SEASONAL PATTERNS OF CITRUS BLOOM

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Each spring the Florida air is made fragrant by the aroma from citrus blossoms. At the same season citrus growers are inclined to comment on the earliness or lateness of the blooming period, and on the duration, magnitude and nature of the bloom. Nearly all such comments are based on a memory of bloom observations in localized areas in one or two prior years.

The phenomenon of flowering or blooming is the natural start of the new crop and as such has a strong bearing on crop size, fruit quality, date of maturity and duration of the marketing period. Flowering influences the timing of important and costly operations such as the spring pesticide applications, the placing of beehives for citrus honey production, and probably the employment of labor for harvesting.

This paper presents quantitative data, obtained by standardized methods, to characterize the citrus bloom in each of the past 11 years. The pattern for each season is compared with an average seasonal pattern for the main Florida citrus belt.

METHODS

The bloom data reported here were obtained routinely as part of the Ecological Survey of Citrus Pests and Disorders which has been in operation by the University of Florida, Citrus Station since 1951. This survey has been conducted essentially as detailed by Simanton (1962). Briefly, observations are made in 130 commercial groves representative of the varieties, areas and grove practices throughout the citrus belt. Of these groves, 70% are oranges, 19% are grapefruit and 11% are Temple, tangerine or tangelo. Trained field men examine the same 5 typical trees in each grove on schedule each month. They record numerous conditions of ecological significance including new growth and bloom. Starting when more than 1% of terminal twigs have at least 1/3 of blossoms with petals open, they record a class rating for bloom, based on the percentage of terminals with blossoms open at the date of each visit. Class 1 is 1 to 24% of terminals with blossoms open, Class 2 is 25 to 49% and Class 3 is 50% or more terminals with bloom. They continue the record until less than 1% of terminals have blossoms that still retain petals. In groves where the peak bloom occurred between monthly visits they also record the approximate date and class rating at the peak.

To express magnitude of bloom for a group of groves, use is made of a "bloom index" calculated by weighting the number of groves with a class 1 rating by a factor of 1, weighting the number of class 2 groves by a factor of 2, and weighting the class 3 groves by 3. The sum of the weights is then divided by the total groves examined to give the bloom index. An index is calculated for the 65 groves visited in the first half of each month and another is calculated for the 65 groves examined in the last half of the month. Both groups of 65 groves are equally representative of the citrus belt conditions. Although indexes are calculated and charted at mid-month and end of month, they refer to the bloom conditions that existed 3 to 17 days earlier.

RESULTS AND DISCUSSION

Indexes obtained in the manner described have been plotted as graph lines for the 11 years 1959 through 1969. In Figure 1 the horizontal scale shows the 7 months January through July. Bloom after July was negligible and is not shown. The graphs thus illustrate the date on which bloom begins, peaks and ends as well as the duration at different levels. In 6 of the 11 years portrayed, bloom peaked in the latter half of March. This is considered the modal or normal blooming time and is indicated by the short vertical part of the cross on each chart. The horizontal arm of the cross indicates the mean height of the peak for the 11 years. It is noted that bloom peaked later in 1960, 1966, 1968 and 1969. Earlier bloom occurred only in 1963 and this apparently was related to the severe cold of mid-December 1962 which defoliated about half of the survey groves. Defoliated groves are shown as 1963 COLD. Only the 1963 WARM groves which escaped serious damage were included in the 11 year averages. Magnitude of

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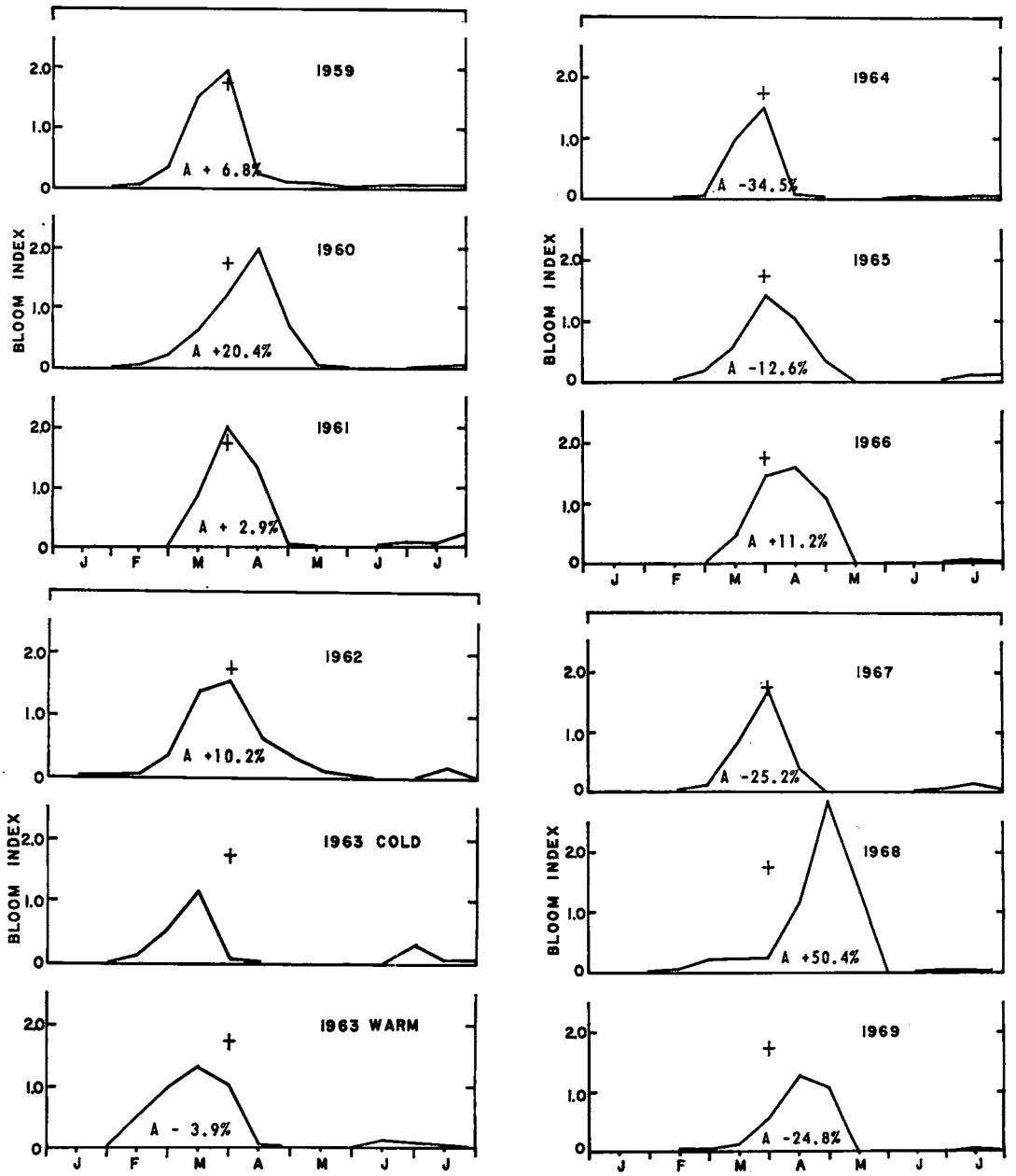

Figure 1. The start, peak, termination, and magnitude of citrus bloom January through July in 11 years, 1959 through 1969. The cross indicates the 11 year average date and magnitude at peak of bloom. The figure with prefix A is the area of the graph in comparison to the 11 year average area.

the peak was above the mean index of 1.75 in 1959, 1960, 1961, and 1968. It was near average in 1967 and below in 1962, 1963, 1964, 1965, 1966 and 1969. The maximum peak in 1968 is 2.25 times larger than the minimum peak in 1969.

Magnitude of the bloom also was measured by comparing the area under the graph lines for each year, with the 11 year average. The percentage over or under the average area is marked on the figures with the prefix A. The

percentages in descending order are: +50.4% in 1968, +20.4% in 1960, + 11.2% in 1966, +10.2% in 1962 +6.8% in 1959, +2.9% in 1961, −3.9% in 1963, −12.6% in 1965, −24.8% in 1969, −25.2% in 1967, −34.5% in 1964. The maximum area in 1968 is 2.3 times larger than the minimum area in 1964.

Other survey data (not shown) disclosed that in 1965 and 1967 peak of bloom coincided with peak of spring foliage growth but in the other 9 years the bloom peak ocurred 1 week after the growth peak.

Figure 2 portrays the year of earliest bloom, 1959, and the year of latest bloom, 1968, in comparison with a hypothetical average bloom period constructed from mean index figures from 10 recent years. Bloom in 1963 was earlier but was excluded from this comparison because severe cold damage caused irregular flowering and anomalous indexes. On the average, bloom occurred at the 0.5 index level for 41 days, approximately from March 5 to April 15. It occurred at the 1.0 level for 26 days and at the 1.5 level for 10 days on the average; however, in some years as in 1965 and 1969, the statewide bloom index did not reach the 1.5 level. In individual groves of a single age and variety the duration of bloom is usually 12 to 20 days.

Figure 2 also indicates that the period of bloom is not shortened and may be longer when bloom occurs earlier or later than usual. This latter point is of interest to beekeepers who move colonies to citrus areas for duration of the nectar flow.

It is recognized that considerable difference in bloom patterns can occur between groves, especially groves of different varieties or in differing locations. However, with reasonably healthy groves such as constitute the survey sample, groves of comparable variety and location tend to bloom in a similar manner. It is believed that the data presented here are highly indicative of the bloom characteristics of Florida citrus in the main citrus growing areas.

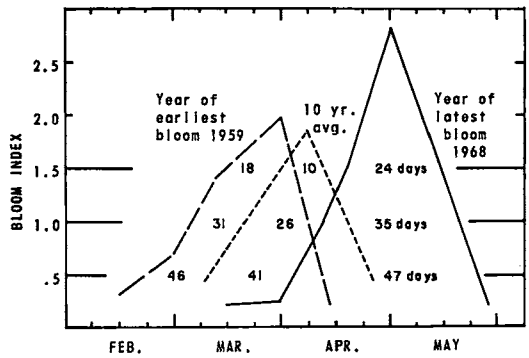

Fig. 2. The start, peak, duration and magnitude of citrus bloom in the year of earliest bloom and the year of latest bloom in comparison with 10 year average bloom data.

SUMMARY

The dates, duration and magnitude of citrus bloom are presented in graphic form for the 11 years 1959 through 1969. These were derived from monthly observations by standardized methods in 130 citrus groves representing the main citrus growing areas of Florida. The earliest bloom, except in 1963 which was abnormally early due to severe cold damage, occurred in 1959 whereas the latest and also the most abundant bloom occurred in 1968, two weeks later than average. Although the duration of bloom in individual groves is usually 12 to 20 days, citrus groves on a statewide basis have a moderate amount of bloom for an average of 41 days, approximately from March 5 to April 15. Bloom may be more than twice as abundant in a year of maximum bloom as compared to a year of minimum bloom.

REFERENCE CITE

Simanton, W. A. Operation of an ecological survey for Florida citrus pests. J. Econ. Entom. 55:1:105-112. Feb. 1962.