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Patterns of Flowering Periods in Selected Floras of the World(5)

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世界各國의 植物相花期型에 對하여(5)

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ABSTRACT

I have studied several patterns of flowering periods in selected floras of the world since 1969. The total sums and patterns of flowering periods in Netherland, South Germany, France, and Mediterranean and Palestine floras are compared.

The total sums of flowering periods of the floras are gradually increased from Netherland to Palestine. The patterns of these flowering periods are characteristic, and divided into two categories; northern temperate and Mediterranean climatic types. The patterns of Netherland, south Germany, and France flora belong to the northern temperate climatic type, and thus the peak of flowering period occur in the month of July. These patterns are particularly correlated with the factor of temperature. The patterns of Mediterranean, Greece and Palestine belong to the Meditterranean climatic type; and thus the peaks of patterns of flowering period occur in April or May.

The increasing patterns of flowering period from January to April or May seems to be dependent upon the combined factors of satisfactory precipitation and increasing temperature, while the decreasing patterns since the month of the peak is presumably greatly affected by the scanty precipitation in the high temperature seasons.

INTRODUCTION

Since 1969, I have reported several patterns of flowering periods in selected floras of the world(1969, 1971, 1972, 1973).

This study proposes to find the patterns of flowering periods in floras of Netherland, South Germany, France and Aegean, the Mediterranean and Palestine.

The patterns are showed as tables and diagrams. Particularly the patterns of flowering periods are compared with each other and also correlations between the flowering periods, temperatures and precipitations.

This study has been done during my visiting Europe and Mediterranean countries in summer of 1980.

Materials and methods.

The flora of Netherland, South Germany, France, the Mediterranean and Palestine are used for calculating the data of flowering periods.

The temperatures and precipitations are taken from the world weather records. The bibliography below lists the principal sources used for the calculation.

Les Quatre Flores de La France by P. Fourier Editions Paul Lechevatier in 1961.

Flowers of the Mediterranean by Oleg. Poluniny Anthony Haxley in 1965.

Flora Palestine Vol. One Text. by Michael Zohary in 1965.

Flora Palestina Vol. Two Text. by Michael Zohary in 1972.

Pflanzensoziologische Excursions flora für süddeutschland und die angrenzenden Gebiete by Prof. Dr. Oberdorfer in 1970.

Flora van Netherland by Dr. S. T. Van Ooststroom in 1977.

Flora of Greece and Aegean by Anthony Huxley and William Talar in 1977.

Flowering periods of the floras were calculated from January to December. The total of the flowering periods in a month is expressed in two ways, viz. absolute number of flowering entries, and number of species which are in flower in percent of the total number of species. If one species continues to bloom during the year from January to December, this is counted for each month in the year. The data of temperature and precipitations were taken from the following records of weather stations.

Nethernlands; De Bilt.

South Germany; Essen, Frankfurt, Friedrichafen, München, Saarbruecken, Stuttgart, Trier, Zugspitze.

France; Bordeaux, Bourges, Brest, Lyon, Nancy, Nantes, Nice, Nimes, Paris, Strasburg, Toulduse.

Greece and Aegean; Athens, Miraklion, Patral, Samos.

Mediterranean; Gibralter, Valencia, Athens.

The monthly mean values for temperature and precipitation were calculated as averages of the values from a number of weather stations in each country.

The flowering periods for each flora were figured together with temperatures and precipitations in order to find correlations between the factors.

The calculations as well as some of the climatological data are further transferred to a number of diagrams, which may facilitate comparisons. (Fig. 1, 2, 3, 4, 5, 6).

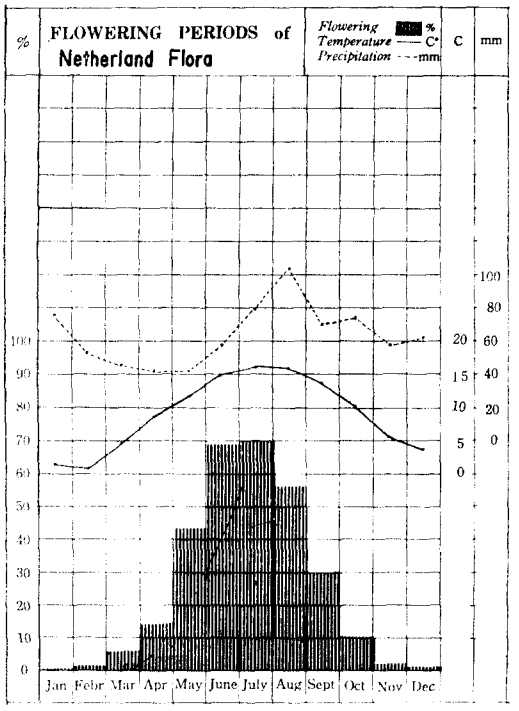

Fig. 1. Flowering periods of Netherland Flora.

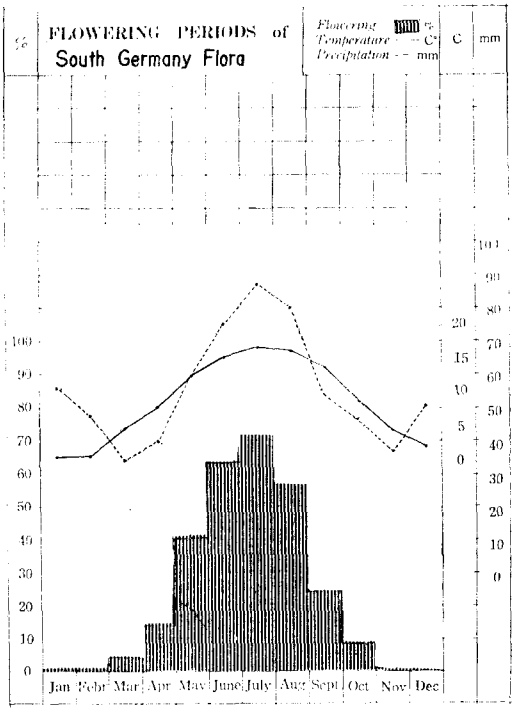

Fig. 2. Flowering periods of South Germany Flora.

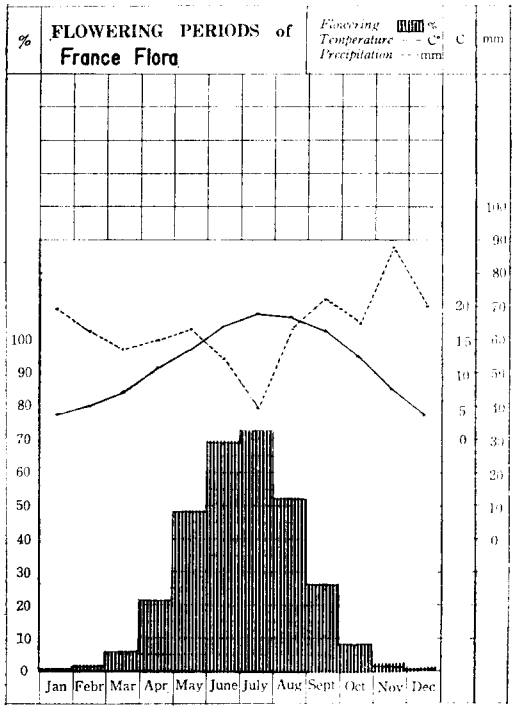

Fig. 3. Flowering periods of France Flora.

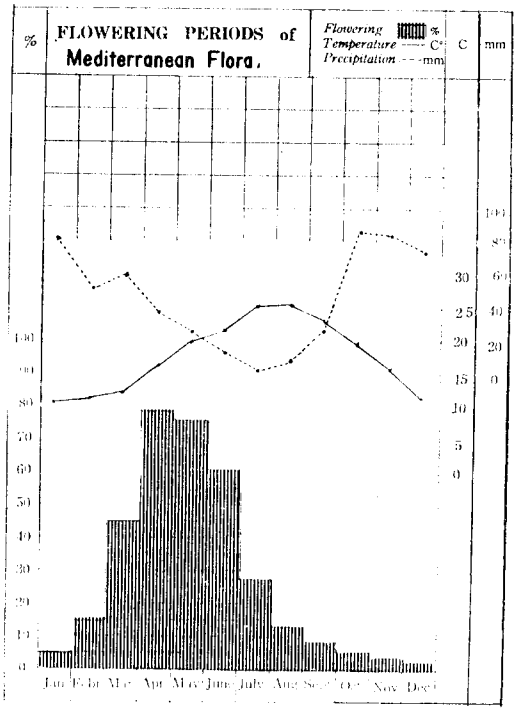

Fig. 4. Flowering periods of Mediterranean Flora.

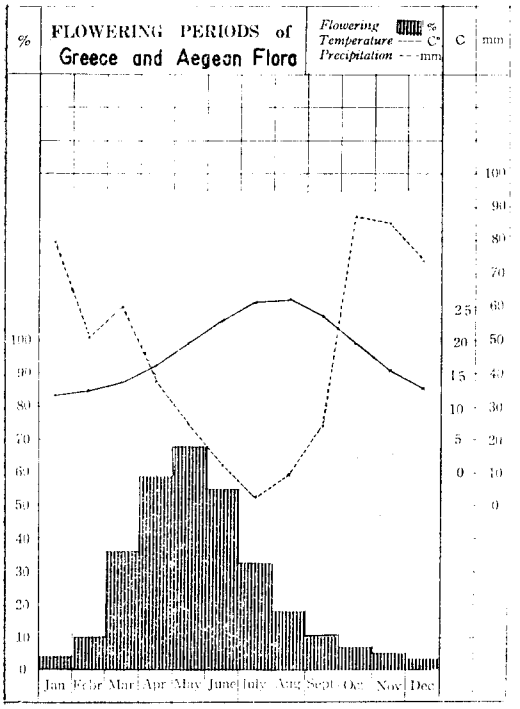

Fig. 5. Flowering periods of Greece and Aegean Flora.

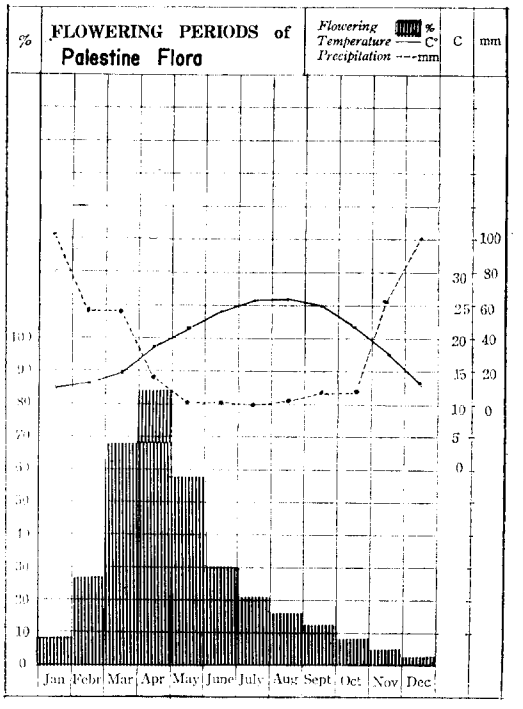

Fig. 6. Flowering periods of Palestine Flora.

RESULT

Result of the calculated data as following tables(Table 1, 2, 3) and figures(Fig. 1, 2, 3, 4, 5, 6)

Table 1. Temperatures

Locality	1	2	3	4	5	6	7	8	9	10	11	12	Month Mean
Netherland	2.1	1.4	5.0	8.1	12.2	15.1	16.7	16.3	14.1	10.3	6.1	4.2	9.3
South Germany	−1.1	−0.9	3.4	6.8	11.3	14.4	16.1	15.3	12.3	7.8	3.4	1.2	7.7
France	3.8	5.1	7.2	10.7	13.8	19.4	19.3	18.7	16.7	12.8	7.7	4.0	11.5
Greece and Aegean	11.0	11.7	12.6	16.1	20.2	24.5	26.8	27.1	23.6	19.7	15.7	12.6	17.9
The Mediterranean	11.6	12.2	13.8	16.1	19.5	22.9	25.6	25.9	23.4	19.5	15.4	12.6	18.2
Palestine	12.7	13.2	14.9	18.4	21.8	24.7	26.2	26.7	25.5	22.8	18.1	14.0	20.0

Table 2. Precipitation

Locality	1	2	3	4	5	6	7	8	9	10	11	12	Month Total
Netherland	74.7	51.9	44.5	42.5	42.8	59.2	79.4	104.7	69.9	74.6	57.0	65.3	766.5
South Germany	79.3	70.5	57.1	63.5	82.7	103.7	111.0	100.1	76.6	70.0	60.1	74.5	950.9
France	69.3	62.7	57.7	60.3	63.1	54.2	39.9	63.1	72.8	65.3	88.8	70.7	768.0
Greece and Aegean	121.9	59.6	65.9	33.0	23.7	7.0	1.5	3.3	18.1	67.6	93.4	96.6	608.2
The Mediterranean	80.3	50.2	59.5	37.6	24.0	12.0	2.3	8.8	24.0	86.7	84.7	73.0	543.1
Palestine	103.0	57.9	56.9	16.5	3.4	0.03	0.03	0.00	1.4	6.4	64.5	104.0	421.9

Table 3. Flowering entries and percentage

Locality	Taxa Total	1	2	3	4	5	6	7	8	9	10	11	12	Month
Netherland	1148 3126	1	5	47	169	484	784	715	525	308	78	9	2	Entrie
	301.7%	0.1	0.4	4.1	14.7	42.2	68.3	62.3	45.7	26.8	6.8	0.8	0.2	Percentage
South	2272 6459	3	17	99	335	922	1433	1631	1287	553	170	6	3	Entries
Germany	284.1%	0.1	0.7	4.4	14.7	40.5	63.1	71.8	56.6	24.3	7.5	0.2	0.1	Percentage
France	3607 11366	25	68	223	792	1768	2502	2652	1929	968	334	71	24	Entries
	314.5%	0.7	1.8	6.4	21.9	49.0	69.3	73.5	53.4	26.8	9.2	1.9	0.6	Percentage
Greece and	622 1920	22	63	288	367	419	343	204	115	66	44	29	20	Eetries
Aegean	308.5%	3.5	10.1	36.6	59.0	67.4	55.1	32.8	18.5	10.5	7.1	4.7	3.2	Percentage
The Medite-	562 1918	30	84	252	437	425	339	155	77	49	32	23	15	Entr es
rranean	340.9%	5.3	14.9	44.8	77.6	75.6	60.3	27.6	13.7	8.7	5.7	4.1	2.6	Percentage
Palestine	1071 3654	93	291	726	892	611	326	226	176	139	93	51	30	Entries
	341.3%	8.6	27.2	67.7	83.3	57.1	30.4	21.1	16.7	12.9	8.7	4.8	2.8	Percentage

DISCUSSION

Flowering plants exist in complex environments on the earth. Raunkiaer analysed the position and protection of vegetative winter buds, and finally approached a conception that plant life forms are climatic indicators. On the basis of local floras Raunkiaer calculated lifeform spectra giving the percentage distribution of his lifeforms in a flora, and he also compared lifeform spectra from different parts of the world.

In the present study the author used flowering periods of all species in a flora and brought the

data together in diagrams showing the monthly percentage of flowering species. The flowering is the most important period in the life of a plant species. Thus, such diagrams are believed to express something essential about a flora.

In the early part of the twentieth century, flowering were studied by many scholars using current methods, and they found many influential factors of flowering (Salisbury 1963). The main internal factor is florigen and the major external ones are temperature, light and day length. Initiation of flowering is controlled by florigens. The florigens are principally affected by the temperature and photoperiodism.

During the flowering period, the growth of vegetative organs is inhibited, while in a vegetative period flowering maybe controlled. Florigen activations are key factors for flowering. Some florigens keep flowering constantly even in different environments, while some florigens do not. Many of the transplanted temperate plants are blooming the year round in tropical Java, but some of these plants are blooming only during a limited part of the year, and may have a genetically fixed flowering time. Many indigenous Java plants are flowering throughout year, but some of them are not.

Flowering periods of the species in a flora are influenced by the environmental factors, climatic as well as topographic, and even geohistoric ones. The flowering periods of a total flora may be looked upon as a sum of responses of the flora to the environmental conditions during the year.

From Netherland, South Germany and Quatra France, the total sum of flowering periods of the floras and the number of species in each flora gradually increase.

The patterns of these floras are characteristic and very similar each other, and the peak flowering periods occure in July. The patterns of flowering periods are correlated with the curve of temperature in each country.

The flowering patterns of the Mediterranean, Greece and Aegean, and Palestine floras are very close each other, the peaks of flowering periods occur in April or May. The increasing patterns of flowering periods from January to April or May seems to be dependent upon the combined factors of satisfactory precipitation and increasing temperature while the decreasing patterns since the month of the peak is presumably affected by the scanty precipitation in the high temperature seasons.

In this study author found two types of patterns of flowering periods in the floras of the world, northern temperate and Mediterrancan climatic flora.

In Netherland flora, the peaks in patterns of flowering periods for native flora occur in June, while for native with naturized flora in July. Author reconginized a modification of the patterns of flowering periods in Netherland by the naturized foreigen flowering plants.

要　約

1969년이래 世界各國의 植物相花期型에 對한 연구를 하여왔다.

금번의 화기형은 화란, 독일, 불란서, 地中海연안, 희람과 파레스타인의 植物相花期型을 밝힌것이다. 月別 花期率의 총화는 화란에서 독일, 불란서 희람 지중해연안과 파레스타인의 植物相順으로 점차 증가현상을 보였다. 그리고 花期型이 2型으로 나누어지는 것을 볼 수가 있었다. 즉 화란 독일 및 불란서와 같이 花期率의 月別 피—크가 7월에 나타나는 북온대형이 있고 지중해연안, 희람 및 파레스타인과 같이 花期率의 피—크가 4월 또는 5월에 나타나는 地中海型이 있다. 北溫帶型은 주로 低溫곡선과 관련이 깊음을 보게되고 지중해형은 특히 우량곡선과 깊은 관련이 있는 것을 볼 수가 있었다.

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