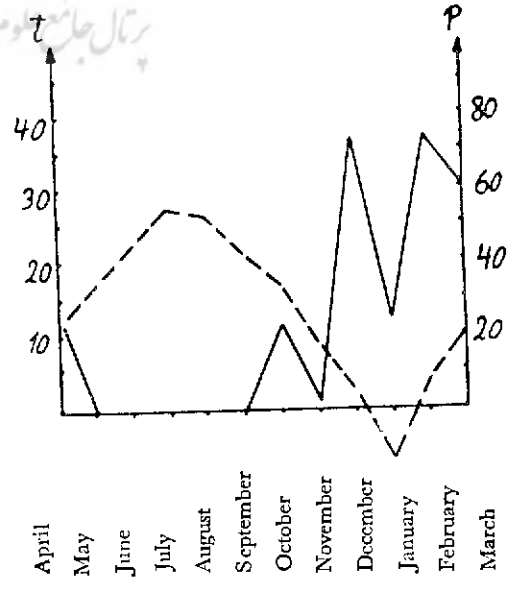
l=4.36cm



P=281.8

S=2460.48

l=7.08cm 1963–64

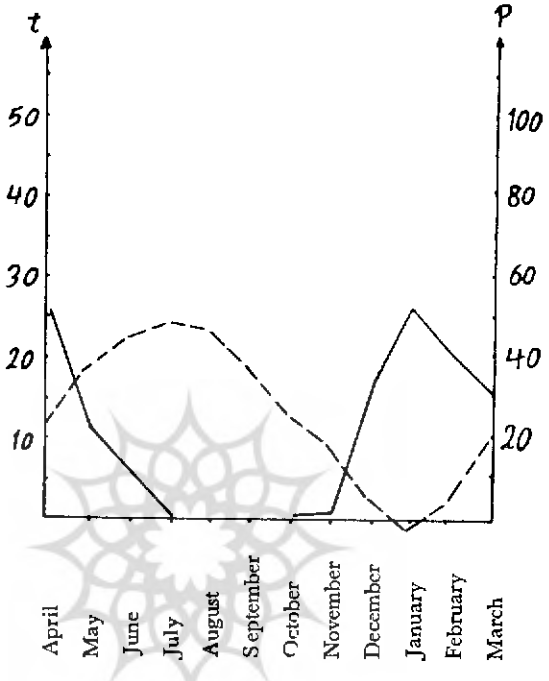


Precipitation and temperature charts to determine length of dry period, for Mashad

P=238

S=2145.48 1956–57

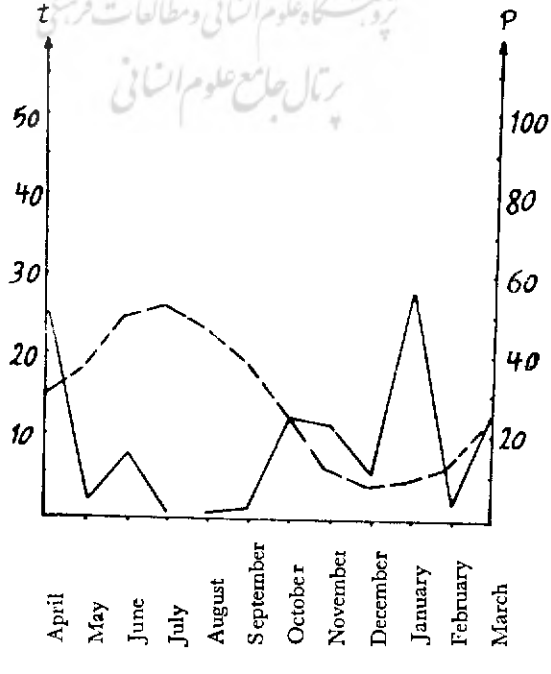
l=6.76cm



P=211.7

S=2022.35 1957–58

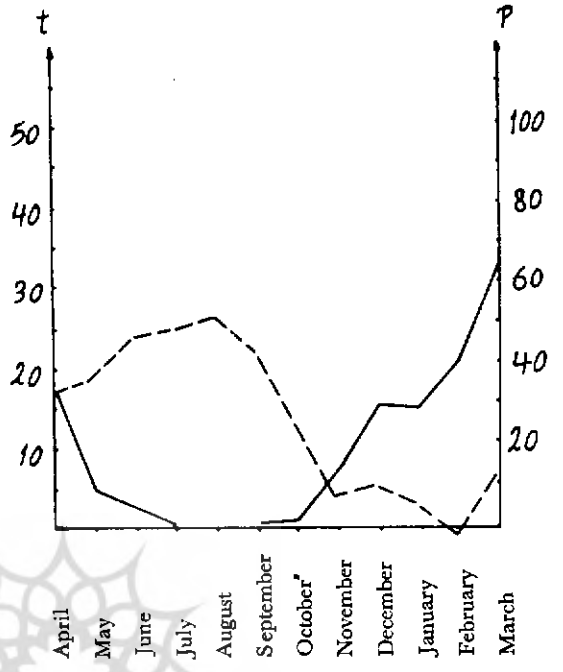
l=6.68cm



P=224.7

S= 2379 1958–59

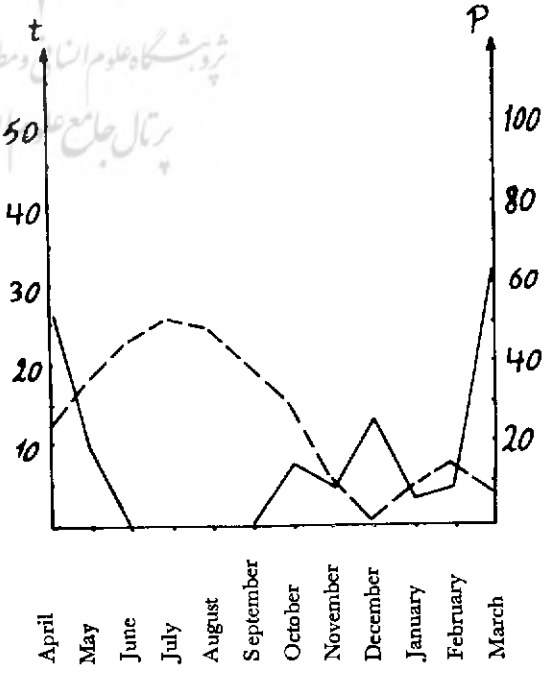
l=6.74cm



P=197.1

S=2203.31 1959–60

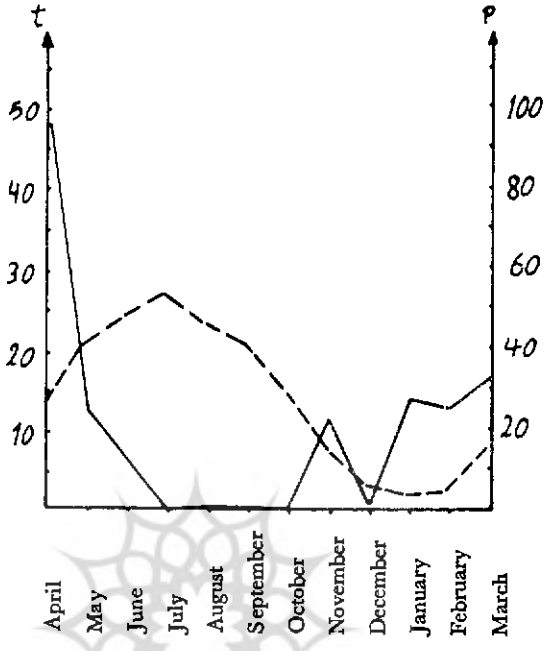
l=7.69cm



P=240.8

S=2201.4 1960–61

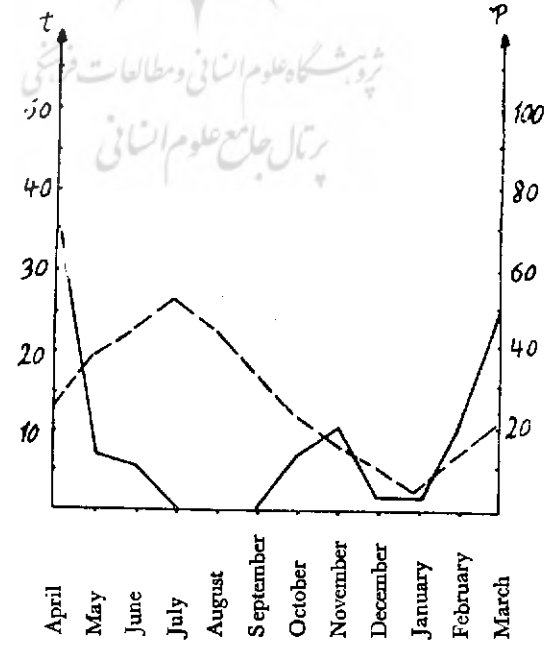
l=6.60cm



P=205.5

S=3035.52 1961–62

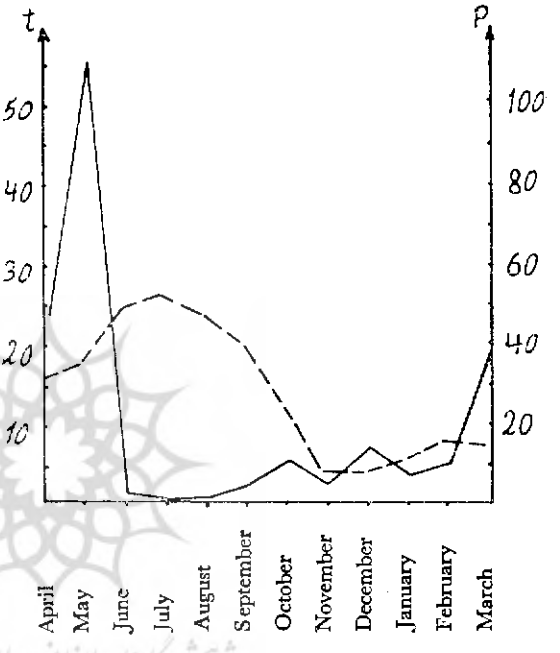
l=8.07cm



P=244.1

S=1943.72 1962–63

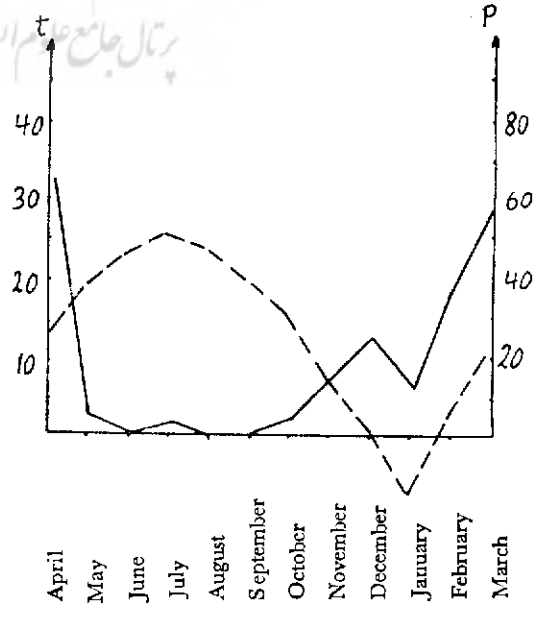
l=7.61 cm



P=228.8

S=2340.9

l=6.42 cm 1963–64

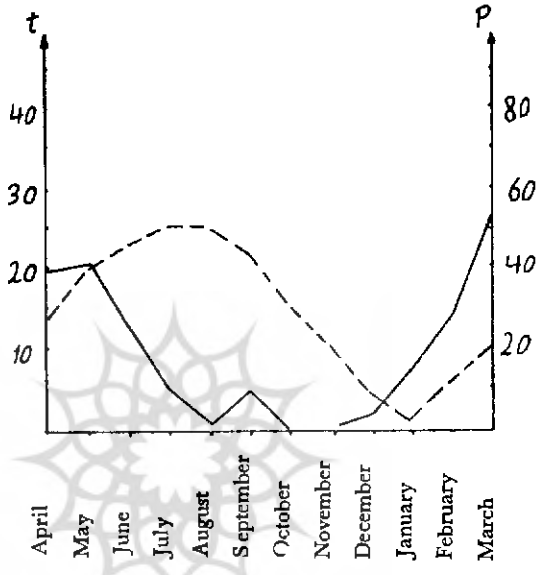


Precipitation and temperature charts to determine length of dry period, for Shahrood

P=225.9

S=1987.97 1956–57

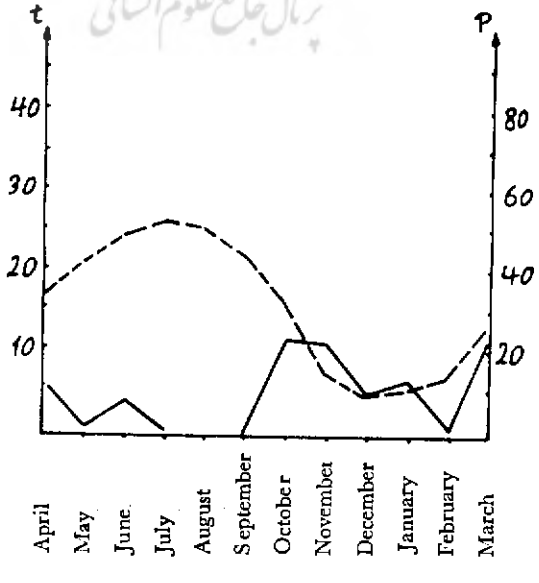
I=7.17cm



P=106.3

S=2574.54 1957–58

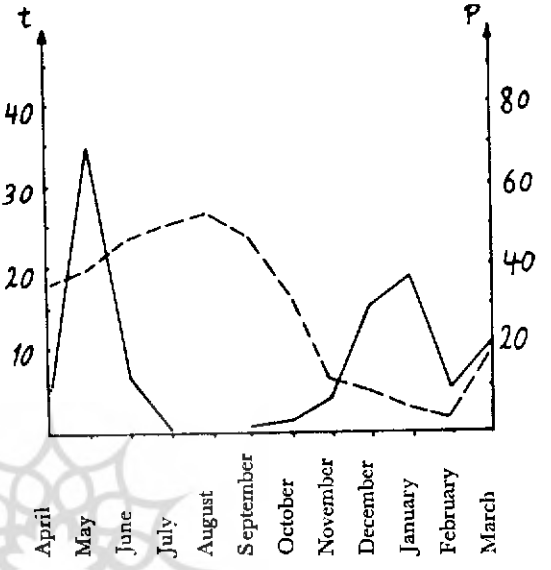
I=8.30cm



P=196.1

S=2173.63 1958–59

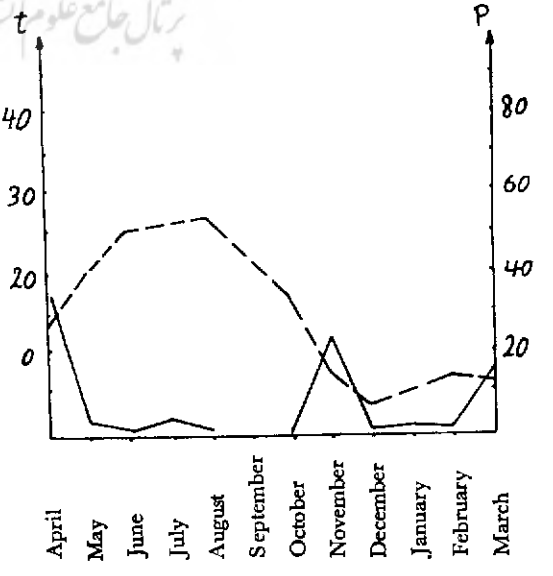
l=6.15 cm



P=80.3

S=2818.32 1959–60

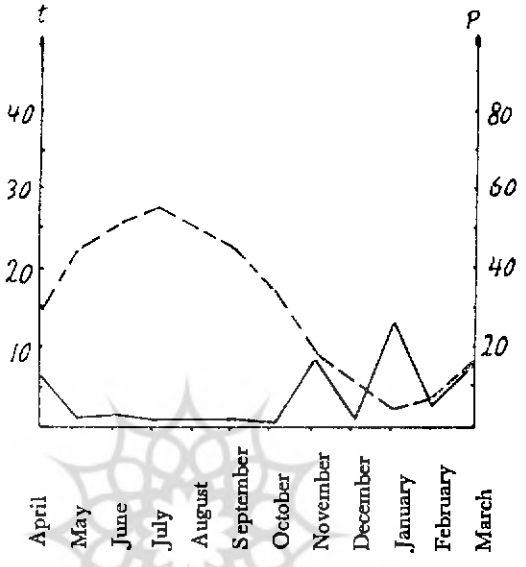
l=9.81 cm



P=77.3

S=2940.13 1960–61

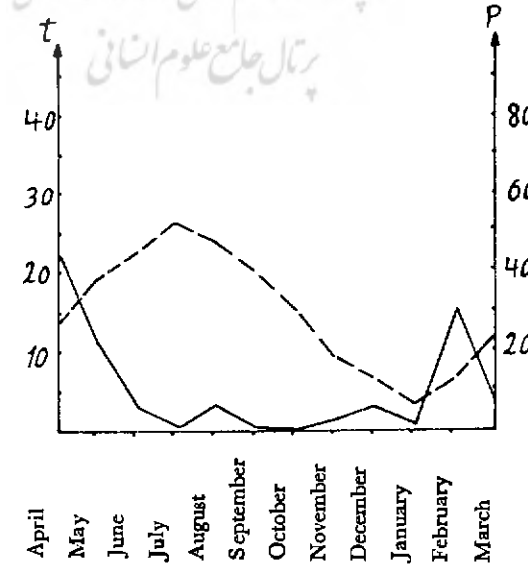
l=9.42cm



P=123.8

S=2509.56 1961–62

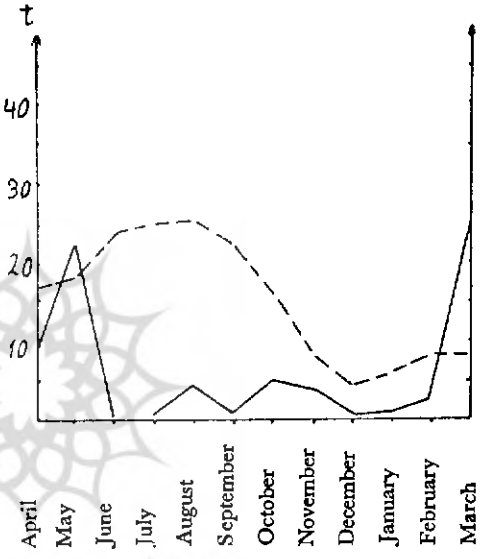
l=9.24cm



P=130.6

S=2545.80 1962–63

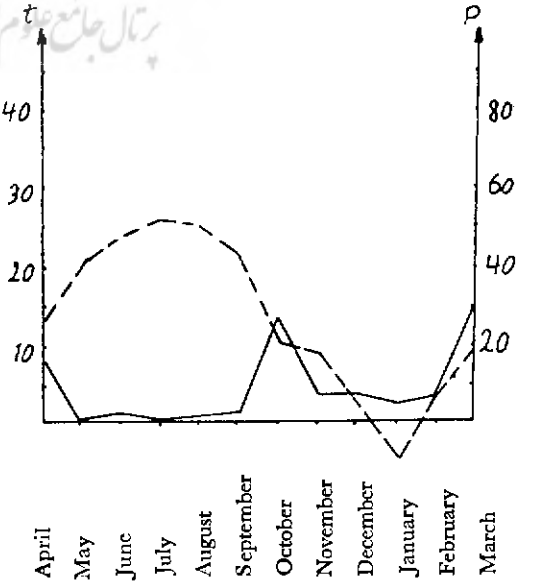
l=9.90cm



P=100.6

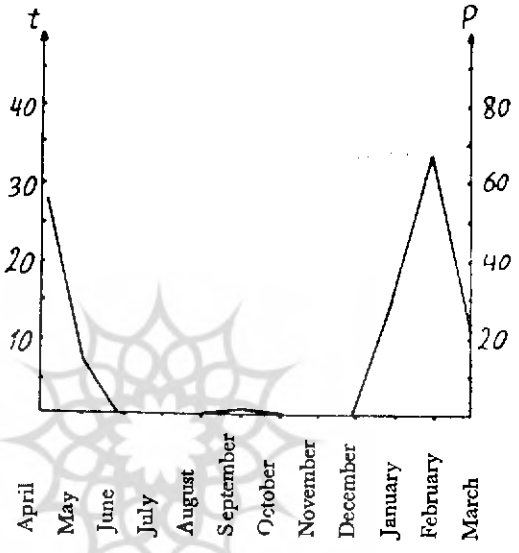
S=2390.78

l=7.38cm 1963–64



Precipitation and temperature charts to determine length of dry period, for Ahvaz

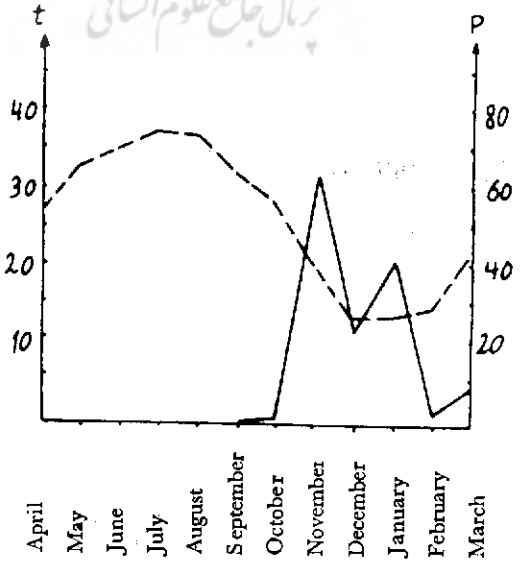
1956–57



P=138.4

S=4571.91 1957–58

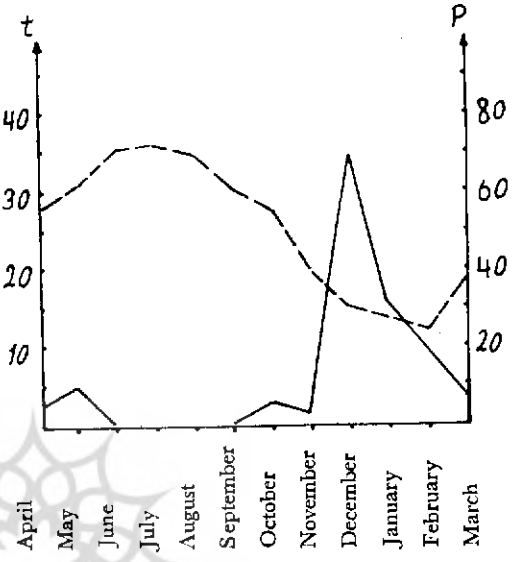
I=8.62cm



P=146.9

S=4448.93 1958–59

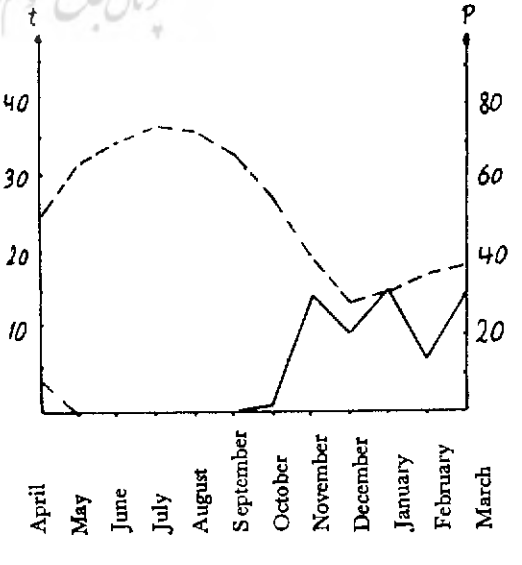
l=9.03cm



P=135.7

S=4509.7 1959–60

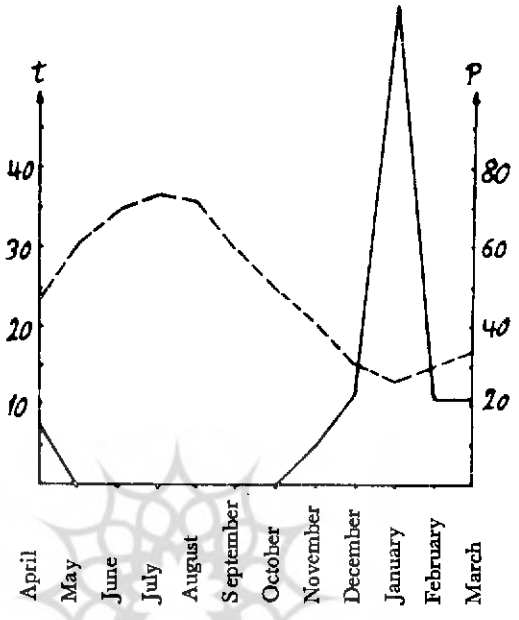
l=10.65cm



P=213.4

S=4472.6 1960–61

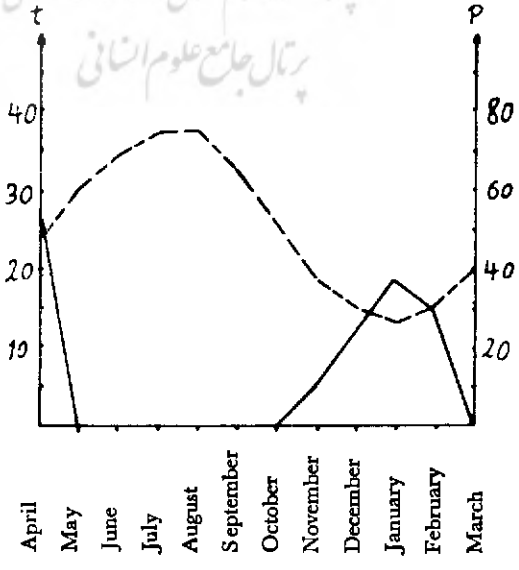
l=9.2cm



P=154.6

S=4436.84 1961–62

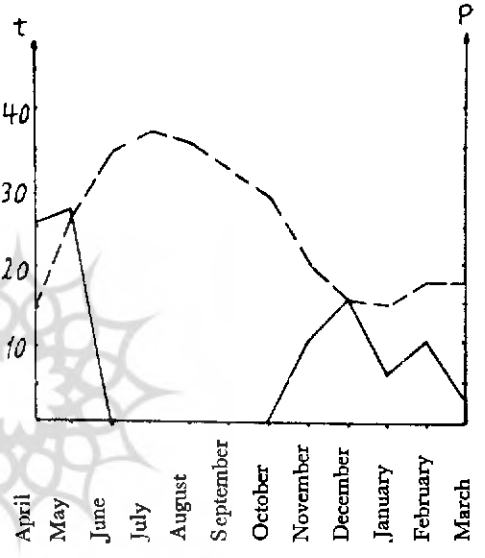
l=9.39cm



P=169.5

S=4114.92 1962–63

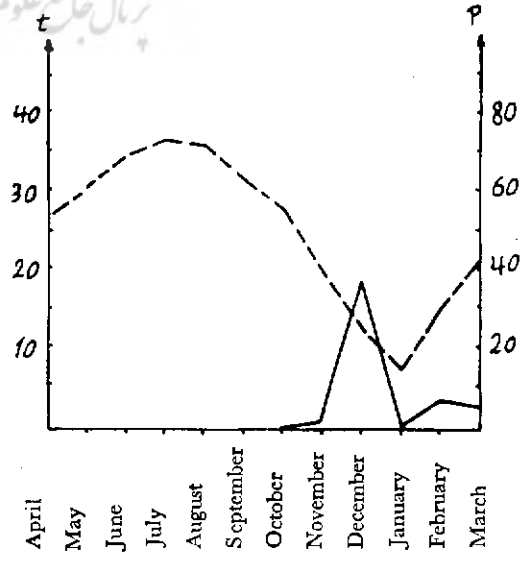
l=10.98cm



P=52.7

S=5058.21

l=10.28cm 1963–64

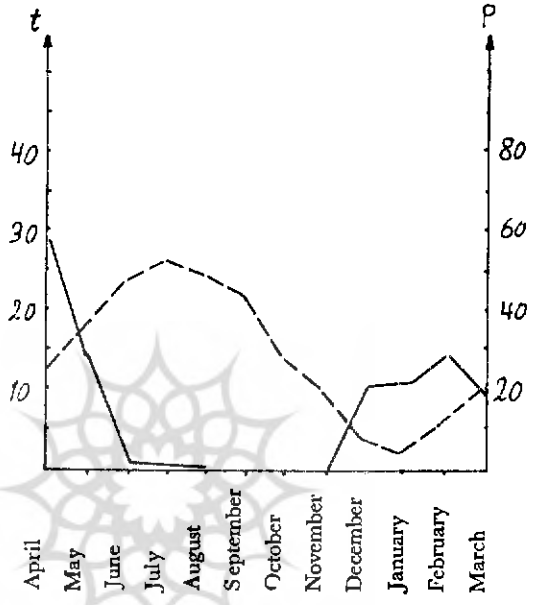


Precipitation and temperature charts to determine length of dry period, for Esfahan

P=173.9

S=2411.38 1956–57

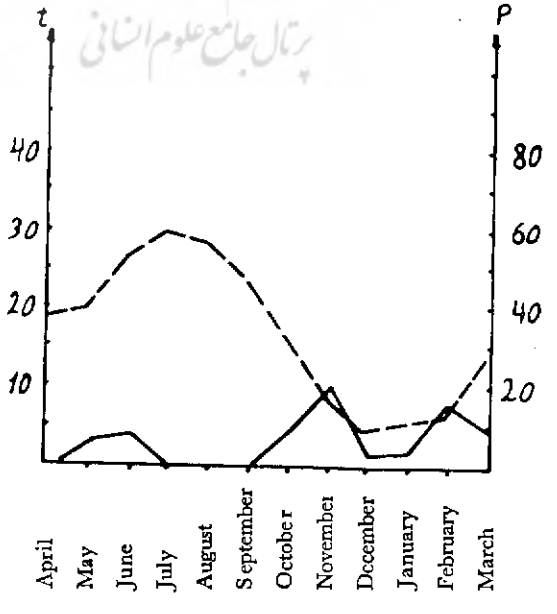
l=6.92cm



P=74.2

S=3007.41 1957–58

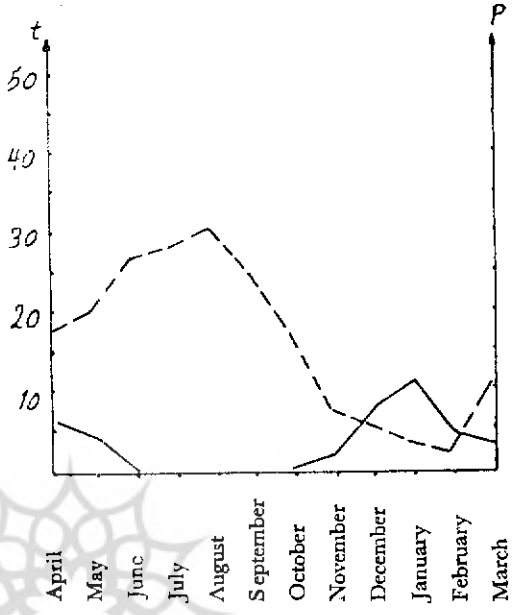
l=9.99cm



P=78.20

S=3144.60 1958–59

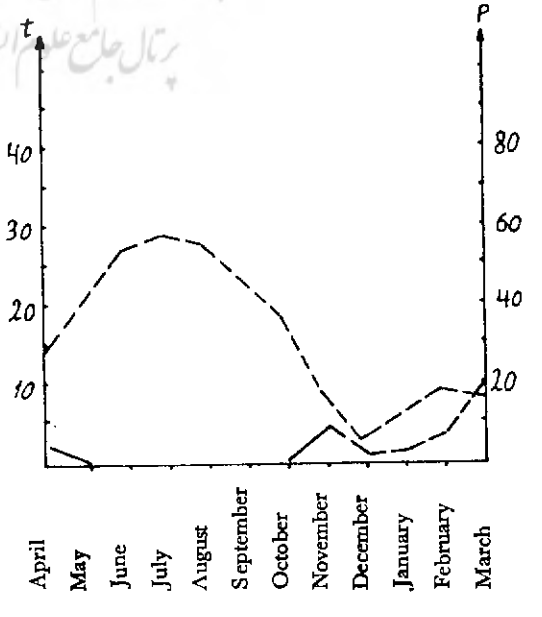
l=8.39cm



P=44.1

S=3361.68 1959–60

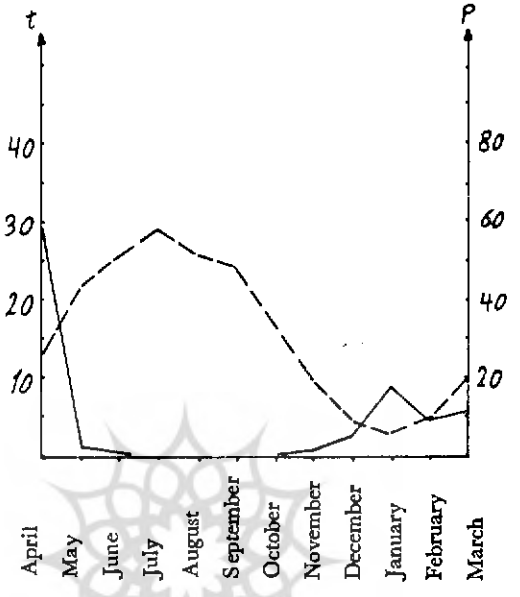
l=10.76cm



P=103.6

S=3010.74 1960–61

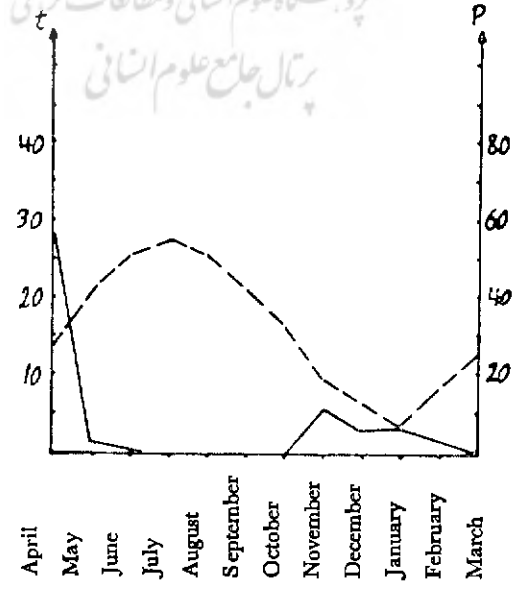
l=8.81cm



P=83.3

S=3033.8 1961–62

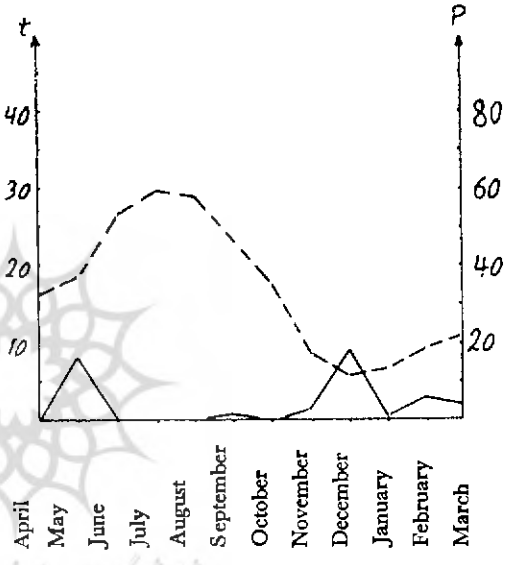
l=10.6cm



P=48.8

S=3286.88 1962–63

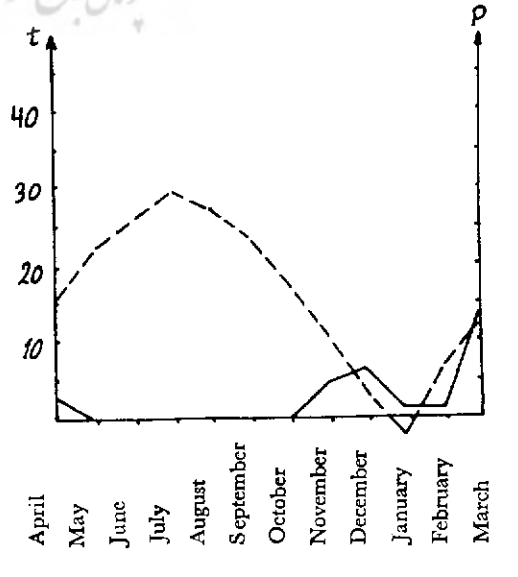
l=10.32cm



P=61.7

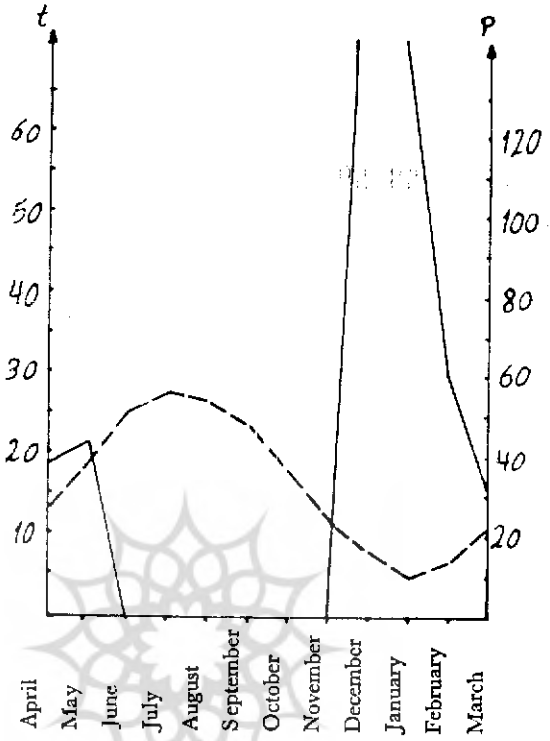
S=3136.4

l=9.0cm 1963–64



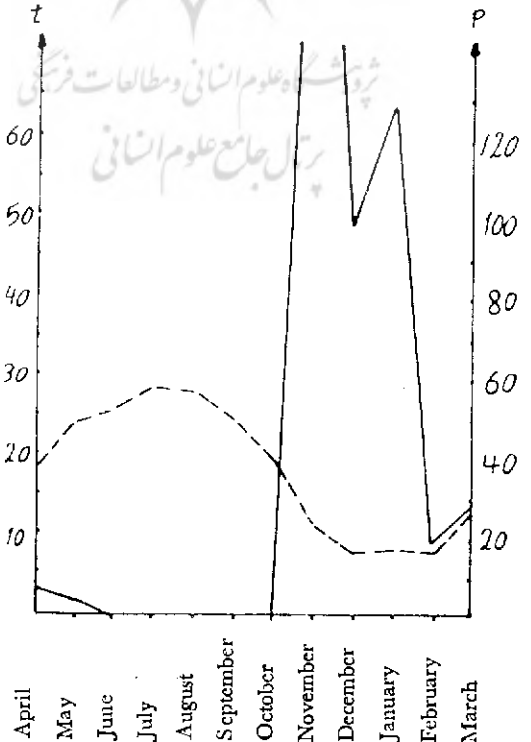
Precipitation and temperature charts to determine length of dry period, for Shiraz

p=510.5
s=2468.96 1956–57
l=5.96cm

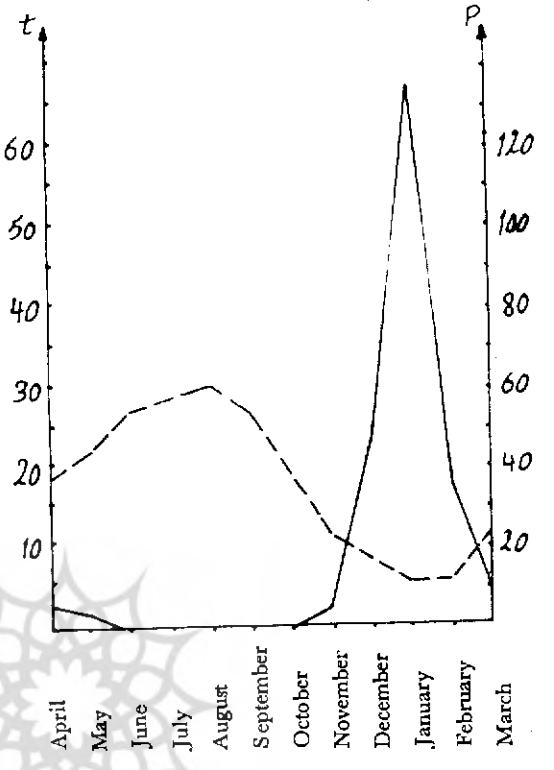


November max. 239

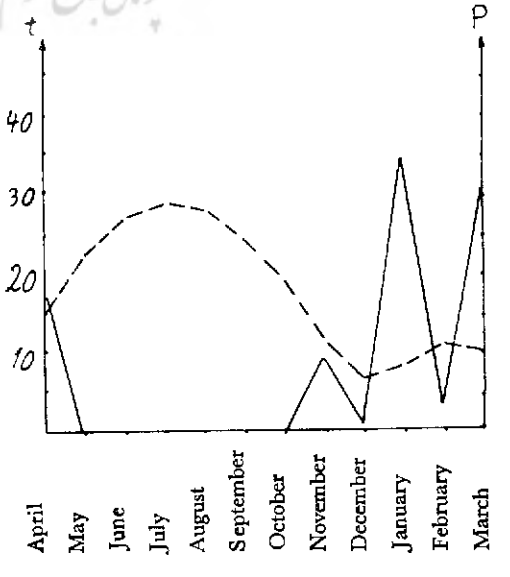
p=526.2
s=2896.22 1957–58
l=6.19cm



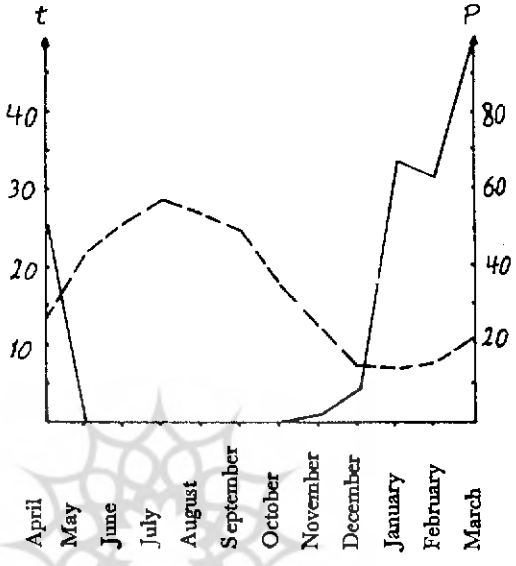
p=243.8
s=3218.02 1958–59
l=7.82cm



p=197.1
s=3021.85 1959–60
l=8.47cm

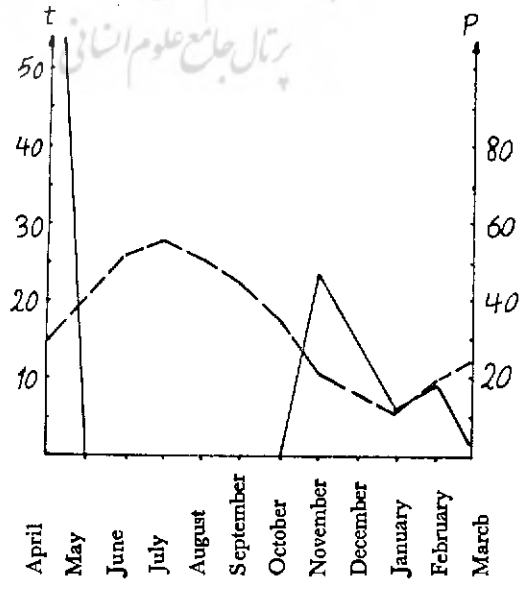


p=291.8
s=3078.34 1960-61
l=7.72cm

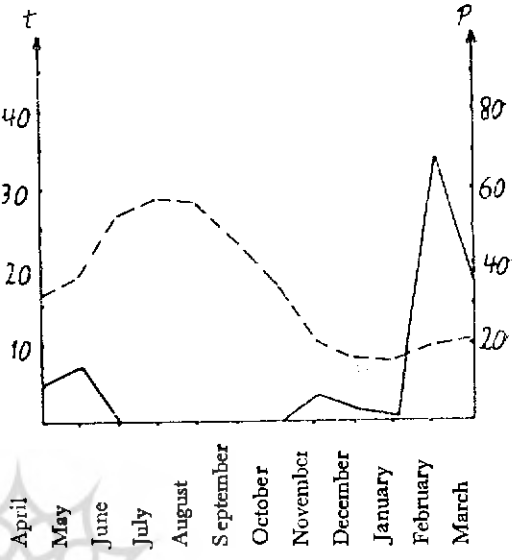


April max. 171

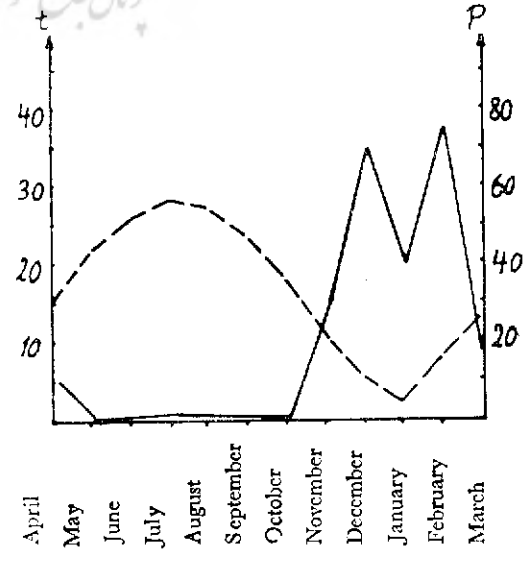
p=279.8
s=709.92 1961-62
l=7.63cm



p=140.7
s=3181.25 1962–63
l=9.25cm



p=238.4
s=3001.93 1963–64
l=7.06

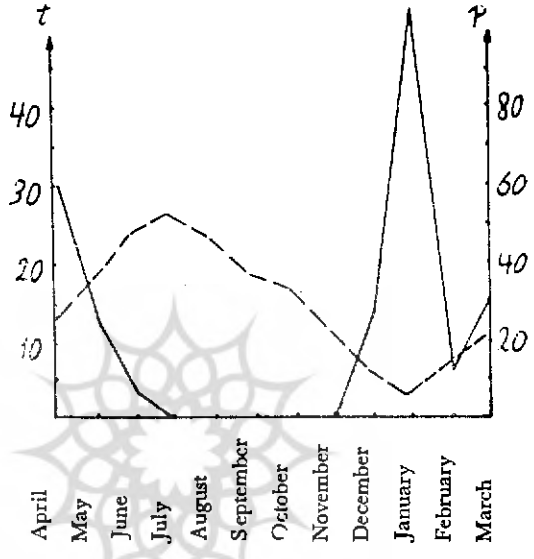


Precipitation and temperature charts to determine length of dry period, for Kerman

P=269.7

S=2330.75 1956–57

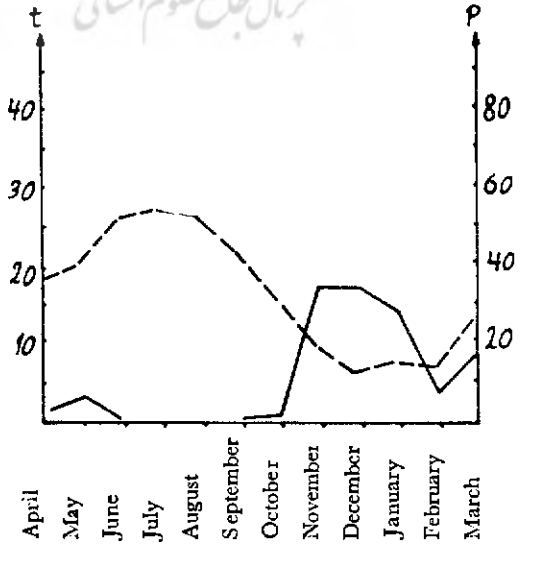
I=6.85cm



P=126.4

S=2825.13 1957–58

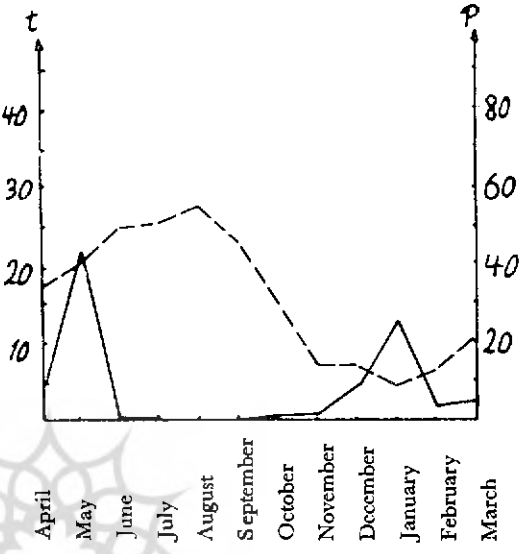
I=7.97cm



P=95.5

S=2742.075 1958–59

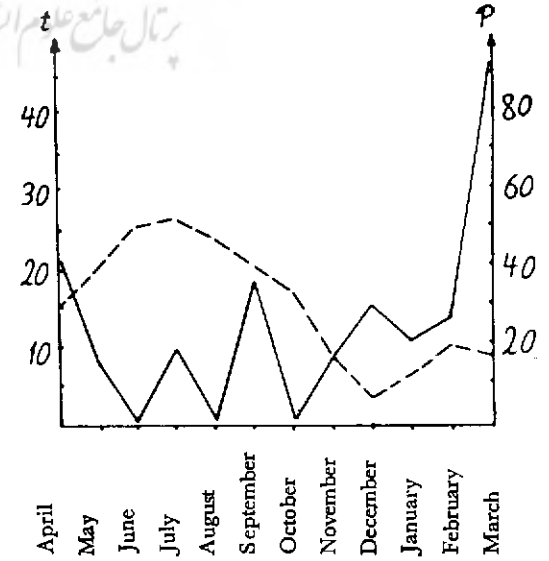
l=9.45cm



P=300.6

S=1885.94 1959–60

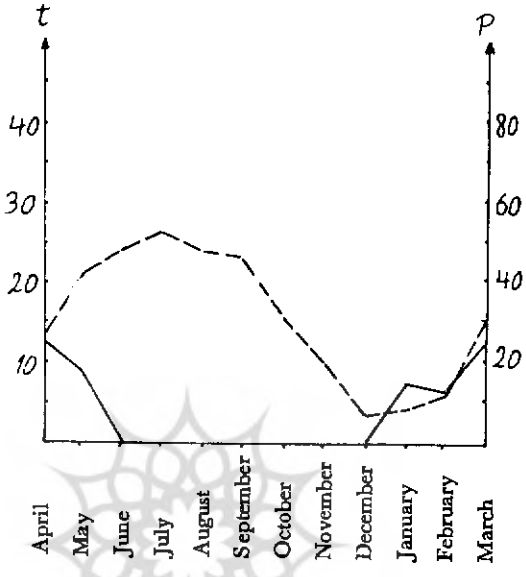
l=6.56cm



P=100.1

S=2700.1 1960–61

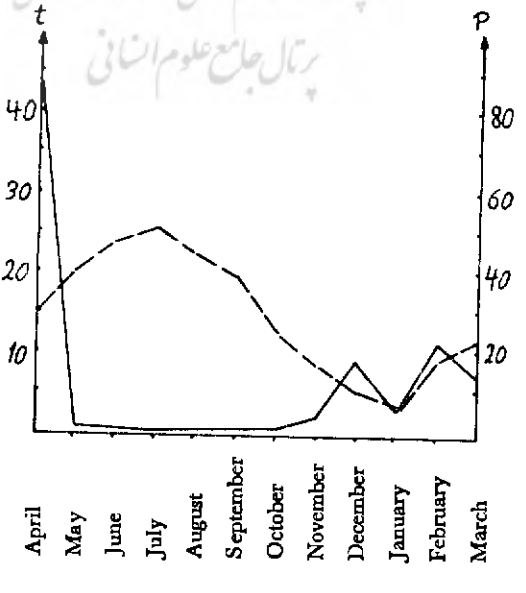
l=8.52cm



P=159.9

S=2478.950 1961–62

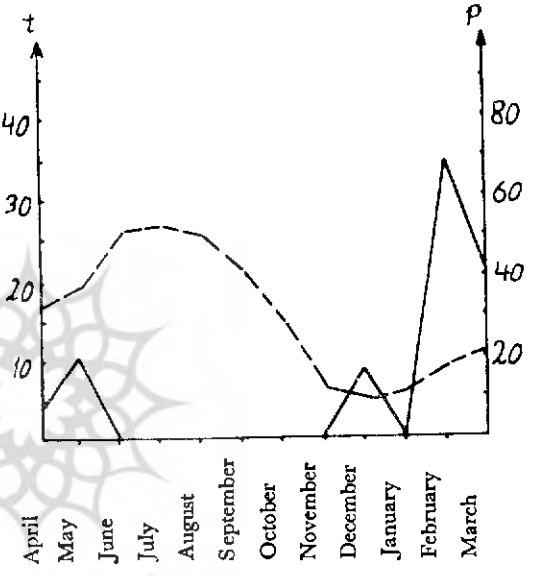
l=8.32cm



P=156.8

S=2761.03 1962–63

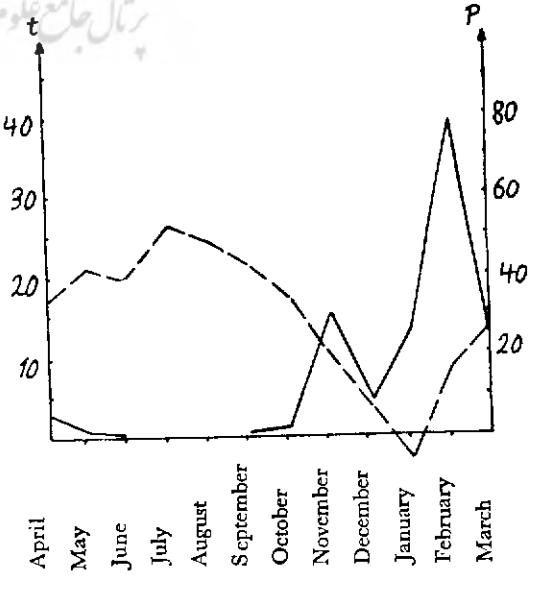
l=8.48cm



P=173.6

S=2688.25

l=6.78cm 1963–64

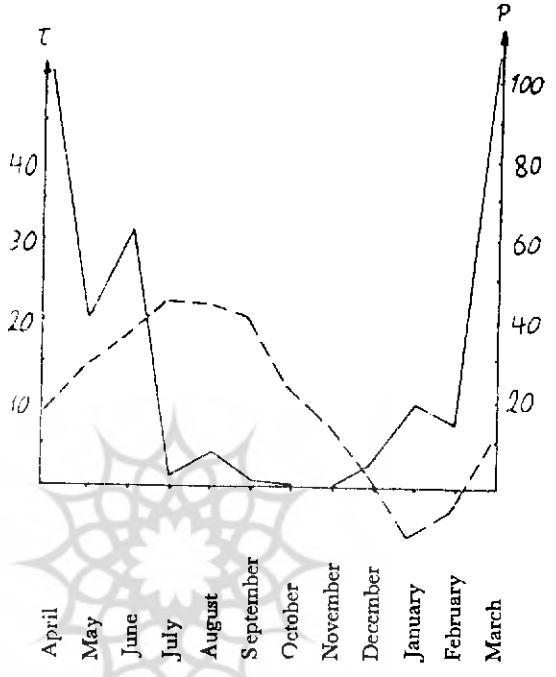


Precipitation and temperature charts to determine length of dry period, for Zanjan

P=359.8

S=1536.670 1956–57

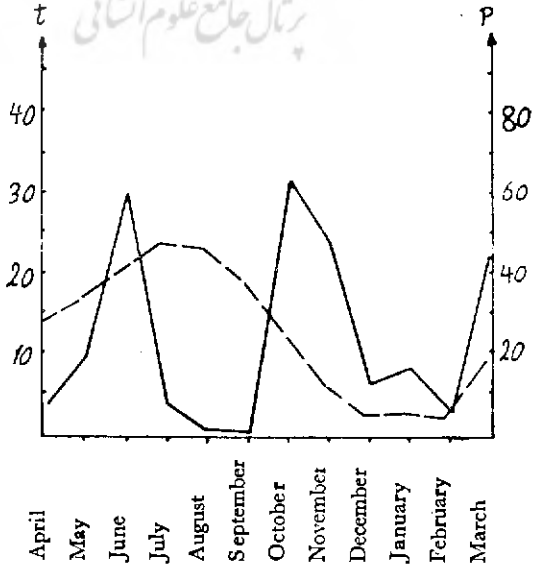
l=5.45cm



P=288.4

S=1283.190 1957–58

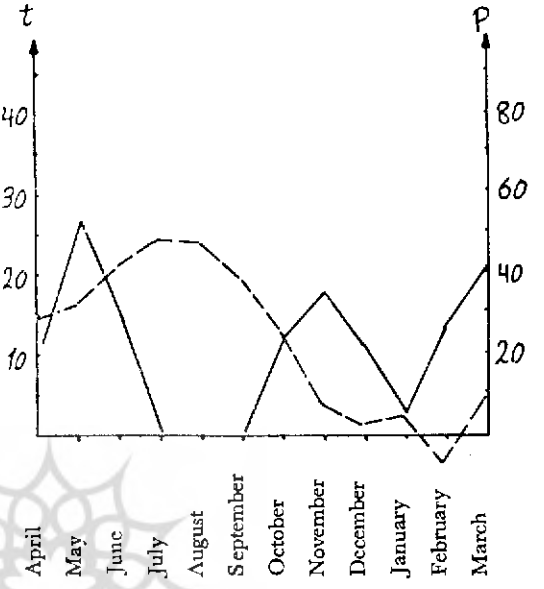
l=4.60cm



P=253.9

S=1483.380 1958–59

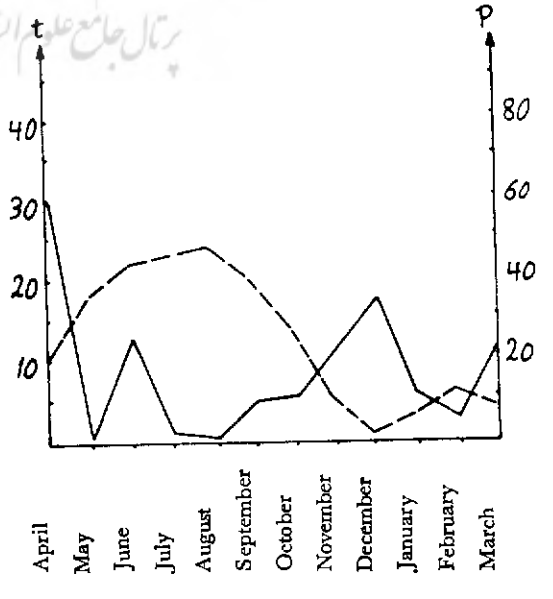
l=4.82cm



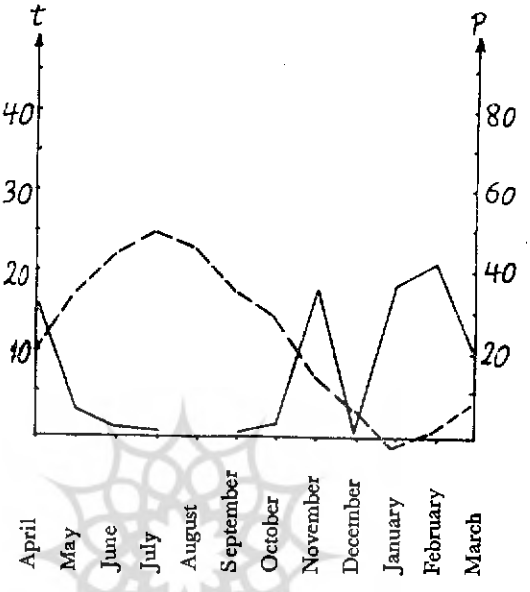
P=199.6

S=1834.44 1959–60

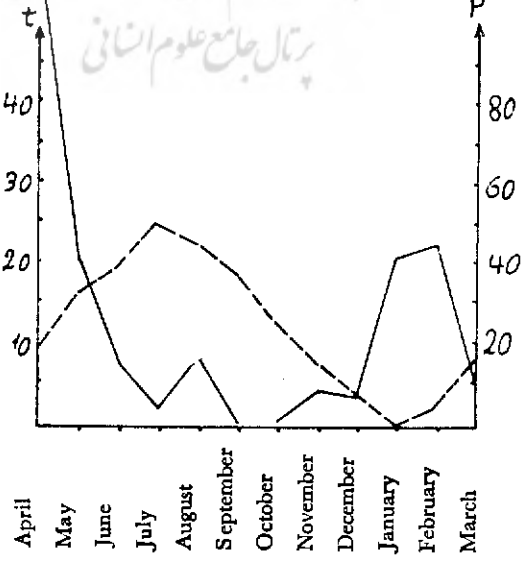
l=6.96cm



P=175.7
S=2192.2 1960–61
l=6.54cm



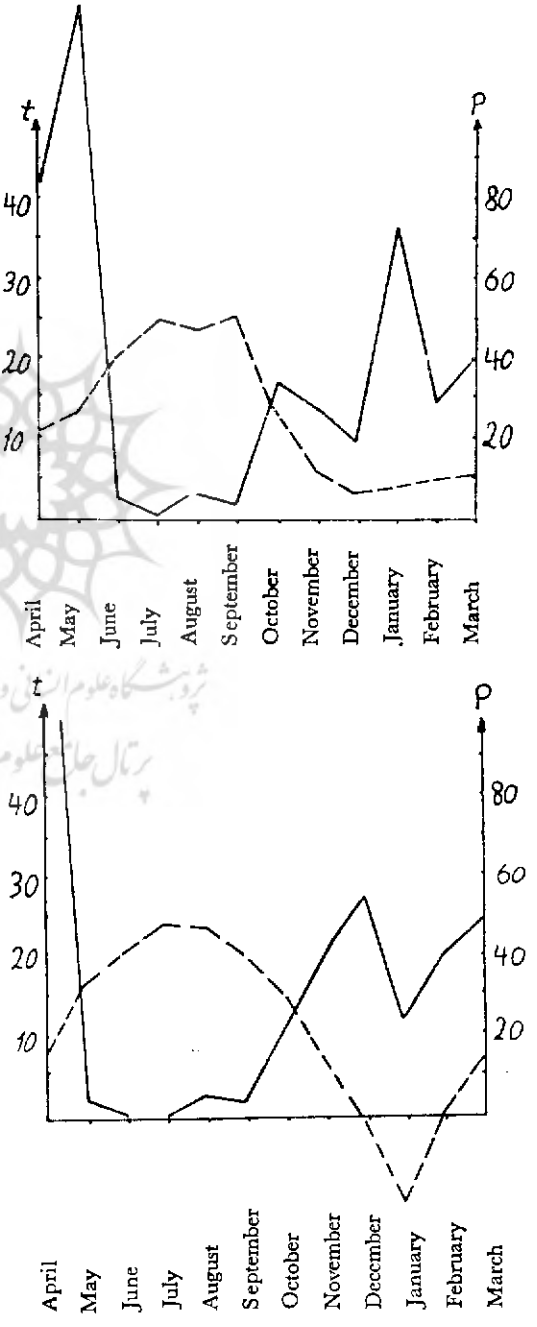
P=300
S=1653.56 1961–62
l=7.02cm



P=442.1

S=1551.25 1962–63

l=4.15cm



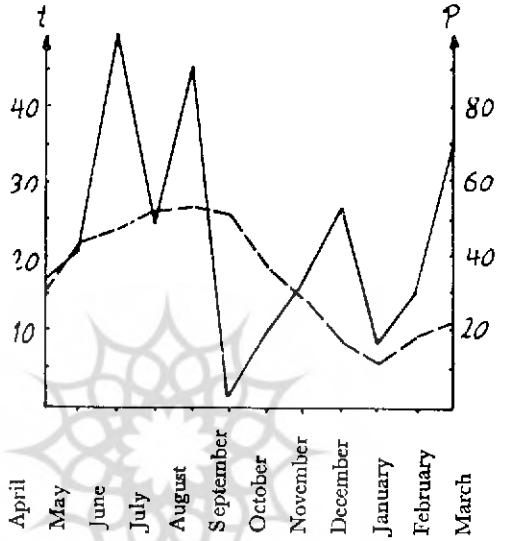
P=399.5

S=1871.11

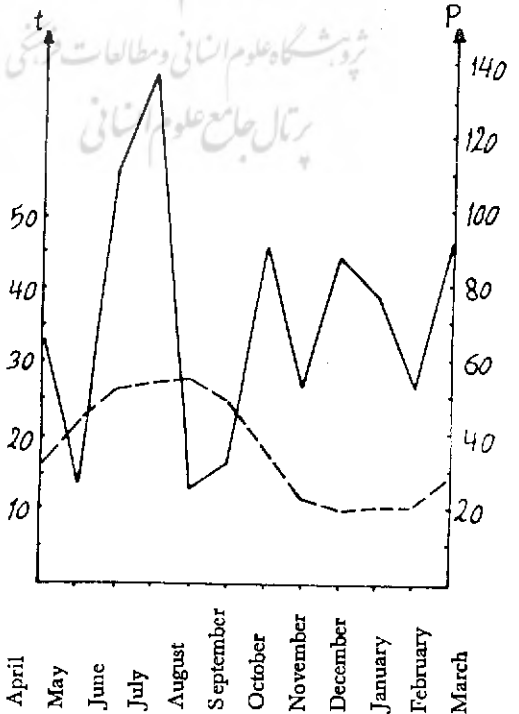
l=5.41cm 1963–64

Precipitation and temperature charts to determine length of dry period, for Gorgan

p=530.9
s=574.830 1956–57
l=3.25cm

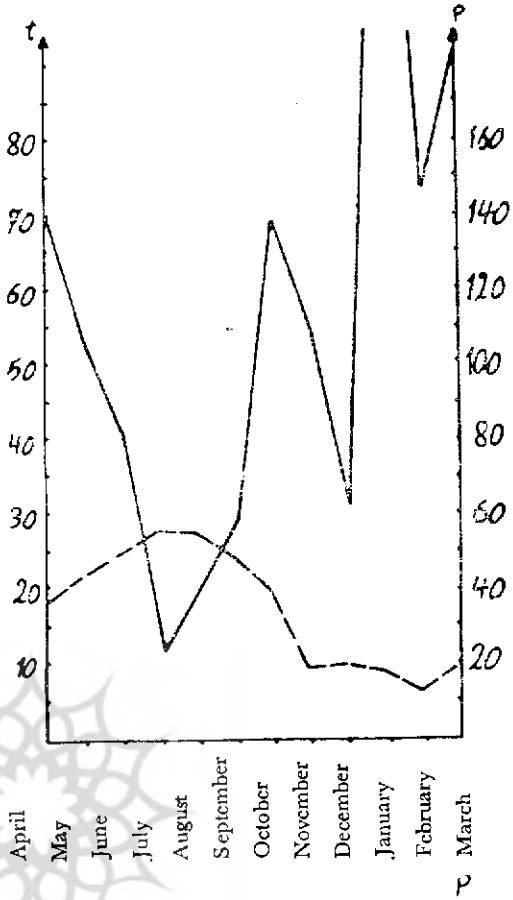


p=840.7
s=371.59 1957–58
l=2.11cm



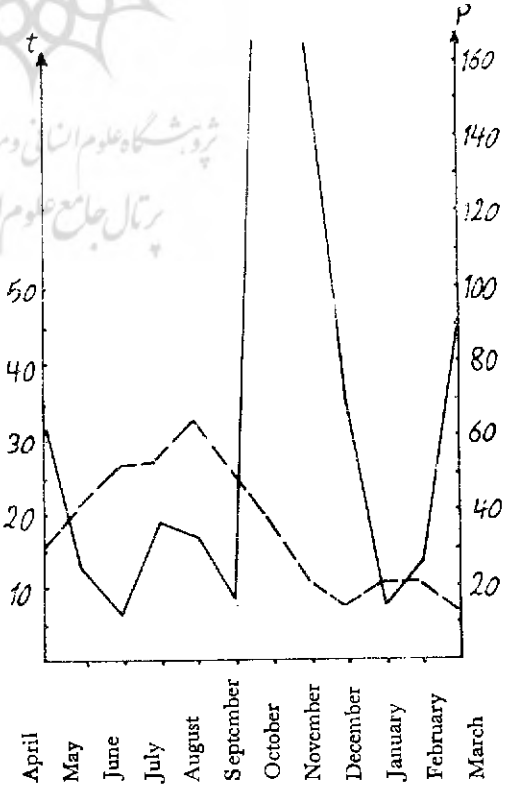
January max. 296.4

p=1382.1
s=393.12 1958–59
l=2.20cm

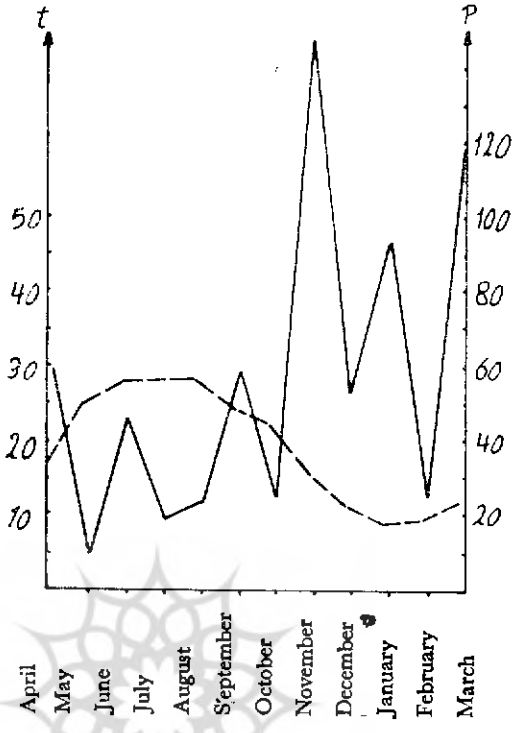


October max. 274.6

p=825.6
s=1298.19 1959–60
l=5.33cm

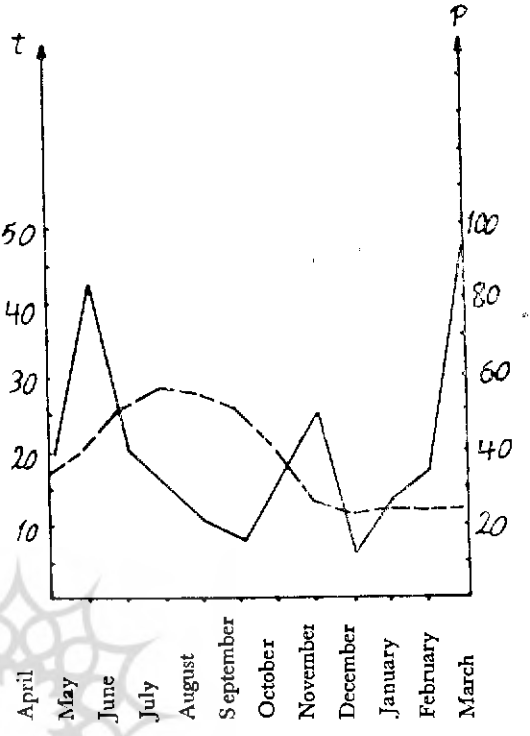


p=672.7
s=1170.60 1960-61
l=5.2cm

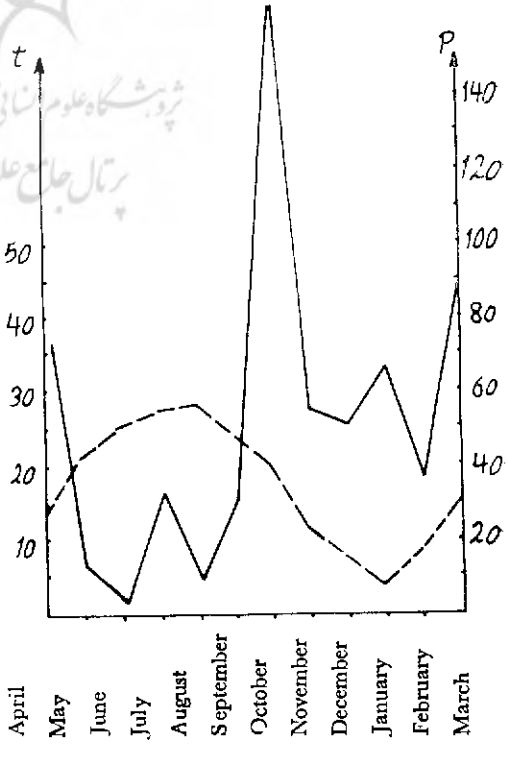


p=631.4
s=1217.51 1961-62
l=4.05cm

p=488.6
s=1140.38 1962–63
l=5.63cm

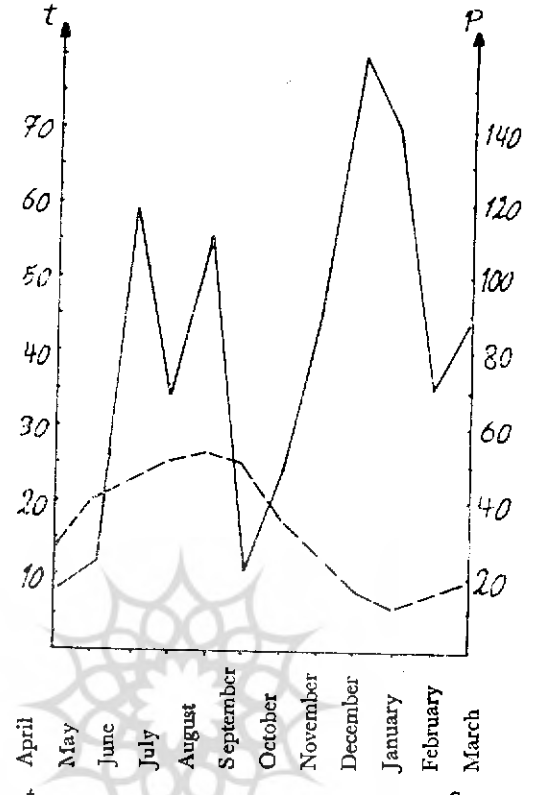


p=644.6
s=1453.66 1963–64
l=4.43



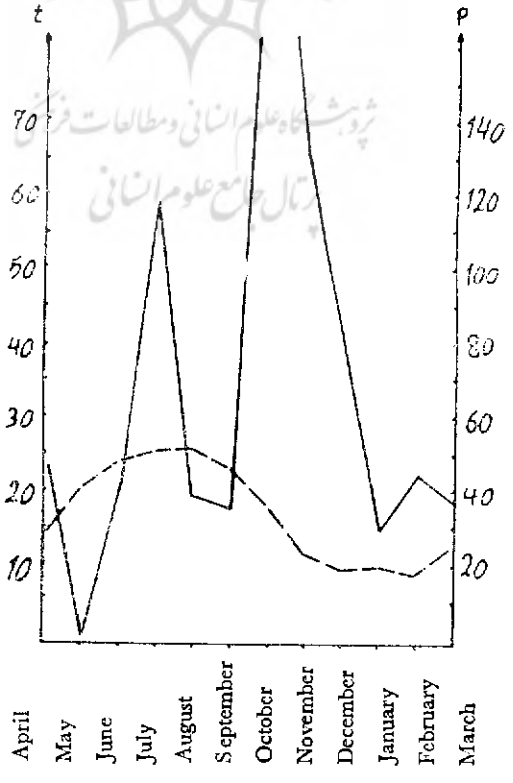
Precipitation and temperature charts to determine length of dry period, for Babolsar

p=953.5
s=329.42 1956–57
l=2.28cm

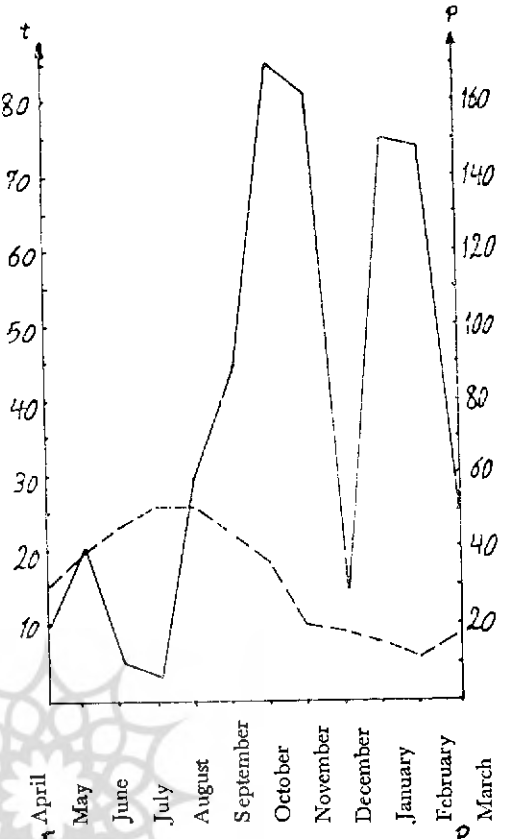


October max. 228.4

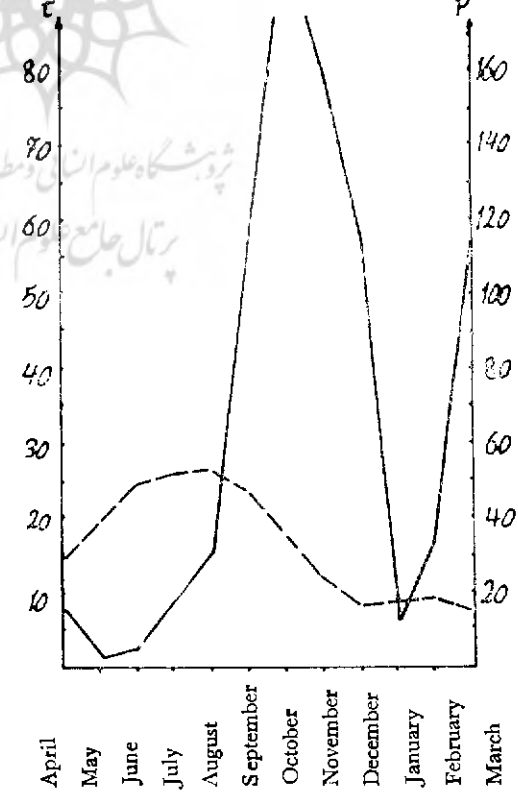
p=830.7
s=511.70 1957–58
l=3.02cm



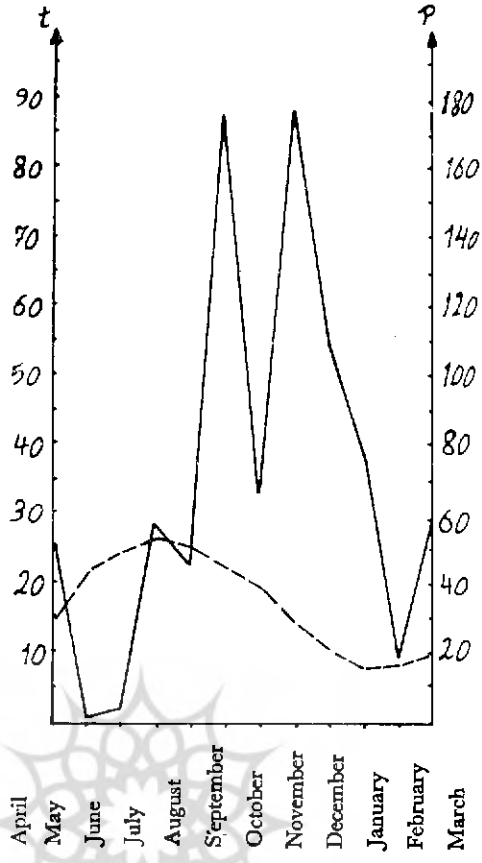
p=939.5
s=792.15 1958–59
l=3.5cm



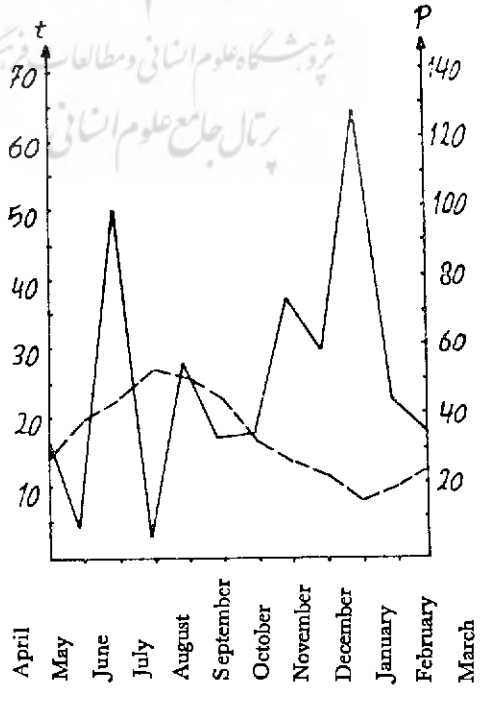
p=844.5
s=1305.4 1959–60
l=4.5cm



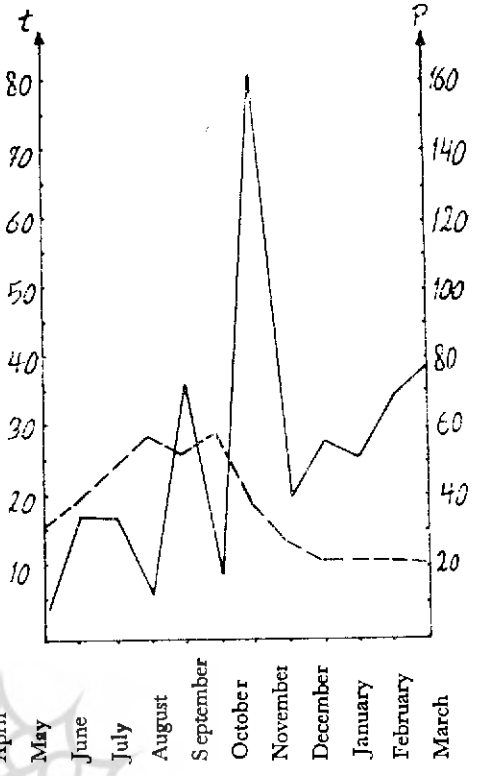
p=854.6
s=756.27 1960-61
l=2.96cm



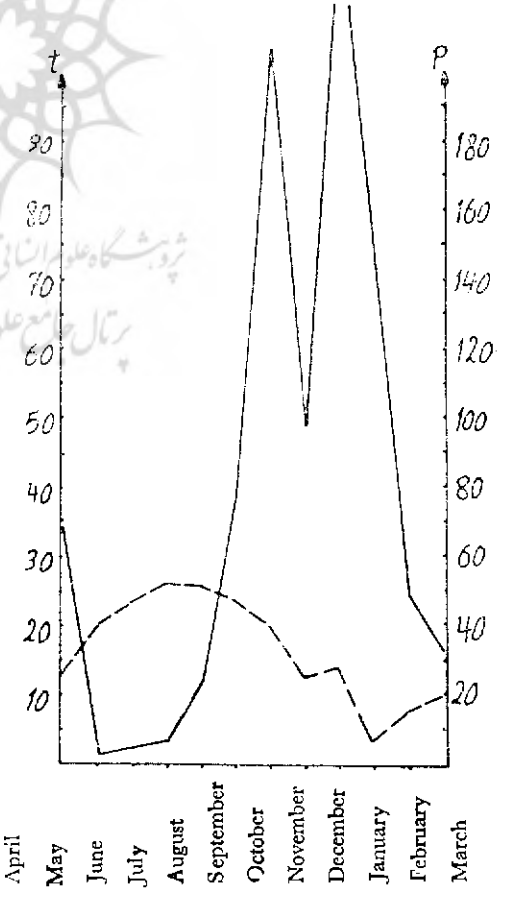
p=612.9
s=642.96 1961-62
l=4.24cm



p=638.3
s=820.91 1962–63
l=4.59cm

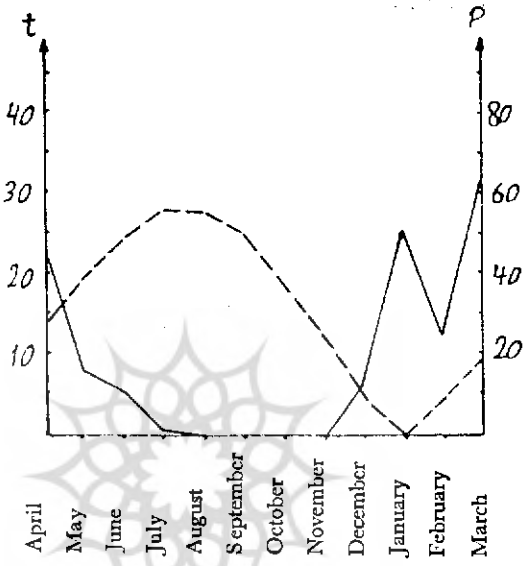


p=941.6
s=1360.85 1963–64
l=3.95

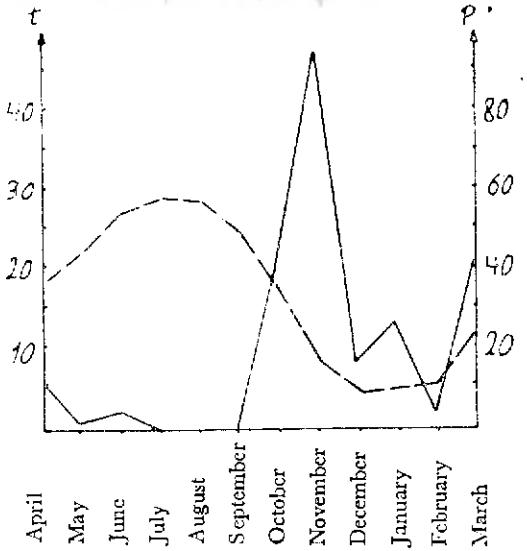


Precipitation and temperature charts to determine length of dry period, for Tehran

p=233.0
s=2731.08 1956–57
l=7.32cm



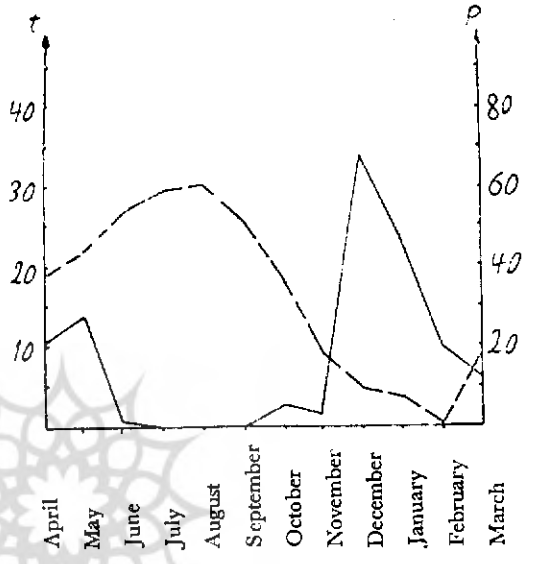
p=244.0
s=2664.90 1957–58
l=6.50cm



p=206.1

s=2884.90 1958–59

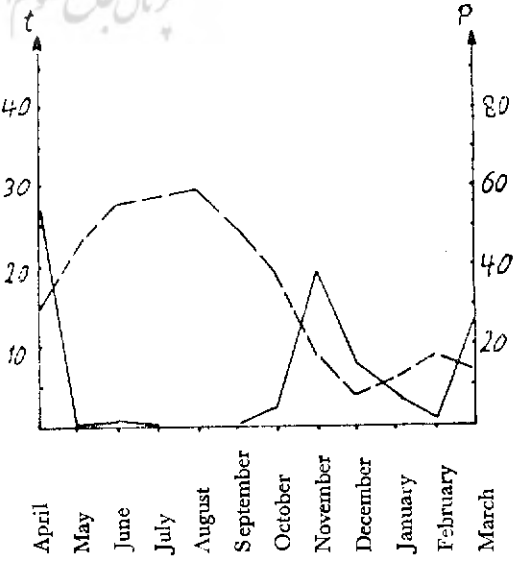
l=7.45cm



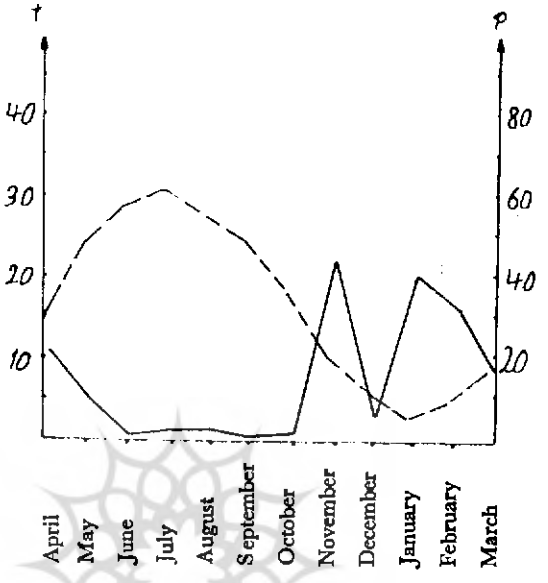
p=156.0

s=3017.260

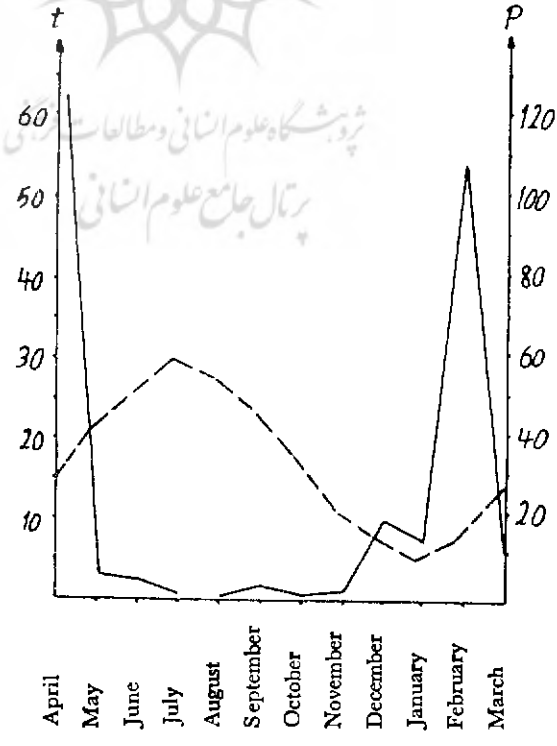
l=8.08cm 1959–60



p=168.7
s=2978.15 1960–61
l=7.15cm



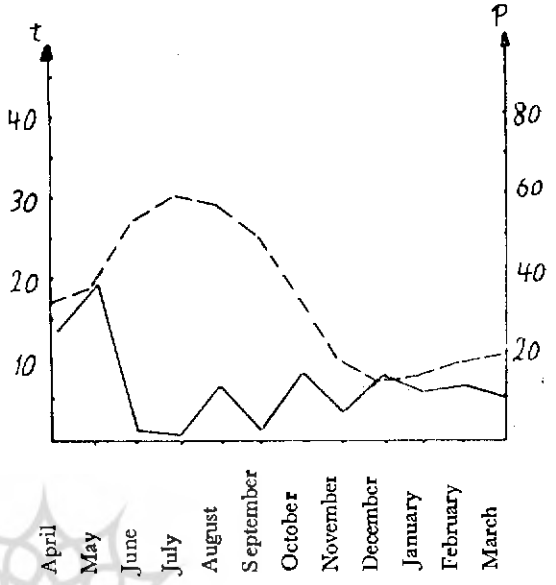
p=288.5
s=2882.77 1961–62
l=7.28cm



p=144.8

s=2647.290

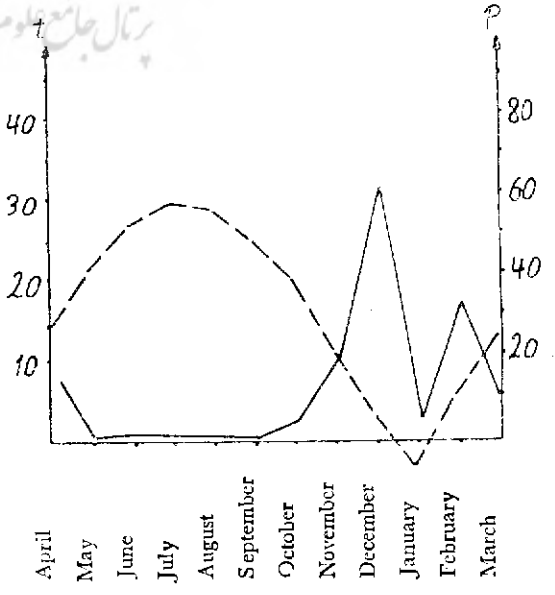
l=10.78cm 1962–63



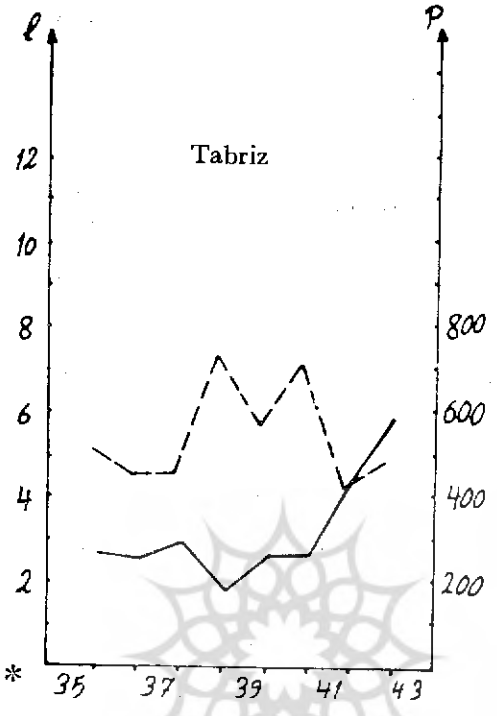
p=147.8

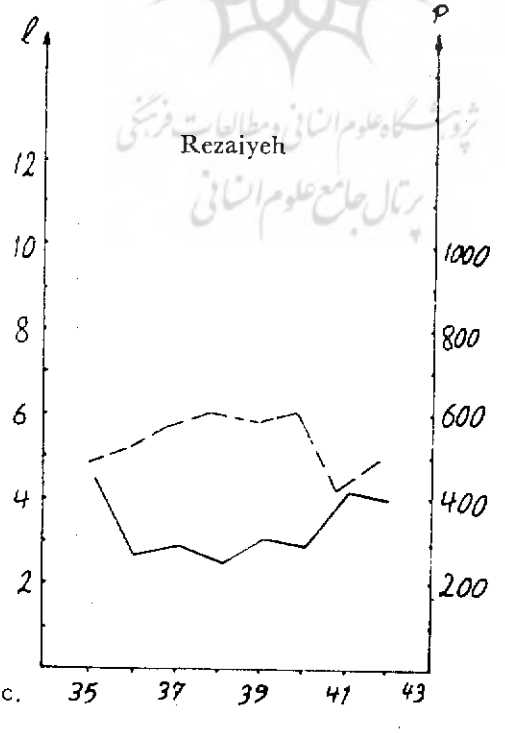
s=3069.41 1963–64

l=7.46 cm

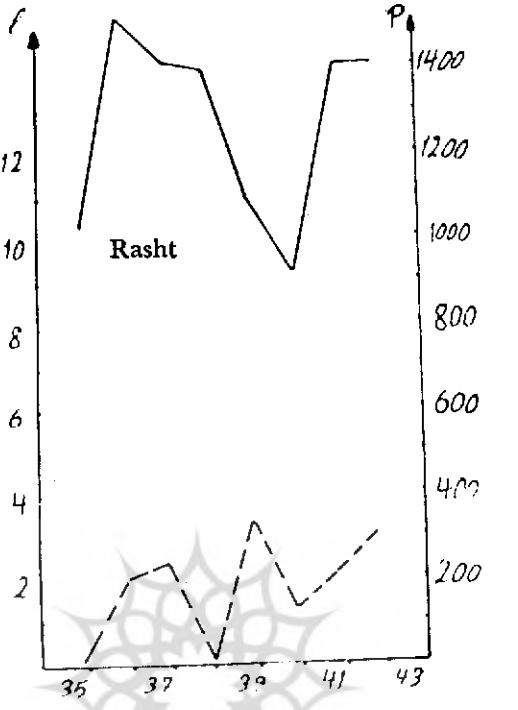


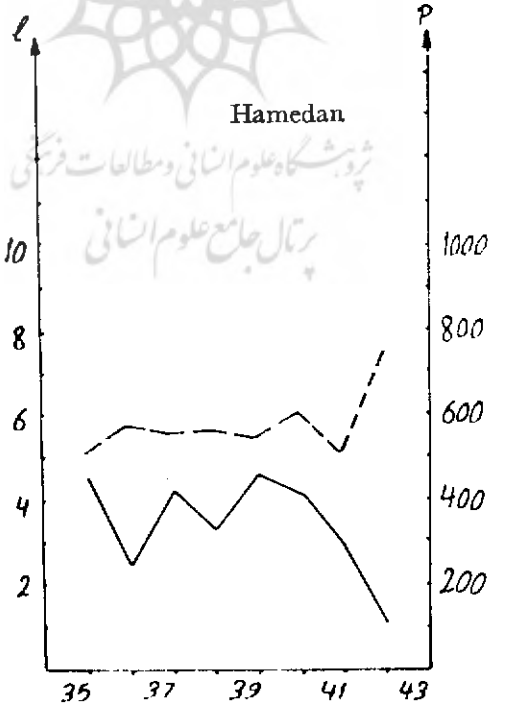
charts depicting changes in length of dry period and precipitation in various years

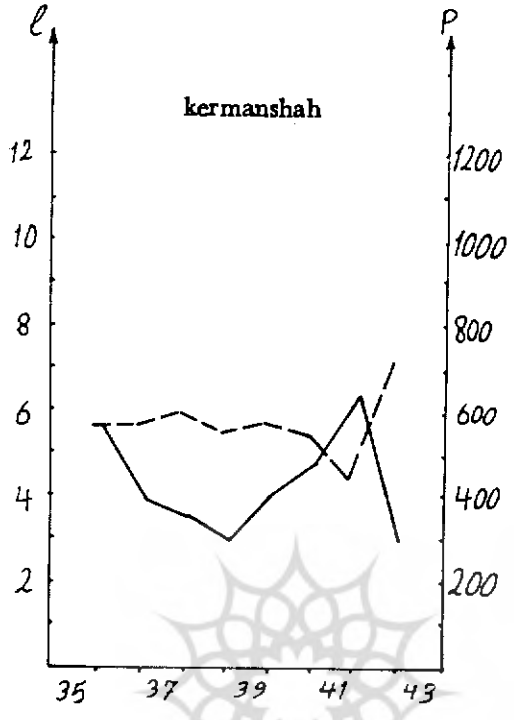


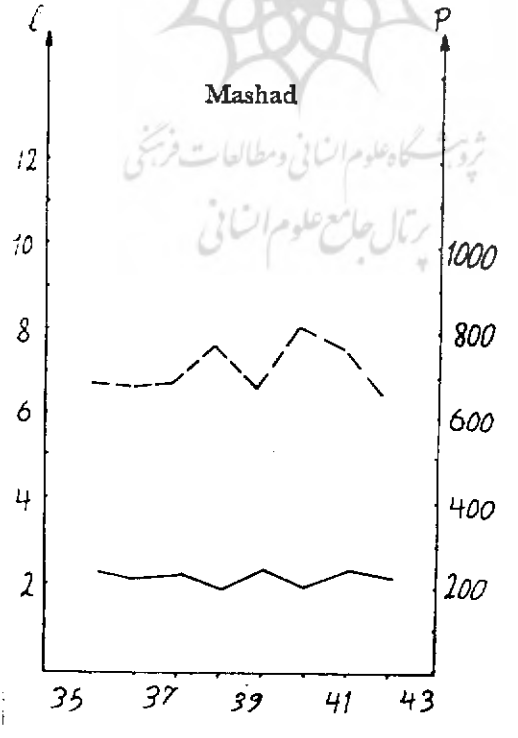


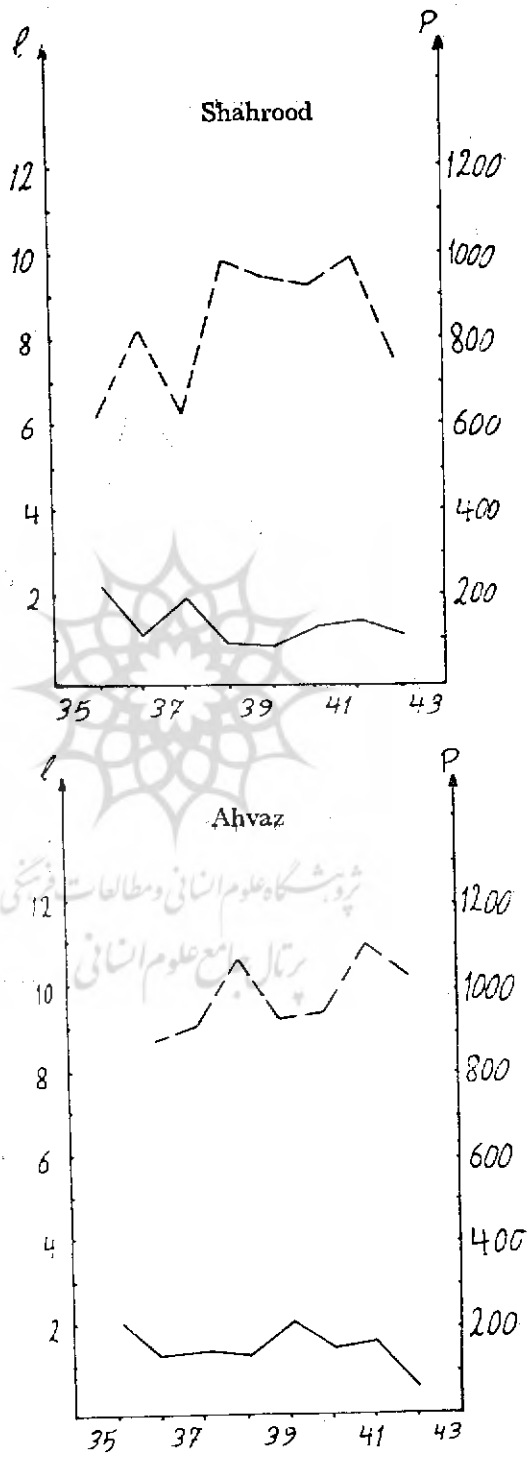
*1335 = 1956 p. c.

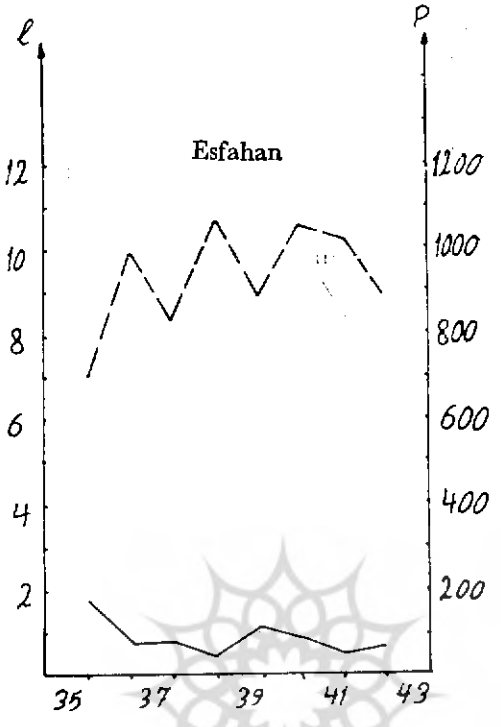


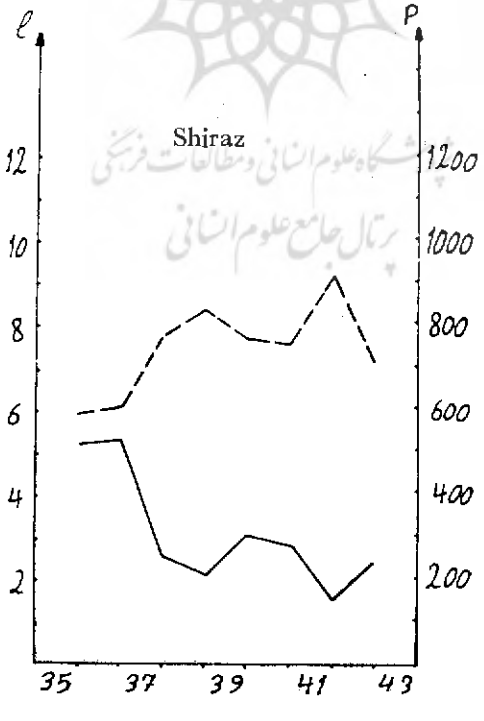


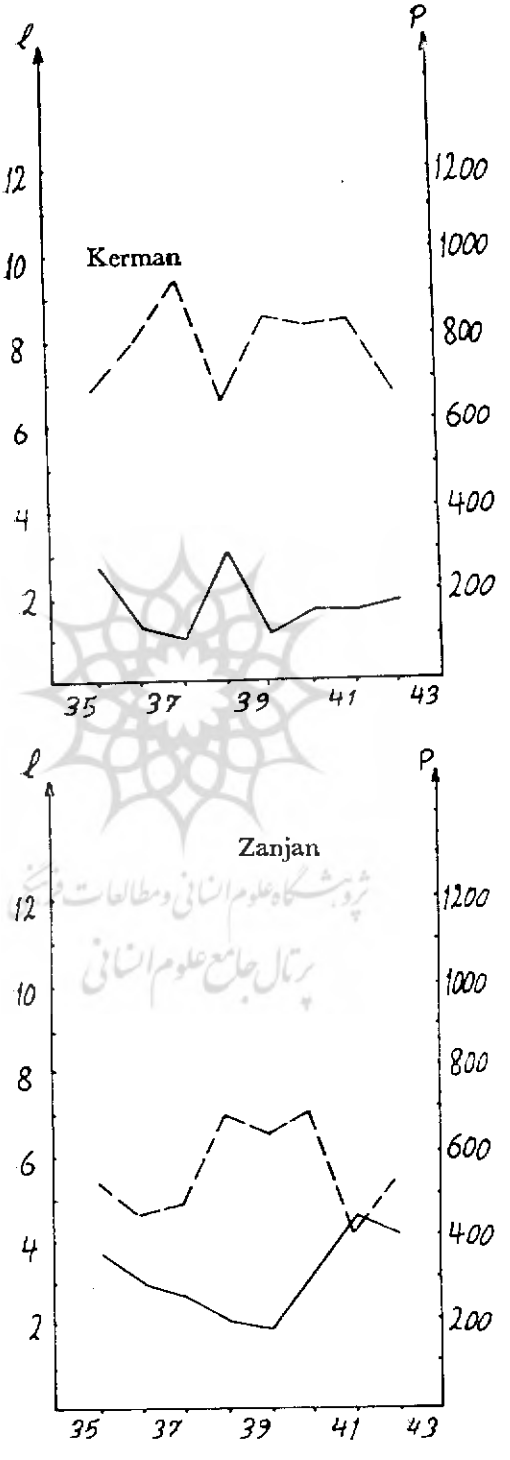


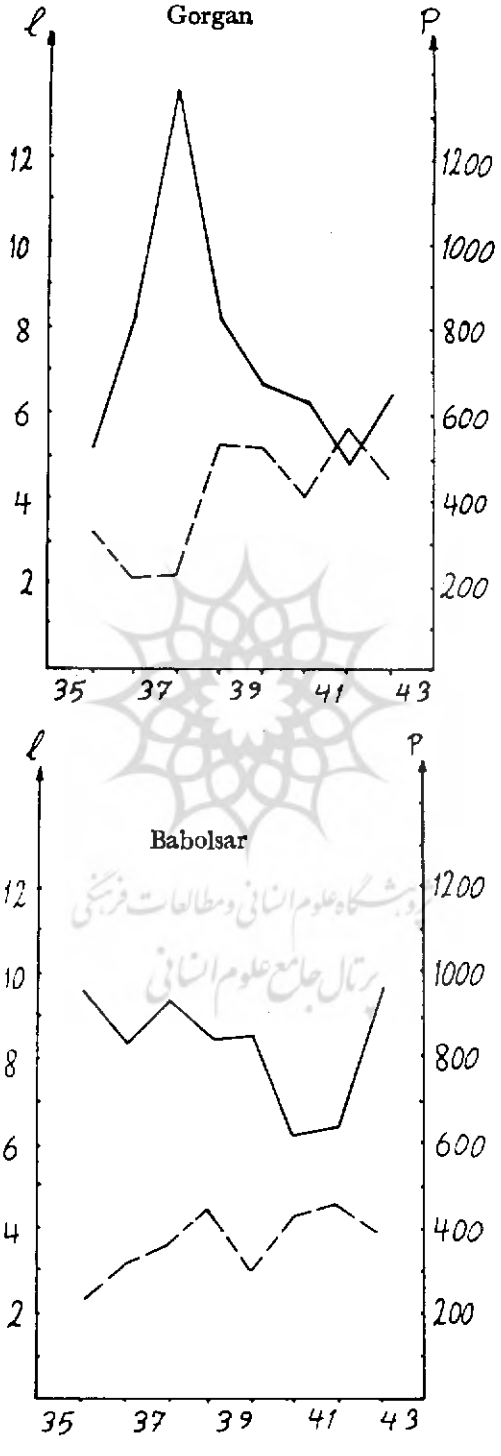


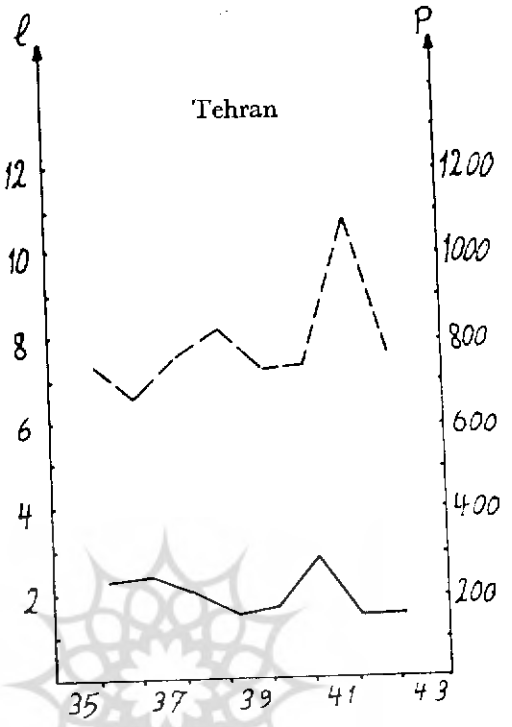




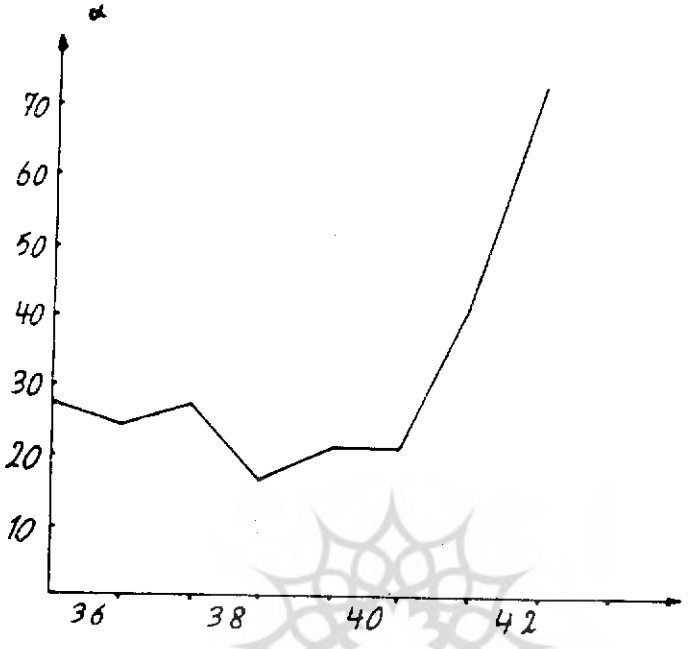






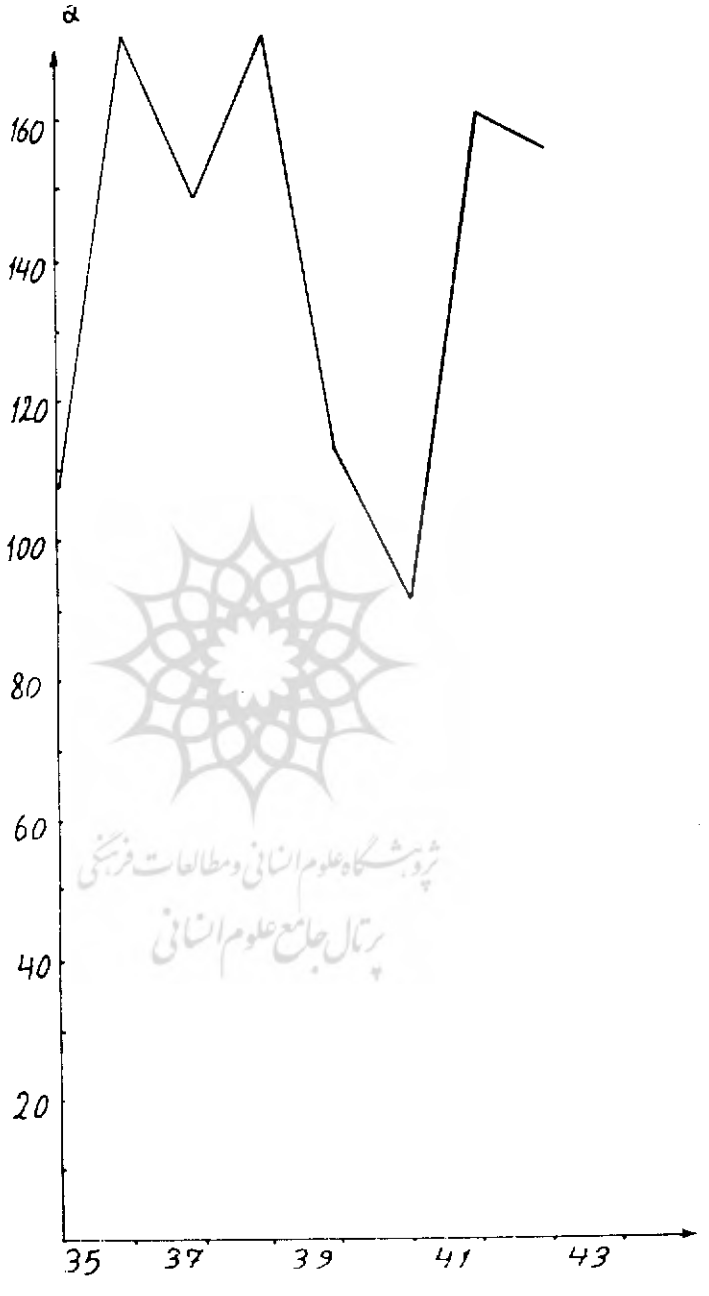


Charts depicting changes in the coefficient of aridity in various years

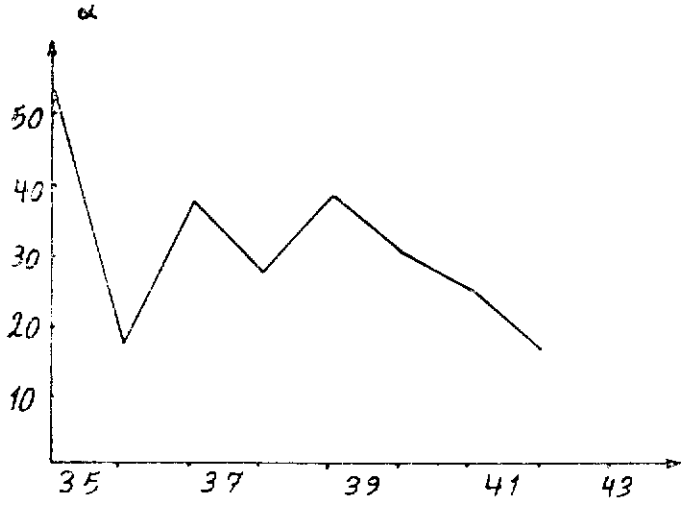


Tabriz

Rezaiych



Rasht



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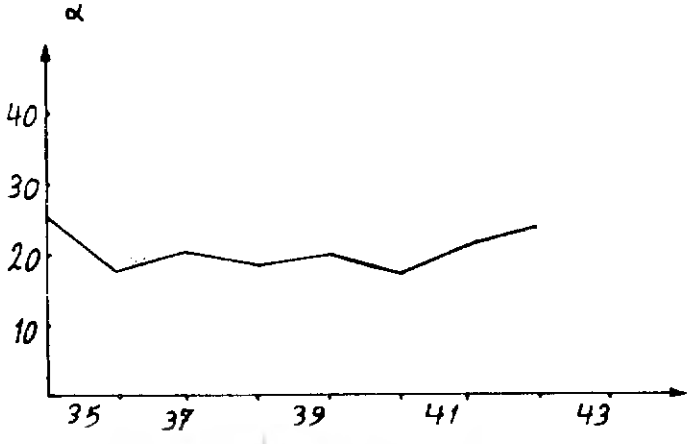

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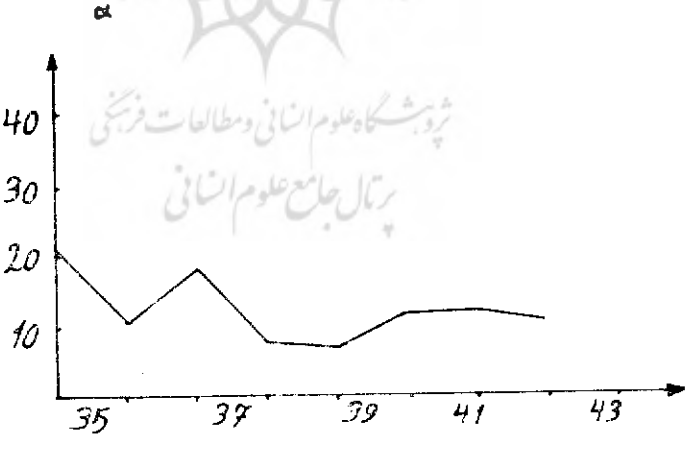

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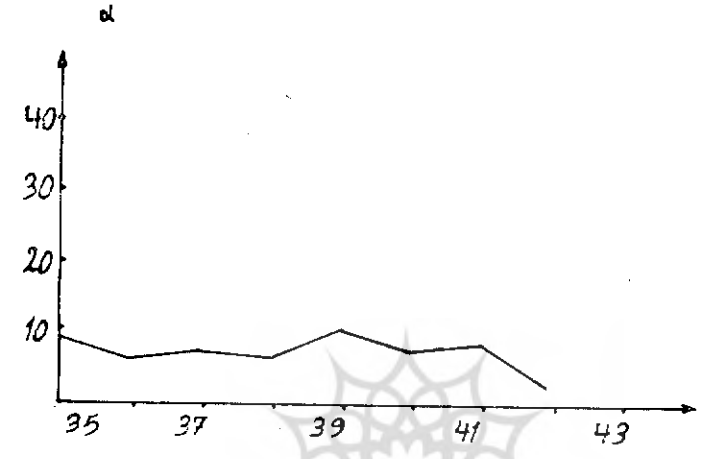

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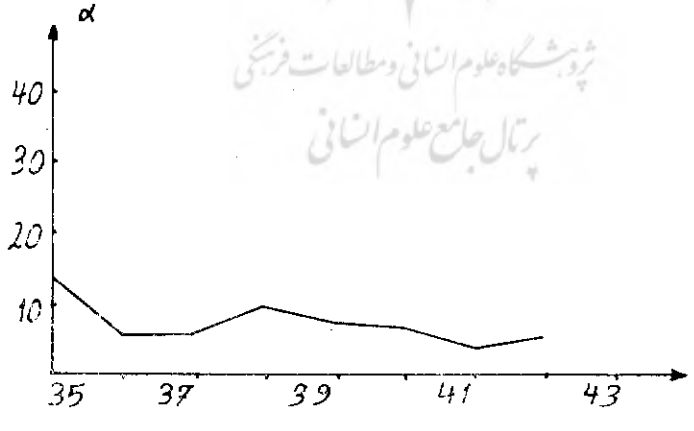

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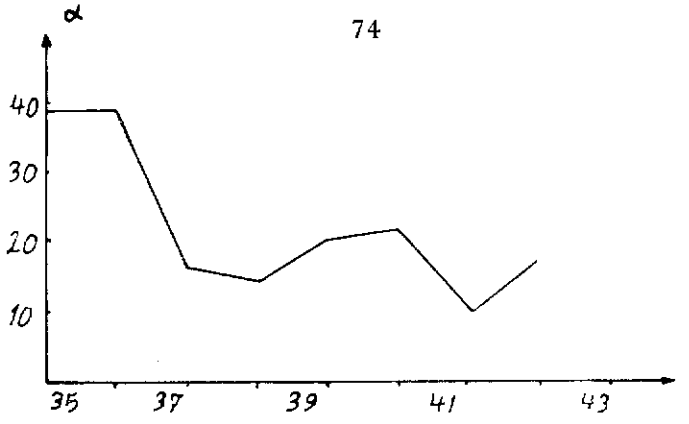

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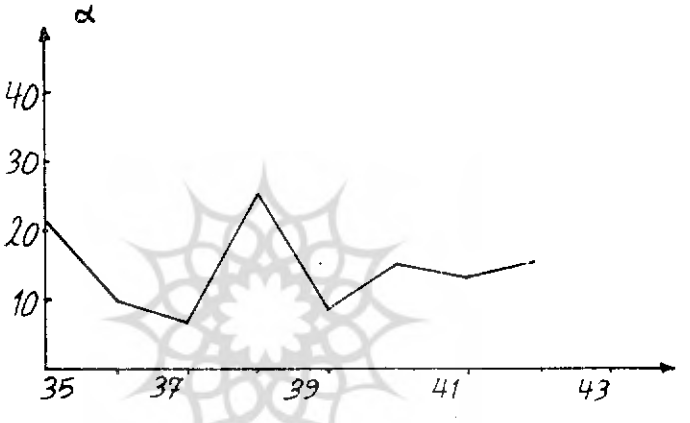

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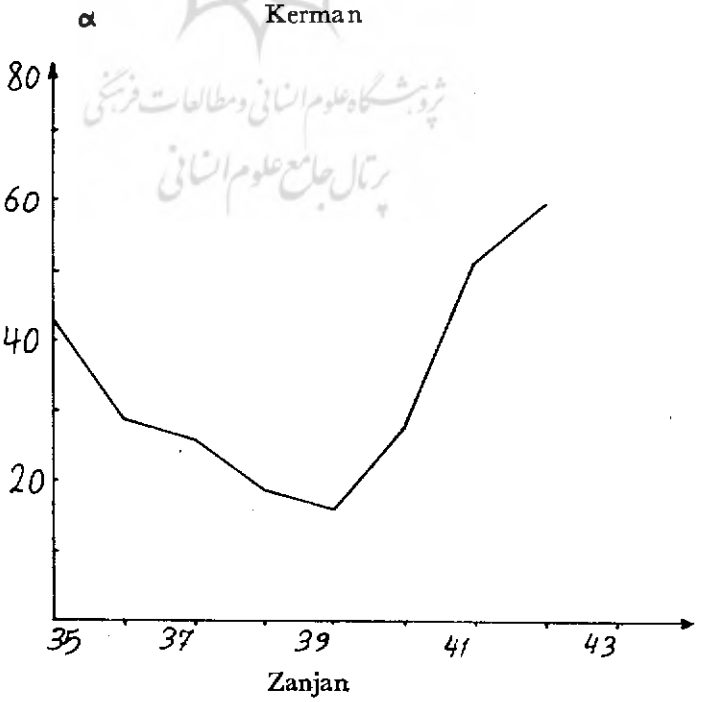

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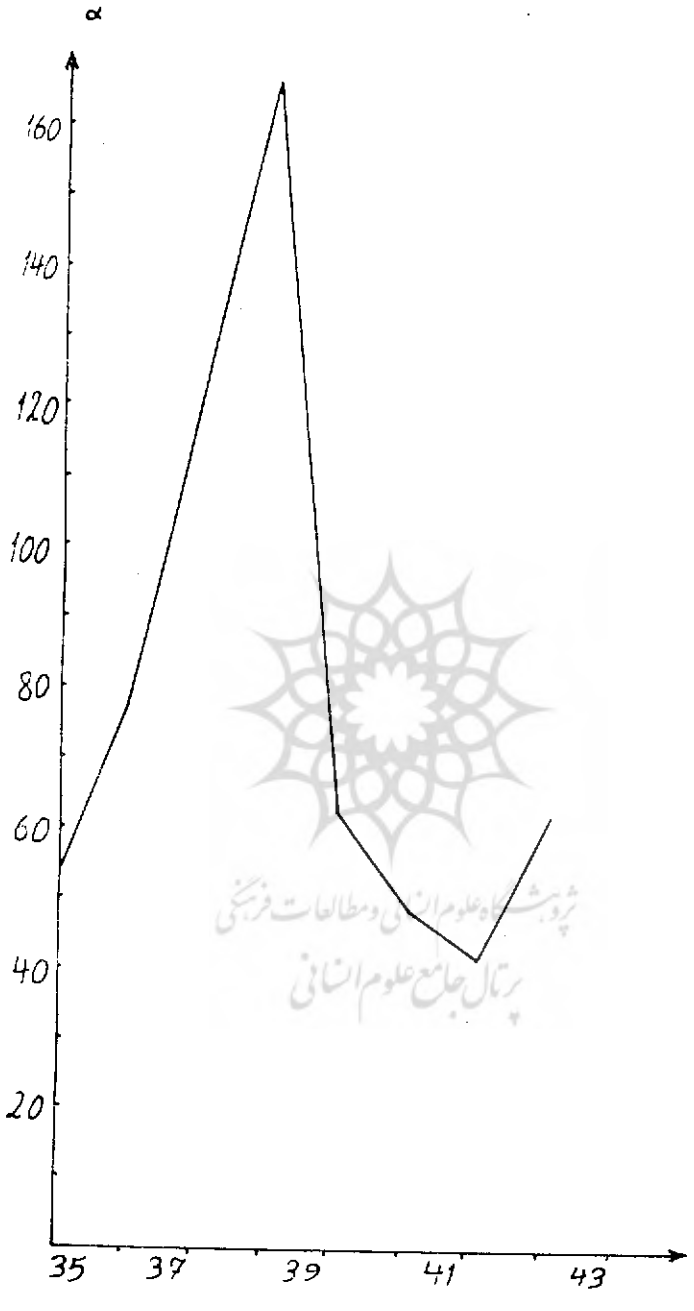

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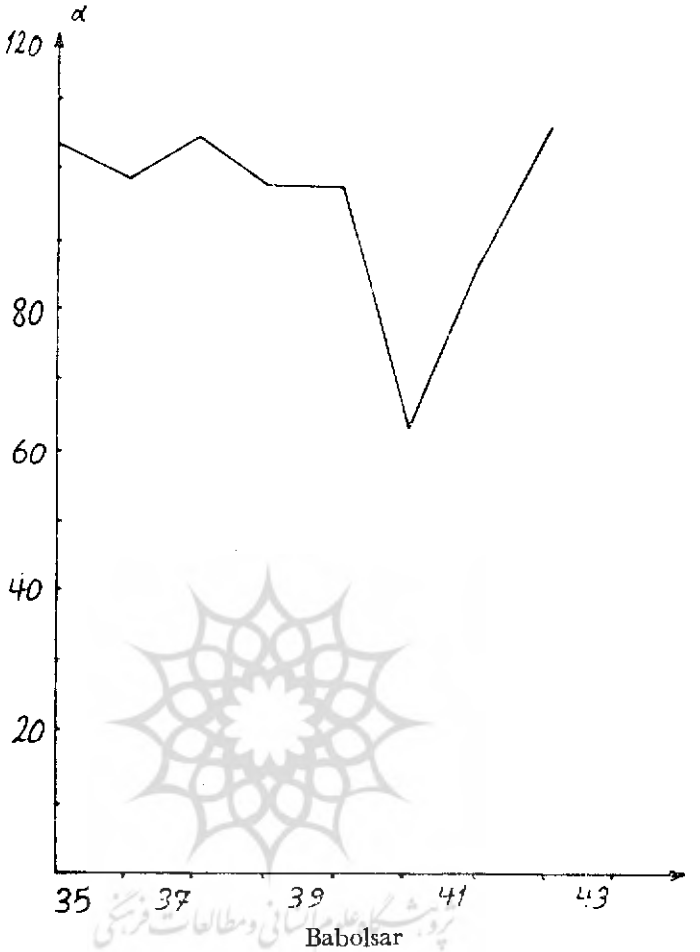

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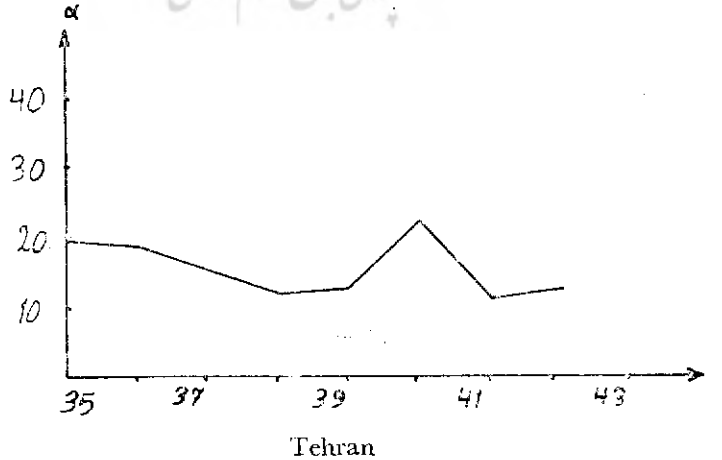

Tehran