

Surveying Some Morphological Characteristics and Buds Development in Sweet Cherry *Prunus avium* L in Syria

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Abstract

This research was conducted to study each of phenological stages, flowers characters, development of buds, and morphological traits of fruits and leaves under climatic conditions of the Mediterranean Sea in Syria during 2015- 2016.

This study determined dates of enter the cherry plants to different phenological stages. Monthly temperature degrees and rain average were

determined. Results showed that was a correlation between climatic conditions and phenological stages of cherry plant.

The research also studied major morphological traits of cherry plant, as characters of flowers, leaves and fruits.

Key words: Rosaceae, *Prunus avium*, morphological characters, and phenological characters.

correlated with decreasing vascular diseases [14], and some kinds of cancers [15].

I INTRODUCTION

Many sorts of fruits have been known long times ago, among which is were sweet cherry trees (*Prunus avium* L.) [1]. Cherries belong to Rosaceae family, Prunoideae subfamily , *Cerasus* genus , and *Prunus* subgenus. This family also contains plums, apricots, and almonds [2].

Sweet Cherry is an active tree characterized with strong apical domination, pyramidal, upright, grows up to 18 m. leaves elliptical relatively large with numerous veins [3].

Sweet cherry is considered of considerable economic importance owing to its nutritional and hygienic value containing high percentage of mineral elements [4]. [5]. This plant received increasing interest recently because of containing high percentage of mineral elements [6].

Cherry's leaves and seeds are currently used for pharmaceutical purposes and its trees are utilized for ornamentation [7]. The economic significance of cherries is dependent upon the chemical compounds contained in its leaves, which represent an important source for antioxidants, where it helps in eradicating radicals [8], and phenolic compounds responsible for numerous biotic activities [9], among the most important of which is the Anthocyanin compound [10]; [11], which gives fruits their distinguished red color [12], therefore its fruit is used as natural food coloring agents [13].

Cherry fruit also has some therapeutic uses and benefits against some diseases and sanitary problems . The fruit's nutritional utilization also

A. Phenological Stages:

Cherry plant passes through a number of developmental stages to grow floral buds and give ripe fruit. The floral buds develop into leaves. This arrangement is called

“the phenolic stages”, which are deemed basic in the life and persistence of this plant. The cherry plant's phenologic stages are correlated with the gradual change of temperature [16]; [17].

Cherry tree is counted among the low temperature tolerant trees in winter when buds go into a dormancy phase during winter period, which enables them survive severe environmental circumstances in winter, then floral buds and vegetative buds continue their growth in spring. Re. [18] showed that cherry buds enter dormancy phase which enables plant survive harsh circumstances during winter , then buds pursue their growth in spring. Cherry cultivars are distinctive from each other in terms of fluorescence initiation, duration, and these cultivars' reaction to surrounding circumstances , since these changes are related to the genetic factors for each cultivar on the one hand [19] and nature of influential environmental factors on the other [20]; [21]; [22].

There are researchers who investigated the surrounding environment's influence on fluorescence initiation, dynamicity and duration, in Cherry plants,

among some of whom are: [23]; [24]; [25]; [26]; Others surveyed phenologic stages progress on other species of the Rosaceae family like plums [27]; [28], Apples, Apricots [29], [30], and others.

Furthermore, through their experiments, both researchers [23]; [31] found that number of hot days as of first of January till end of March determine if flowering would be early or late. Re. [32] studied floral buds development in “Bing” sweet cherry (*Prunus avium* L.) using the electronic microscope. The study demonstrated difference in the timing of some developmental stages of the plants studied including flowering stage.

B. Climatic Circumstances:

Climatic factors are considered one of the most significant factors which are to be observed when sowing cherries [19]. The plant's agricultural climatic needs have to be known since they affect the growth of these plants [33] and the flowers' development into fruit [20].

High temperature accelerates sweet cherries' blooming hastens sweet cherry's blooming [34].

Cherry tree likes cold regions, where it can be cultivated at a height of circa (800-2000) meters a.s.l., when winter provides enough coolness hours in response to this species' demands [35]. The scarcity of coolness hours affects cherry trees and hinders progress of phenologic stages for this plant as well as influencing its productivity [36].

Humidity also affects fruit and is considered cause for fruit damage and cracking, which is considered a great problem for cherry farmers [37], rains and high moisture also during blooming or plucking periods lead to spreading of fungal diseases, the matter which reduces flowering or causes fruit rotting [38].

II RESEARCH MATERIALS & METHODS

A. Vegetative Material

The research has been carried out in a number of cherry producing orchards of Lambert Cultivar, on Slinfeh site, which is a mountainous location situated at (1100 m) a.s.l. during 2015-2016. The Syrian Coast is considered one of the most important cherry producing regions in Syria whose cultivation is centered on the coastal mountains and some internal regions, where (20) twenty trees have been specified to survey their morphologic features and evaluate their

phenologic behavior, all of which are in the complete production phase.

B. Site's Climatic Characterization:

to evaluate behavior under climatic conditions prevailing on the site under investigation. Data containing monthly average of temperatures and rain quantities during the study period, i.e. during (2015-2016), obtained from local Meteorological stations, and phenologic phases have been studied from January (2015) through December (2016), where phenologic stages were divided according to [39].

C. Phenologic Description:

Stages progress have been assessed on the studied trees during the study period, where the different phenologic stages timing has been identified like leaves shedding, which was recorded when the tree had lost 95% of its foliage. This case was visually estimated, buds dormancy stage, blooming stage, ripe fruit forming, where 50 buds were taken from the investigated site and their development was monitored. Blooming stages have been traced and observed in accordance with [39], where blooming stages have been determined as follows: flowering initiation when 10% of flowers bloomed, blooming peaked when 80% (80-90%) of flowers bloomed. end of blooming when 90% of the petals have been shed. Blooming period has also been determined, which is the number of days from blooming initiation to its end.

D. Morphologic Study:

Some morphological characteristics have been studied like measuring flowers dimensions (length and width of sepal, petal's length and width) using the ruler, and calculating fruit's weight utilizing sensitive scale, and fruit's dimensions using Vernier caliper, and measuring foliage dimensions using conventional ruler .

III RESULTS

A. Climatic Description:

Monthly temperature averages and rain quantities are demonstrated in Table (1), which indicates large reduction in temperature averages during December and February. This drop in temperatures affects the phenologic behavior of cherry trees and helps with phenologic progress of cherry trees.

Table 1. Monthly average temperature (°C) and total rainfall (mm) values (2015).

| Year | Jan. | Feb | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. |
|--------------------------|------|-----|------|------|------|------|------|------|------|------|------|------|
| Average temperature (°C) | | | | | | | | | | | | |
| 2015 | 6.3 | 7.2 | 12.2 | 16.8 | 20.1 | 24.3 | 28.7 | 27.4 | 23.3 | 18.7 | 12.8 | 10.6 |
| Total rainfall (mm) | | | | | | | | | | | | |
| 2015 | 197 | 132 | 163 | 132 | 71 | 10.9 | 2.7 | 0.0 | 0.0 | 1.3 | 45.6 | 55.7 |

B. Morphologic Description:

Our current study allowed determining some characteristics of cherry trees planted on Slinfeh site on the Syrian Coast as follows:

The tree is large sized, crown pyramidal and spread, height 10-15 m.

Flowers: white colored, average sepal length 0.66 , petal’s average length: 1.33 cm; sepals 5 in number, petals: 3 .

Blooming starts n 4/11, peaks on 4/16. Blooming ends 4/20, length of blooming period: 10 days.

Fruits: single seeded drupe, fruit’s average length:24.92 mm; fruit’s average width 21.41 mm. average fruit weight: 7.54 g. ripening date: second week of June.

Leaves: large, simple, green colored, average leaf length 11.95; average leaf width 6.15 cm.

When spring comes, buds resume their growth and development with the start of temperature rising, and begin swelling then start to blossom. In the blossoming stage, small leaf scales start diverging from each other and the bud starts blooming and forming flowers. In this period, the buds are very sensitive to temperature changes and frost, where the large rise in temperature or sudden fall leads to the formation of deformed flowers. The formation of a small number of deformed flowers have been observed, which is attributed to temperature rise in the floral buds blooming period [34].

To study flowers dynamics, readings were taken in the spring of (2015-2016) season, and through the results shown in Table (2), which represents dates for the plant’s entering its various phenological stages, contrasted with Table (1) which represents temperatures and rain amounts during the study period, the following results can be concluded:

Cherry trees started blooming on 11th April and blooming continued until 20th April. Flowering period lasted 10 days where peak blooming was recorded on 16th April. When the bloomed flowers percentage mounted to 100%, petals began shedding on 20th April. Flower petals shedding persisted for all trees until harvest on 10th June.

C. Phenologic Stages:

Phenologic stages of cherry buds have been surveyed in accordance with [39] in seven staged illustrated in Figure (1), which shows the phenological stages arrangement of cherry trees on the site studied.

Flower buds start forming during summer. When growing season comes to an end, the buds go into dormancy period during severe winter period. During this period, buds are in a physiologic dormant state in which they manifest no clear formal changes.

Table (2) Timing of phenologic phases of sweet cherry on Slinfeh Site on the Syrian Coast – Syria (2015).

| Dormancy | Blooming | White bud | Flowering | Petal shedding | Harvest | Foliage shedding |
|--------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|---------------------------|
| 10 th January | 28 th March | 11 th April | 16 th April | 20 th April | 10 th June | 10 th November |

Through the data related to temperatures, it has been found that the days in which temperature dropped

extended from the first of January until beginning of March. At the time temperature began to rise in March,

buds started growing , since high temperature stimulates initiation of blooming [40], light density also plays a role in stimulating plant flowering which is in conformity with [41].

The buds' getting free out of dormancy demands availability of enough cold hours, since coolness hours scarcity hampers phenological stages progress for cherry plant [19]. Growth and production of these trees is affected by availability of enough coolness hours so that the plant may complete its growth and development [31]. This is in line with our study, where the number of flowers and also number and volume of fruit were good owing to availability of coolness hours during winter season, which conforms to [42].

By comparing the quantity of rains during the study months we found that January recorded the highest rainfall (197 mm), i.e. during the buds dormancy period .as for the spring rains, they help flower setting contrasted with heavy rains which lead to washing pollen grains weakening their efficacy and hampering the pollinating insects activities during floral pollination in addition to falling of flowers and set fruit. [38]. Rain is also considered cause of fruits damage and cracking, the matter which is considered a big problem for cherry farmers [37], where water enters to the inside through the pericarp, resulting in the fruit cleaving and excess water flowing out via the tender cuticle. Generally, large and ripe fruit are the mostly affected [43].

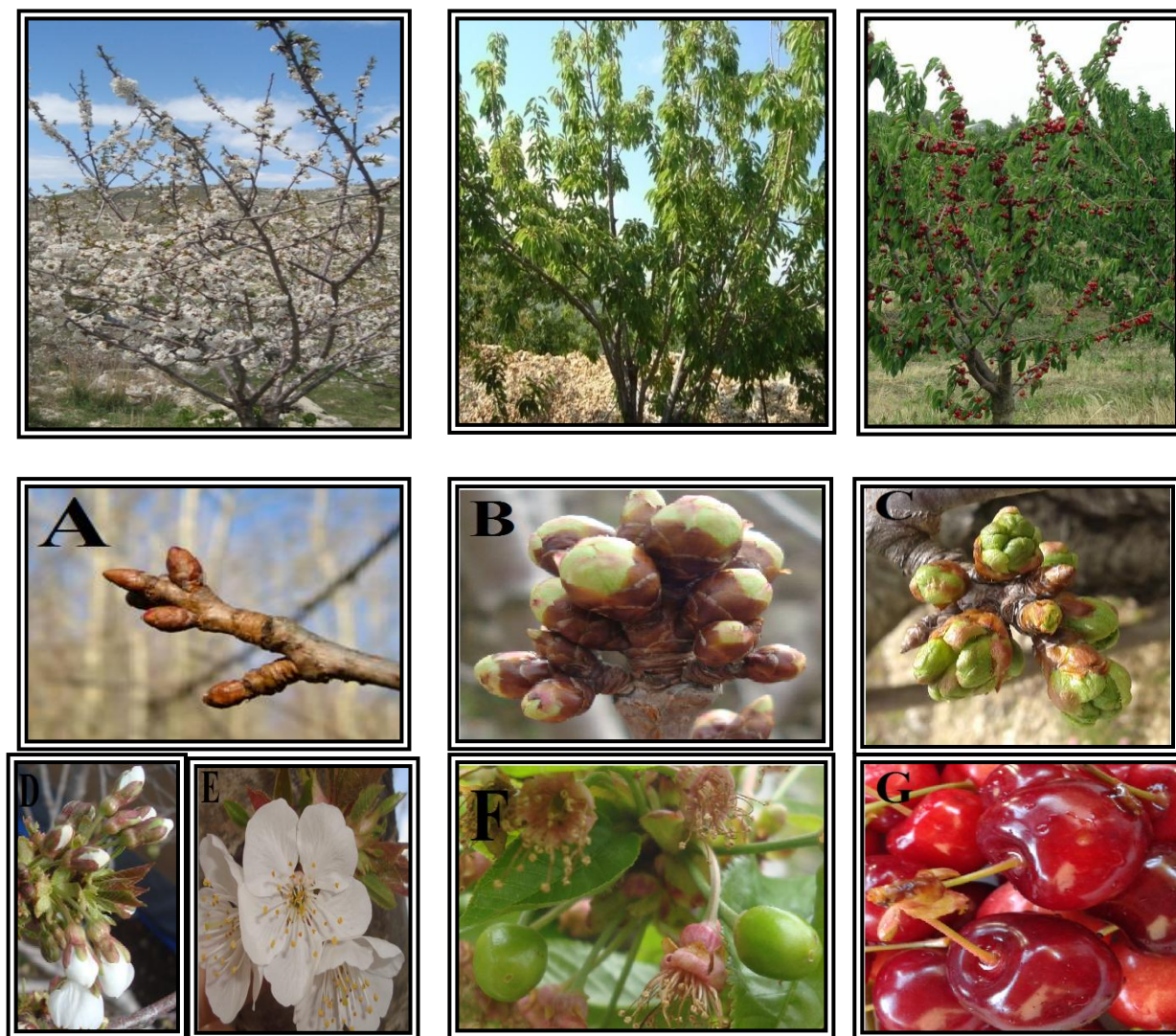


Figure (1): Phenologic Phases in Cherry Plants.

IV DISCUSSION

Blooming is affected by climate, particularly by temperature before flowering and during its period, which conforms to [24] in his study on Cherry plants in two climatically different regions in China. Re. [40] also believe that high temperatures stimulate start of flowering, where temperatures and light density stimulate flower development, which is in conformity with what [41] arrived at in (2001). In our study, flowering period extended from late March until mid April, which conforms with [44], [45], in their survey on cherry plant in similar environmental circumstances.

Cherry trees productivity and fruit quality, like the rest of plant species are sensitive to total climatic elements. The difference in fruit dimensions among various sites indicates the importance of site and prevailing climatic conditions which affect the fruit volume. The researcher and others explain that [46] in that the plant's being exposed to more cold hours increased fruit size and improves their quality. These results are also scientifically in conformity with those arrived at by [31], who explained the climatic conditions effect on growth and production of cherry trees. He also demonstrated that increasing the plant's exposure to cool hours may increase fruit size, which allows the development of high quality fruit. Fruit of the investigated trees were of high quality and of international standard in terms of standard fruit measurements according to criteria specified by the European Union ([47]; [48]; [49]).

A number of researchers referred to role of environmental factors and their effect on quality of

cherry fruit ([28]; [50]; [30]; [29]; and on fruits of other genera of the Rosaceae family like pears [51], and apricots [29].

Results of our present study are in agreement with those of numerous researches and studies which confirmed the existence of obvious influence of climatic conditions on cherry plants' growth and progress of various phenologic stages [19]; [52]; [31].

In general, studied cherry trees showed good characteristics in terms of size of formed flowers and fruit's size and weight. This result is in agreement with those of numerous researchers [36], where the height above sea level plays a significant role in providing the cool climate suitable for cherry trees cultivation, and difference of climatic conditions among various regions leads to the variance in plant's going into its various phenologic phases [24].

V CONCLUSIONS AND RECOMMENDATIONS:

This work provides table for budsdevelopment dates and gives information on the timing of the plant's going into various developmental stages.

The study of phenologic stages is deemed important in determining the investigated plant's behavior towards different environmental factors.

Existence of an obvious increase in thermal accumulations for the period extending from flowering through ripening with the decline of cool hours on the investigated site.

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