IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 9, Issue 1 Ver. I (Jan. 2015), PP 61-70
www.iosrjournals.org

Phenological variability in different populations Cork oak (Quercus suber L.) in Tunisia

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Abstract: *The cork oak (Quercus suber L.) is a Mediterranean species, having great ecological and socio-economic interest. IT is characterized by a large phenological polymorphism showing variations periodic phenomena of plant development residing in observing any qualitative change in external morphological characters. Our study is based on the comparison of phenological parameters (maximum rate of fruiting, flowering and leafing) for periods of peaks and estimated relative to adults of different populations of cork oak trees natural conditions in Tunisia: El Feidja (Ghardimaou), Beni M'ttir, Hammam Bourguiba, Zena and Oued Mejen Essef (Ain Draham), Ain Zana (Bouselm) Jebel Zouza (Nefza) Bellif (Sejnane) Keff El Rand (Haouria) and Hammam Jdidi (Hammamet) located Kroumirie, Mogods and Cap Bon.*

Our results show that the rate of fruiting has a peak (100%) on average for the period beginning November for the population Bellif El Feidja, Keff rand and El Hammam Jdidi, period late November-early December for populations Dar Fatma, Jebel Zouza, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen and Mejen by Essef against the period to the end of December or early January for the population of Beni Mtir and Zena Ain.

The flowering rate is very high (80%) during the end of April for the people of Jebel Zouza, Blessed Mtir El Feidja, Steam Jdidi, Keff El Ain rand and Zena, to lesser extent (50-70 %) for the population of Bellif, Dar Fatma, Jebel Kroufa and Mejen Essef and low (20-30%) for the poulation Oued Ezzen and Hammam Bourguiba and has a peak (100%) for wholes populations towards the end of the month May.

The rate is maximal foliation (100%) for wholes cork oak populations during all the year for all populations.

Unlike the period of phenology (leafing, flowering and fruiting) for the populations of cork oak (Quercus suber.L) in Tunisia can be attributed to environmental and climatic factors of the original site and / or specific biological conditions (physiological and genetic) of the case study.

Keywords*: Phenology, population, cork oak, variability, Tunisia.*

I. Introduction

Phenology, derived from the Greek term meaning phaino shown or appear, is the study of development stages (leafing, flowering, fruiting and yellowing autumn) and the seasonal rhythm of the events of the life cycle. For plants, the seasonal rhythms play a critical role in the survival, growth and reproduction. Indeed, the study of these rhythms is needed to understand the ecology of the species. In this work, we focused specifically on the leaf phenology (bud), which is regulated as a first approximation by the sum greater than threshold temperatures after a cold period necessary and photoperiod. The issue of adaptation phenological rhythms weather today is especially significant with the observed and predicted climate change. These changes have an impact of an increase of several days of vegetative season, resulting in an earlier bud break. Studies on the phenology of leaf buds of evergreen species are overwhelmingly ignored, thus we propose to study the situation of an evergreen species in the Mediterranean region through the example of inter-interindividual variability and inter-annual Quercus suber, Mediterranean forest species persistent sheet. This species is found throughout the western rim of the Mediterranean.

The purpose of this work is to note the different stages and dates of bud hundred eighty trees within a one hectare plot in different populations of cork oak in the north-west and north-east of Tunisia: El Feidja (Ghardimaou), Beni M'ttir, Hammam Bourguiba, wadi and Zena Mejen Essef (Ain Draham), Ain Zana (Bouselm) Jebel Zouza (Nefza) Bellif (Sejnane) Keff El Rand (Haouria) and Hammam Jdidi (Hammamet), located Kroumirie, Mogods and Cap Bon.

II. Materiel And Methods

2.1. Plant material

Our study related to adult trees resulting from various populations of cork oak (Quercus suber L) in Tunisia (Kroumirie, Mogods and Cape Bon): Hammam Bourguiba, Dar Fatma (Ain Draham); Djebel Kroufa (Tabarka); Keff El Rand (El Haouaria) and Hammam Jdidi (Hammamet). (30 individuals from each populations of Hammam Bourguiba [HB], Dar Fatma [DF], Oued Zeen [OZ], Aîn Zana [AZ]; Mejen Essef [ME]; Béni Mtir [BM]; Djebel Zouza [DZ] **(**Ain Draham) El Feidja [EF] (Gar Dimaou); Bellif [B] (Nefza); Djebel Khroufa [DK] (Tabarka); Keff El Rand [KR] (El Haouaria) and Hammam Jdidi [HJ] (Hammamet) (Tab1).

2.2. Methods

2.2.1. Choice of the stations

The experimentation was carried out on twelve sites of study located in four different areas: Hammam Bourguiba [HB], Dar Fatma [DF], Oued Zeen [OZ], Aîn Zana [AZ]; Mejen Essef [ME]; Béni Mtir [BM]; Djebel Zouza [DZ] **(**Ain Draham) El Feidja [EF] (Gar Dimaou); Bellif [B] (Nefza); Djebel Khroufa [DK] (Tabarka); Keff El Rand [KR] (El Haouaria) and Hammam Jdidi [HJ] (Hammamet)**;** The choice of the sites was carried out according to the geographical distribution, the bioclimat and the relief in December 2011 (Fig.1).

Table 1. - Characteristics geographical, bioclimatic and relief of different populations of oak cork (Quercus suber L) in Tunisia.

Site	Abbreviation	Area	Geographical distribution	Bioclimat (bioclimatic stage)	Relief	Altitude (m)	Characteristics Geographical
El Feidja	**EF**	Ghardimaou	Western North (Kroumirie)	Wet superior at moderate winter	Montagne	780 m	32 43 84 22 E 40 40 26 7 N
Beni M'ttir	**BM**	Ain Drahem	Western North (Kroumirie)	Wet superior at moderate winter	Montagne	800 m	32 47 48 36 E 40 65 89 8 N
Hammam Bourguiba	**HB**	Ain Drahem	Western North (Kroumirie)	Wet superior at moderate winter	Montagne	570 m	32 46 76 08 40 71 96 0 N
Dar Fatma	**DF**	Ain Drahem	Western North (Kroumirie)	Wet superior at moderate winter	Montagne	909 m	32 47 84 09 E 40 73 59 6 N
Oued Zena	**OZ**	Ain Drahem	Western North (Kroumirie)	Wet superior at moderate winter	Montagne	675 m	32 48 22 49 40 75 63 0 N
Mejen Essef	**ME**	Ain Drahem	Western North (Kroumirie)	Wet superior at moderate winter	Montagne	800 m	32 48 17 17 E 40 69 20 4
Aîn Zana	**AZ**	Bouselm	Western North (Kroumirie)	Wet superior at moderate winter	Montagne	851 m	32 48 77 03 E 40 64 69 4 N
Djebel Zouza	**DjZ**	Nefza	Western North (Kroumirie)	Wet superior at moderate winter	Montagne	542 m	32 49 96 49 E 40 77 41 2 N
Keff El Rand	**KR**	Haouaria	North Est (Cap Bon)	Sub-wet superior at hot winter	Montagne	642 m	32 65 77 63 E 40 77 15 8 N
Hammam Jdidi	**HJ**	Hammamet	North Est (Cap Bon)	Semi-arid lower than hot winter	Montagne	174 m	32 62 08 79 E 40 35 84 9 N
Djebel Khroufa	**DjK**	Tabarka	Western North (Mogods)	Wet inferior at hot winter	Chaine tellienne	160 m	32 4 41 25 E 40 90 49 5 N
Bellif	**B**	Tabarka	Western North (Mogods)	Wet inferior at hot winter	Chaine tellienne	88 m	32 50 79 87 E 40 98 60 9 N

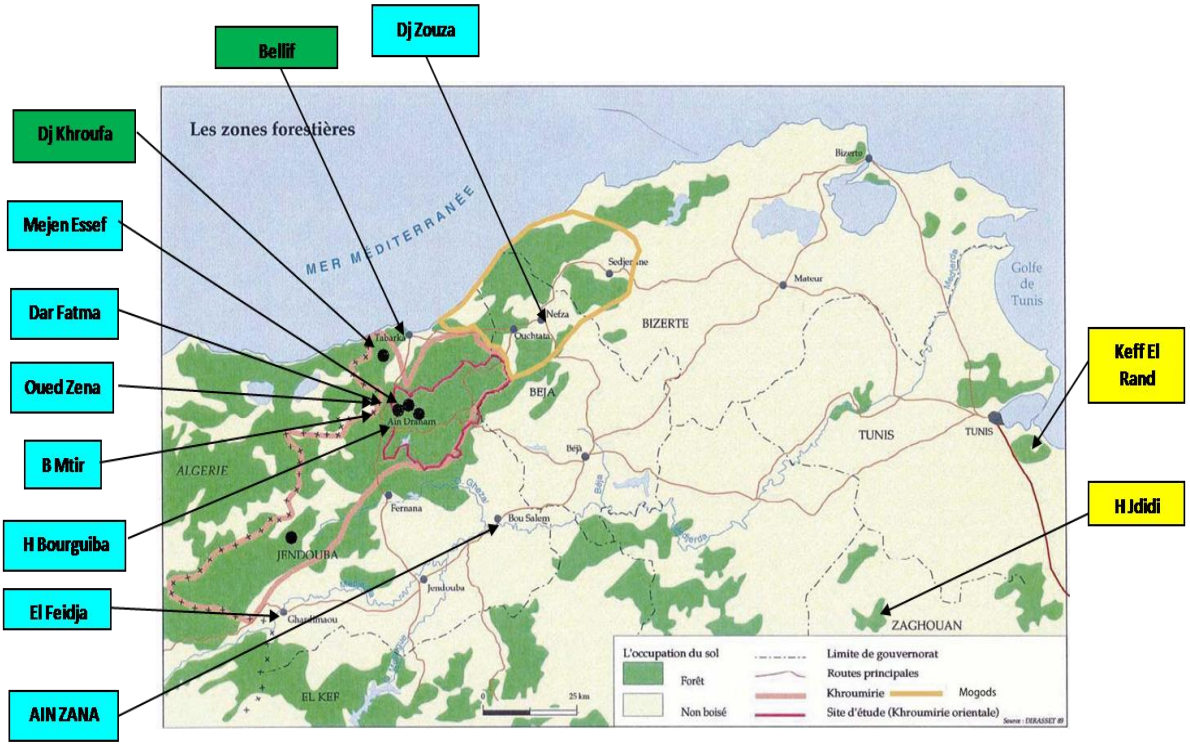


Figure 1: Geographic range of cork oak Kroumirie & Mogods **[8]**

2.2.2. Measurement of the phenology parameters

The phenology, the study of the growing cycle of mature trees:

Phenology studies the variations periodic phenomena of plant development and their relationships with climate factors. It lies in the observation to any qualitative change in external morphological characters. Phenology is therefore a key element of the autecology of species because it provides insight into their adaptation to local climatic and ecological context of development.

This study is based on the dynamic aspect of the phenology of Quercus suber. It aims at analyzing the organization of phenological phases during the year.

-The Temporal components: it is to determine the duration of different phases: flowering, fruiting, and vegetative bud break.

-the Spatial components: it is tracked over time quantitative namely shoot growth, seed length changes.

- The phenology: Plant material dedicated to this study consists of 12 populations of Quercus suber from prospecting carried out in 2010 the Tunisian Kroumirie the Mogods and Cap Bon. Phenological observations follow a course with all the numbered topics. The pace of observation is 2 times / month (every 15 days); it is virtually intensive when leafing, flowering and fruiting. The observations take place during the years 2010 and 2012, they are recorded on individual cards.

-Bloom: (April and May) Monitoring Flowering: Flowering is a very important phenomenon of survival because she participates in some output to sexual reproduction.

-Monitoring Bloom: occurs by direct observations over scores of trees carried on the frequency and location of the flowers in the tree on a periodic basis during the months of flowering.

- Method for the Study of Flowers: A late to fix the flowering period of each plot, we followed by comparing the oak trees, the variation in flowering intensity since the beginning of the last flower up 'fruiting. The observations were made in the field, noting both the percentage of oak flowers.

Bloom observed parameters are divided into three groups as follows:

Early bloom, flowering and Plain End of flowering

-Leafing (July and August): Follow-up Leafing: Leafing observed parameters are divided into five groups as follows:

Formation of leaf buds, Bud, Full foliage, early leaf fall and End of defoliation

-Fruiting (September and October): Monitoring Fruit: Fruiting observed parameters are divided into three groups as follows: Early maturity, late maturity and maturity.

-Practice Of Phenological Observation: Observations were made near the experimental station of the Tunisian forest twelve populations relatively cork oak Hammam Bourguiba, Dar Fatma Mejen Essef, Oued zena, Blessed

Mtir, Ain Zana Jebel Zouza (Ain Drahem) El Feidja (Ghardimaou) Bellif (Sejnane) Jebel Khroufa (Nefza), Steam Jdidi (Hammamet), Keff El rand (Haouria).
These sessions were held because of the difficulties often encountered, related to sampling and observation.

a-Bebatilloanage:
We have selected a number of individuals to be followed periodically. A resort map showing the spatial arrangement of these trees is established. In addition, to facilitate the phenological monitoring, we have numbered the trees with labels clearly visible.
The sample for each of the twelve populations of cork oak comprises 30 individuals including measurements of height and basal diameter were made.

b- Comments:
The main difficulty in assessing the phenological stages. While it is generally easy to recognize the various phases, the assessment stage is even less often that they are sometimes vaguely defined.
Experience and skills are required to complete the phenological monitoring. Observers inexperienced. require prior information on the morphology of leaf buds, floral button and young fruits of the species to be studied, in order to facilitate the recognition of these organ. field.

c- Sampling:
To follow the phenological changes in vegetation, we used the technique commonly who is to perform in a more or less regular surveys in which the state of the vegetation is noted [11].
This broad approach should be adapted to the objectives of the research undertaken in the relevant equipment and moyc,,, implemented, taking into account the cost of each observation, ie the ratio of the qualilé information to the time to get [5].
[6] indicates the ideal conditions for a phenology :. The stalion relatively undisturbed, so immune to pressures (bushfires, sections, ...) that may cause a change in the structure of the population.

The accessibility of the station at any time of the year is essential to consider because moving from one site during the experiment stops the homogeneity of observations and sentenced to only draw general conclusions. The edge effect must be avoided by a suitable choice of the position of the actual station high enough, representative of the population considered to establish the variations within population and generate an average behavior of space.
To determine the size, a stratified sample can be made on the basis of the structure of the population, ie the frequency histogram by diameter class to the base [9].
On a reference area (this may vary depending on the density), systematic diameter measurements of all individuals (population) are performed. Thirty individuals at least (sample) are then determined relative to the size of each class.
Phenological observations were followed for two years in order to establish the frequency of phenological phases.

d-Nature criteria and comments:
Our study of phenology is based on observation.
Leafing, flowering and fruiting are the three phases observed, the morphological characterization differs from theirs to another.
The qualitative assessment of phenological phases is always supplemented by quantitative data required for statistical analysis.

e- Frequency of comments:
Comments are regular, the time interval between two observations successsives is short of the order of one to three times a month like that done by [5] proving that the duration of the phenomenon. fastest cycle is variable depending on the species, time of year and events to watch. This period can vary from a few days during the season of intense activity of the vegetation to a month or more for population studies.

2-3 Statistical Processing
The statistical analysis of the experiment carried-out on the WAS Studied variables (hydrous and physiological factors) under the natural conditions. It is the carried out thanks to SPSS 17 software.

The Whole of measurements Was the subject of analysis of variance ANOVA year to the test by a factor of F Fisher to check the Assumption of Equality of the Averages of risk to the threshold of 5%. It is Supplemented by multiple comparisons of the Averages by the test of Newman and Keuls When The

Assumption of Equality of the Averages is Rejected [4].The graphic exits Were the carried out with the software Excel XP.

III. Results

Phenological study of different populations of cork oak in Tunisia:

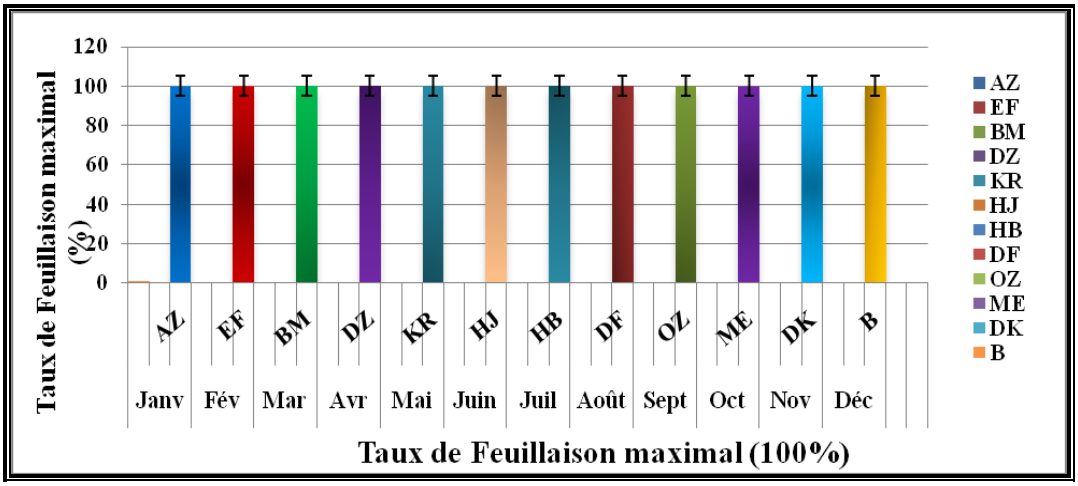
3.1. Results of the phenology of different populations of cork oak in Tunisia

3.1.1. Rate leafing cork oak

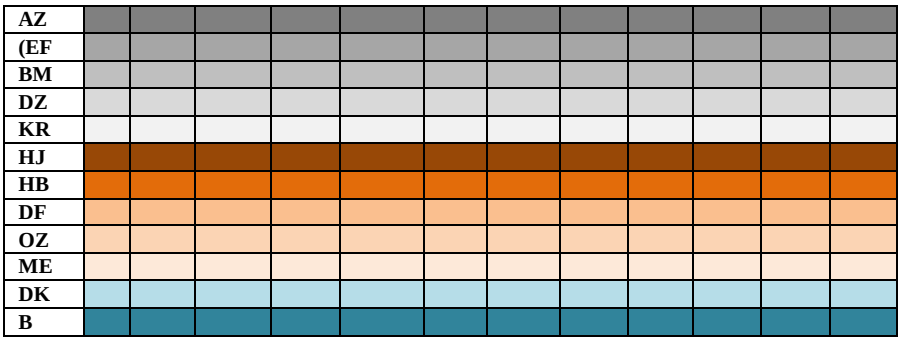
The maximum rate recorded foliation are of the order of 100%; 100%; 100%; 100%; 100%; 100%; 100%; 100%; 100%; 100%; 100% and 100% respectively for the population of Beni Mtir, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen, Keff El rand, Jebel Zouza, Mejen Essef El Feidja, Ain Zana Bellif, Dar Fatma and Hammam Jdidi throughout the year study (Fig. 2a-2b).

Student test newMS Keuls 5% discriminates 1seul homogeneous group A (Blessed Mtir, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen, Keff El rand, Jebel Zouza, Mejen Essef El Feidja, Ain Zana Bellif, Dar Fatma and Hammam Jdidi).

Statistical analysis shows no significant difference between all populations of cork oak for the rate parameter foliation 5% threshold.



(a) Leafing rate cork oak



(b) Dates

Mai	Ju	Jui	Ao	Sp	Oc	Nv	Dc	J	Fv	Ma	Av

Figure 2 (a-b): Change in rate Leafing (%) of different populations of cork oak (Quercus suber.L) in Tunisia.

3.1.2. Fruiting rate of cork oak

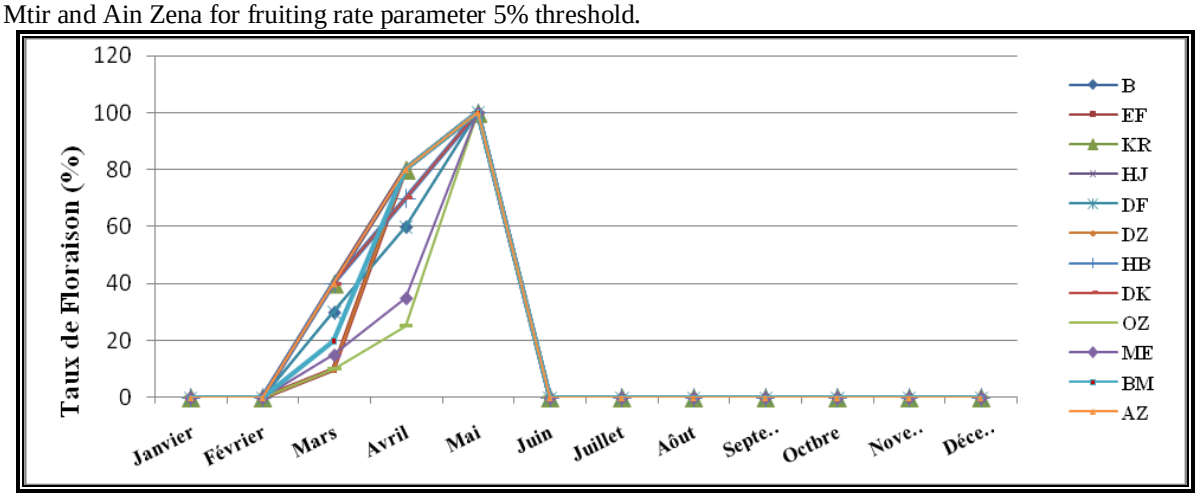
The maximum rate is recorded fruiting of about 30%; 10%; 30%; 40%; 20%; 10%; 40%; 30%; 20%; 30%; 10% and 40% respectively for the population of Beni Mtir, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen, Keff El rand, Jebel Zouza, Mejen Essef El Feidja, Ain Zana Bellif, Dar Fatma and Hammam Jdidi during the month of October. (Fig.3a).

The rate of fruit has a peak (90-100%) on average for the period beginning November for the population Bellif El Feidja, Keff rand and El Hammam Jdidi, period late November-early December for the people of Dar Fatma Jebel Zouza, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen and Mejen by Essef against the period to the end of December or early January for the population of Beni Mtir and Zena Ain (Fig.3a-3b).

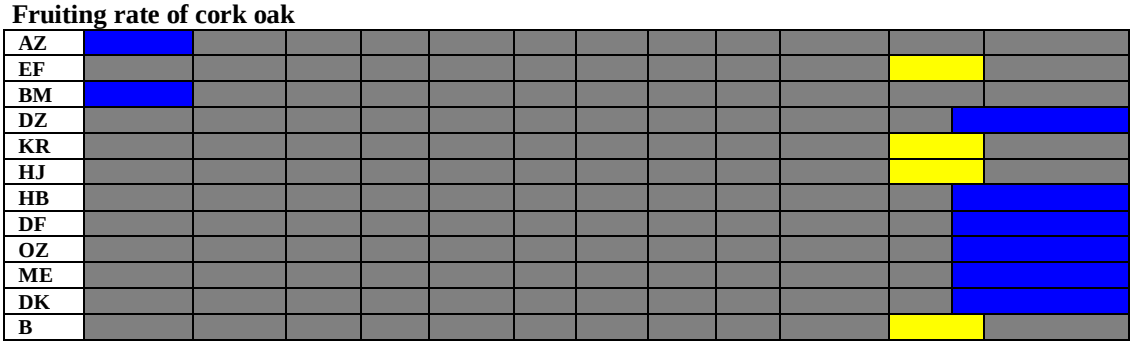
Student test newMS Keuls 5% discriminates three homogeneous groups: A (Bellif El Feidja, Keff and El Hammam Jdidi rand) for the period beginning November, B (Dar Fatma, Jebel Zouza, Hammam Bourguiba,

Jebel Kroufa, Oued Ezzen and Mejen Essef) for the period late November-early December and C (Blessed Mtir and Zena Ain) to the period in late November-early December.

Statistical analysis shows a highly significant difference between all populations of cork oak except between populations Bellif El Feidja, Keff rand and El Hammam Jdidi, between the populations of Dar Fatma, Jebel Zouza, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen and Mejen Essef and between populations of Beni Mtir and Ain Zena for fruiting rate parameter 5% threshold.



(a) Fruiting rate of cork oak



(b) Dates

J	Fv	Ma	Av	Mai	Ju	Jui	Ao	Sp	Oc	Nv	Dc

Low Fruiting

Average Fruiting

Total Fruiting

Figure 3 (a-b): Change in Rate of fruiting (%) of different populations of cork oak (Quercus suber.L) in Tunisia.

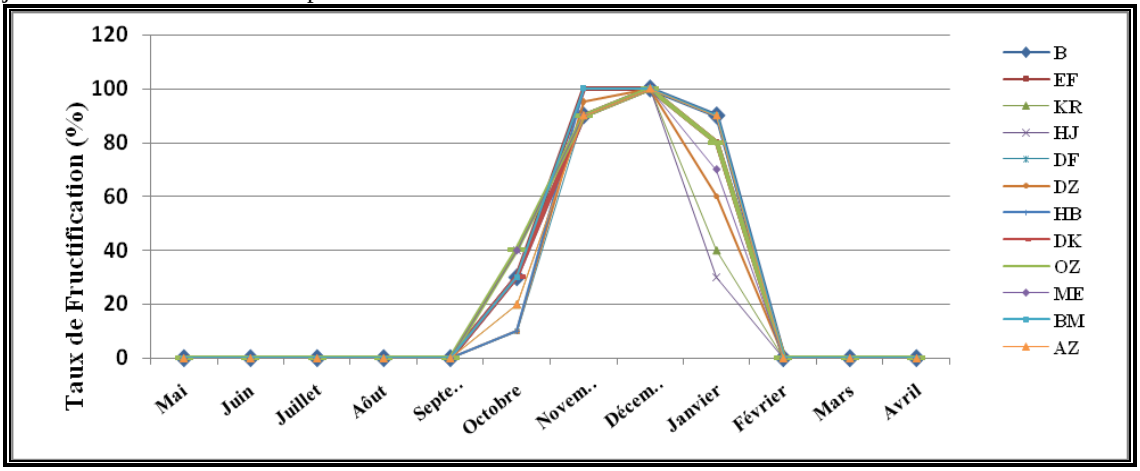
3.1.3. Flowering cork oak rate

The flowering rate is very high (100%) for all populations Blessed Mtir, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen, Keff El rand, Jebel Zouza, Mejen Essef El Feidja, Ain Zana Bellif, Dar Fatma and hammam Jdidi during the end of May to a lesser extent (80%) for the people of Jebel Zouza, Blessed Mtir El Feidja, Steam Jdidi, Keff El Ain rand and Zena, and the order of 60-70% for population Bellif, Dar Fatma, Hammam Bourguiba and Jebel Kroufa and low (25-35%) for the population of Oued Ezzen and Mejen Essef (Fig.4a).

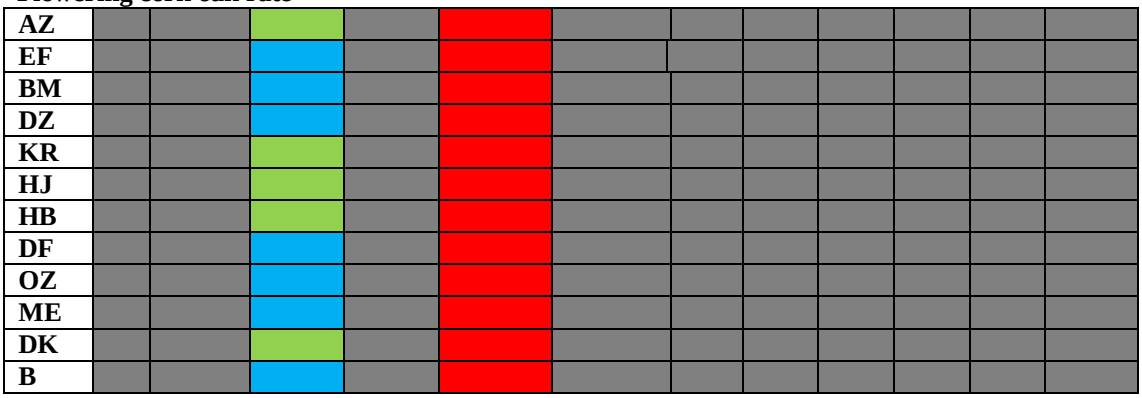
The minimum rate of flowering are recorded in the order of 20%; 40%; 40%; 10%; 40%; 10%; 15%; 10%; 40%; 30%; 30% and 40% respectively for the population of Beni Mtir, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen, Keff El rand, Jebel Zouza, Mejen Essef El Feidja, Ain Zana Bellif, Dar Fatma and Hammam Jdidi during March . (Fig.4a-4b).

Student test newMS Keuls 5% discriminates 4 homogeneous groups: A (Jebel Zouza, Blessed Mtir El Feidja, Steam Jdidi, Keff El Ain rand and Zena), B (Bellif, Dar Fatma, Hammam Bourguiba and Jebel Kroufa); C (Oued Ezzen and Mejen Essef) for the month of April.

Statistical analysis shows a highly significant difference between all populations except between populations Ain Jebel Zouza, Blessed Mtir El Feidja, Steam Jdidi, Keff and Ain El rand Zena and between populations Bellif, Dar Fatma, Hammam Bourguiba Jebel Kroufa and between populations and Oued Ezzen Mejen Essef for the month of April to 5% threshold..



(a) Flowering cork oak rate



(b) Dates

J	Fv	Ma	Av	Mai	Ju	Jui	Ao	Sp	Oc	Nv	Dc

Floraison Faible

Floraison moyenne

Mai

Floraison Total

Figure 4 (a-b): Change in Rate of flowering (%) of different populations of cork oak (Quercus suber.L) in Tunisia.

IV. Discussion

Phenology, derived from the Greek term meaning phaino shown or appear, is the study of development stages (leafing, flowering, fruiting and yellowing autumn) and the seasonal rhythm of the events of the life cycle. For plants, the seasonal rhythms play a critical role in the survival, growth and reproduction. Indeed, the study of these rhythms is needed to understand the ecology of the species. Leaf phenology (bud), which is regulated as a first approximation by the sum greater than threshold temperatures after a cold period necessary and photoperiod. The issue of adaptation phenological rhythms weather today is especially significant with the observed and predicted climate change. These changes have an impact of an increase of several days of vegetative season, resulting in an earlier bud break. Studies on the phenology of leaf buds of evergreen species are overwhelmingly ignored.

The study of the situation of an evergreen species in the Mediterranean region through the example of inter-inters and inter-annual variability of Quercus suber, Mediterranean forest species with persistent leaves. This species is found throughout the western rim of the Mediterranean.

The phenological stages noted, two dates of bud were also noted. The first corresponded to the time (weeks) at which 10% of the trees showed at least 20-50% of the crown open buds. The second date was the date at which 90% of the trees showed these characteristics.

Flowering was identified by the appearance of male and female flowers. Bud break occurred last March when he was held in April 2011 in This discrepancy is explained by lower spring temperatures relative to those of the previous year.

[22] point out that the fall acorns often occurs dice the first week of October and is increasing in November-December. In fact, even if the crop is more or less early (late December) to a massive sub-humid mountain, very busy man and his flock, such as Zarifet-Hafir, acorns were still able to escape the tooth rodent and find the necessary conditions (temperature, humidity) to pre-germinate in the undergrowth. This rate is still less than that quoted by [1] or 80% for acorns harvested in February in a semi-arid forest. Especially since pre sprouted acorns in many cases are exposed to the problems of disposing of their rootlets or during transport, storage or use in the nursery.

The maximum rate recorded foliation is of the order of 100% for the population of Beni Mtir, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen, Keff El rand, Jebel Zouza, Mejen Essef El Feidja, Ain Zana Bellif Dar Fatma and Hammam Jdidi throughout the year of study. These results agree with those found by [19], which shows that the leaves are evergreen which lasted life is 2 to 3 years. According [28], the tree may lose all of the leaves after a heavy acorn crop, as a result of adverse weather conditions or after harvest cork exaggerated.

The flowering rate is very high (100%) for all populations Blessed Mtir, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen, Keff El rand, Jebel Zouza, Mejen Essef El Feidja, Ain Zana Bellif, Dar Fatma and hammam Jdidi during the end of May to a lesser extent (80%) for the people of Jebel Zouza, Blessed Mtir El Feidja, Steam Jdidi, Keff El Ain rand and Zena, and the order of 60-70% for population Bellif, Dar Fatma, Hammam Bourguiba and Jebel Kroufa and low (25-35%) for the people of Oued Ezzen and Mejen Essef.

Regarding flowers, cork oak is monoecious and outbreeding the male flowers hang in catkins at the tips of twigs of the previous year, they are long from April to August cm [7]. The female flowers are small scaly buttercups isolated or in groups of three or maximum on the branches of the current year, their protective cup will end future acorns. The climate and exposure condition flowering begins at the age of 12-15 years and runs from late April to late May [19].

The rate of fruit has a peak (90-100%) on average for the period beginning November for the population Bellif El Feidja, Keff rand and El Hammam Jdidi, period late November-early December for the people of Dar Fatma Jebel Zouza, Hammam Bourguiba, Jebel Kroufa, Oued Ezzen and Mejen by Essef against the period to the end of December or early January for the population of Beni Mtir and Zena Ain.

The fruit or acorn of the cork oak has a very variable 2 to 5 cm long and 1-2 cm wide shape and dimensions. Maturation of acorns within one year of flowering [3], [12], [14] acorns fall in October and November, sometimes up to January [19]. According [23], fruiting starts from the age of 15, good glandées are repeated every 2 or 3 years. The acorn matures in autumn, giving rise to three distinct crops: Primary acorns are acorns from the previous year, which ripen in September-October. They are produced in small quantities but are very large, secondary acorns that are produced in large quantities from November to December and their size is average and late acorns falling in late January.

The phenology of plants is influenced by various biotic (insects. Birds ....) and abiotic factors including climate (temperature. Rainfall, light, humidity ..). Soil. The topography and genotype.

Of all these factors, those who received the most attention are climatic factors, especially water data, and thermal. They are usually the most limiting for the plant and determine its phenological behavior.

In tropical regions some work has focused on water conditions. The relatively constant temperature regime was inadvertently considered less critical. We will see that it is not always so.

[20]shows that interannual rainfall variations explain in large measure the fluctuations in the phenology of woody species. The annual amount of rainfall but also their distribution has an effect on the development of populations. The departure of the leaves being especially early as the year's best watered totally absent or delayed and brief flowering in dry years.

[25] observed a two-year study of variation stages of flowering and fruiting in function of the soil water.

[9] noted the important role of soil water on the determinism of leaf fall and flowering phases of Combretum aculeatum. However, the share simultanéilé factors cannot be attributed to the water an exclusive role [9]; woody species with much greater independence (as grasses) on the pace of activity with respect to the period when water is available in the soil [26].

The influence of temperature and / or photoperiod has been the subject of various studies [17], [10]; [24]; [2], [13] and [27].

[10] provides a perfect correlation between flowering and the sum of air temperatures and [18] shows the importance of the influence of photoperiod on phenology 10 "height in Africa.

After eight years of study on oak (temperate zone). A phenological model predicting the date of bud depending on temperature and photoperiod and establish that budding occurs only when sum as indicated average temperatures of 10 days before the event exceeds a threshold donné.Il ally appears that diversity and fluctuating environmental conditions Chairman largely running of cycles of vegetation [15] and [16].
If we are to understand and predict the response of species to changes in the environment, the study of phenology will have more time to consider the comments and variety of stations.

V. Conclusion

The cork oak (Quercus suber) is a Mediterranean species; a great ecological and Socioeconomic the provides a very diversified production cork, wood and fruit. The Quercus suber is Characterized by a wide polymorphism all which has individual wide variations in behavior and botanical characters betweens individuals and betweens ecotypes.

The present work is a study on phenological mature trees under natural circumstances made from twelve different populations (Hammam Bourguiba [HB], Dar Fatma [DF], Oued Zeen [OZ], Aîn Zana [AZ]; Mejen Essef [ME]; Béni Mtir [BM]; Djebel Zouza [DZ] **(**Ain Draham) El Feidja [EF] (Gar Dimaou); Bellif [B] (Nefza); Djebel Khroufa [DK] (Tabarka); Keff El Rand [KR] (El Haouaria) and Hammam Jdidi [HJ] (Hammamet))Cork oak Kroumirie, Mogod and Cap Bon on different soil and climatic condition.

Acknowledgments

This work was supported by grants from the Tunisian "Ministère de l'Enseignement Supérieur et de la Recherche Scientifique and Ministère de l'Agriculture et de l'Environnement.

References

[1]. **ABIDI, A & ABIDI, W., 2009.** Evaluation de la qualité des glands de chêne-liège (Quercus suber L.) dans une séquence de la subéraie Tunisienne. Projet de Fin d'étude. Diplôme de Licence appliquée en Biotechnologie, Inst., Supér. de Biotechnologie Béja, Tunisie, 40p.
[2]. **Borchert R. 1983**. Phenology and control of flowering in tropical trees. Biotropica 15: 81–89.
[3]. **Boudy P., 1950** Economie forestière Nord Africaine. Tome II. Fasc. 2. Livre III monographie et traitement de des essences forestières, pp 773-818.
[4]. **Dagnelie P., 1986** Théorie et méthodes statistiques. Applications agronomiques.Vol.2, p :463. Presse Universitaire de Gembloux. Belgique.
[5]. **DURANTON, J.F.; LAUNOIS, M.; LAUNOIS-LUONG, M. H. I LECOO, M ; 1978** Programme de Recherches lnterdisciplinaires Françâis sur les Acridiens du -Sahel P.R.l.F.A.S. '1975-1978. Bilan scientitique et technF que. Ministère de la Coopération, GERDAT Paris. 26 pages.
[6]. **Frankie GW, Baker HG, Opler PA (1974)** Comparative phonological studies of trees in tropical wet and dry forests in the lowlands of Costa Rica. J Ecol 62:881–919
[7]. **Fraval, A. 1991**. Contribution à la connaissance des rythm de floraison du Chêne-liège, Quercus suber (L.) (Fagales), en forêt de la Mamora. Ann. Rech. for. Maroc, 25, 102-118.
[8]. **El Afsa, 1978** Ecologie, phytosociologie, Régénération et production des subéraies Tunisiennes .Doctorat de spécialité, Univ. Aix-Marseille III, 123 p
[9]. **Grouzis :M. & Sicot M., 1980** - A method for the phenological study of browse populations in the Sahel : the influence ofsome ecological factors. 8 p. (233-240). In «Browse in Africa, the current state of knowledge », Le Houérou éd. ILCA, Addis Abeba, 49p
[10]. **Jackson, W. T. 1966**. Amaryllidaceae needed for cell division studies and Artificial pollination of Haemanthus katherinae Plant Life 22: 97-102.
[11]. **Leith , H. (Ed), (1974):** Phenology and seasonality modelling. Chapman and Hall, London, pp. 444
[12]. **Maire (1926)** Note phytogéographique de l'Algérie et de la Tunisie avec une carte. AlgerManai (2005)
[13]. **Mori, K ; Kuwahara, S.; Igarashi, Y.Pure Appl. Chem. 1990**, 62, 1307-1310
[14]. **Natividade J.V., 1956** Subericulture: Ecole Nationale des eaux et Forêts Nancy.
[15]. **Nizinski, J. & Saugier, B. (1988a)** J. Mesures et modélisation de l'interception nette, dans une futaie de chênes. Acta Oecologico. Oecologia Plantaruni. 4, (in press).
[16]. **Nizinski, J. & Saugier, B. (1988b).** A model of transpiration and soil-water balance for a mature oak forest. Agricultural and Forest Meteorology. (in press).
[17]. **Njoku, E. 1963.** Seasonal periodicity in the growth and development of some forest trees in Nigeria. I. Observation on mature trees. J. Ecol. **51** : 617–624.
[18]. **Njoku, E. 1964.** Seasonal periodicity in the growth and development of some forest trees in Nigeria. II. Observation on seedlings. J. Ecol. **52** : 19–26.
[19]. **PIAZZETTA R. 2005**.Etat des Lineux de la filière liège française. INSTITUT MÉDITERRANÉEN DU LIEGE. Project-Interreg III-B. Medoc. SUBER-MED
[20]. **POUPON H. 1979.** Etude de la phenologic de la strate ligneuse **2** Fété O16 de **1971 2 1977.** WIFAN, **41,** ser. A **(l), 44-91.**
[21]. **POUPON H., 1979.** Structure et dynamique de la strate ligneuse d'une steppe sahélienne au nord du Sénégal. Thèse de doctorat, université d'Orsay-Paris 11, France.. 51 pp
[22]. **Preney S.,Bonvicini M.P et Conche J., 199**7 La récolte des glands de chêne pédonculé (Quercus robur L)et de chêne sessile (Quercus petraea Liebl) à l'office National des forêts .ONF Bultletin technique N°33 office national des forêts service graines et plants Montraincon supt.39300.
[23]. **SACCARDY L., (1937)** – Notes sur le chêne-liège et le liège en Algérie. Bull de la station de rech for du Nord de l'Afrique, II (3), 271-272.
[24]. **Sauer, R. H. 1975.** The reiationship of cumulative sums of moving averages of temperature to reproductive phcnology in Clarkia. Am. Midl. Nat. 95: 144-158.

[25]. **Sauer, R. H.; Uresk, D. W. 1976**. Phenology of steppe plants in wet and dry years. Northwest Scientist 50: 133-139.
[26]. **Seghieri Josiane. 1991,**Dynamique saisonnière d'une savane soudano-sahélienne au Nord-Cameroun. Paris : ORSTOM, (71), 200 p. (Travaux et Documents Microédités ; 71). Th. Sci. Nat. : Physiol. et Biol. des Organismes et des Populations, Montpellier 2. 1990/09/12. ISBN 2-7099-1049-7
[27]. **Specht, R. L. & Yates, D. J. 1990.** Climatic control of structure and phenology of foliage shoots in dicotyledonous overstorey and understorey strata of subtropical plant communities in southeast Queensland. Acta Oecologica, 11: 215-233.
[28]. **YESSAD S.A., (2000)-** Le chêne-liège et le chêne dans les pays du méditerrané occidental. Edition ASBL foret Wallonne. 190P.