Journal of Global Biosciences
ISSN 2320-1355
Volume 4, Number 6, 2015, pp. 2513-2517
Website: www.mutagens.co.in
E-mail: submit@mutagens.co.in
researchsubmission@hotmail.com

Research Paper

THE EFFECTS OF CLIMATE CHANGE ON THE OLIVE TREE PHENOLOGY

Abichou Mounir and Msellem Monji

Olive tree Institute. BP 208, 1082 Tunis.Tunisia.

Abstract

Oleaeuropaea L. is the major crop in Tunisia and cultivated from the South to the North of the country. Flowering is considered the most important and delicate phase, indeed it reflect faithfully environmental extrinsic and tree intrinsic conditions. In the present work we study the impact of global warming on the olive tree in the South east of Tunisia, where nowadays starts a certain doubt about the future of this crop This study has been focus on floral phenology observations during 18 years (1992-2009) It has been investigated on three Tunisian olive oil cultivars (*Zalmati, Chemlali,* and *Zarrazi*) in an arid area (Zarzis, 33°36'N; 11°01'E). Annual rainfall is 180 mm, as an average of the 78 years period (1923 – 2000), however, during the last decade this trend was negative (172,6 mm). January and February minimum temperature is 4.7 and 5.8 °C, respectively, for the period 1923-2003); maximum temperature was recorded in August with an average of 35 °C. During the study period it has been observed an increase of temperature, especially during winter. This phenomenon being more evident during the last decade and strongly during 2007. The results have point out that this crucial stage of the fruitful cycle development vary along the time, depending on the meteorological conditions. Taking into account both phenological and meteorological databases it has been observed certain results that emphasize the impact of global warming during the flowering period. Along the years, a flowering advance has been observed, especially in 2000 and 2004. These results show an advancing trend which can continue with the expected climatic projections. Flowering advance leads to a more advantageous exposition of the fruits to the attack of the olive-tree's fly (*Bactocera oleae*) which can complete its cycle before excessive heats of June this condition causes the intensive use of chemical treatments.

Key words: Phenology, Climate Change, Olive, Tunez.

INTRODUCTION

The olive tree *Oleaeuropaea L.* is one of the most extensive crops in the Mediterranean region. Fruits and oil are among the most important products for the economy of this area. 95% of the total area under olive crop is concentrated in the Mediterranean Basin (South Europe and North Africa) where olive cultivation was originated about 6000 years ago in the Middle East.

Tunisia's olive resources are estimated at over 65 million olive trees, grown on 1 680 000 ha. Olive is wide spreading over the country from the north to the south and mainly cultivated under rainfed conditions. The main production regions are characterized by arid and semi arid climate with high evaporative demand, high solar radiation and an irregular and scarce precipitation (less than 200 mm year^{-1}). Moreover, cyclic severe drought was observed which

was amplified by limited water resources for irrigation. With projected climatic changes, drought will be more frequent.

It is widely known that drought may be considered one of the most frequent environmental constraints in the arid and semi-arid areas of Tunisia. These regions are subjected to severe watering conditions and high evaporative demand initiated by global warming

Olive phenolology is an indicator of global climatic change. Especially during spring months (Osborne et al.2000) The rising of spring temperatures during the past and current centuries has advanced the timing of leafing and flowering in many species at high.

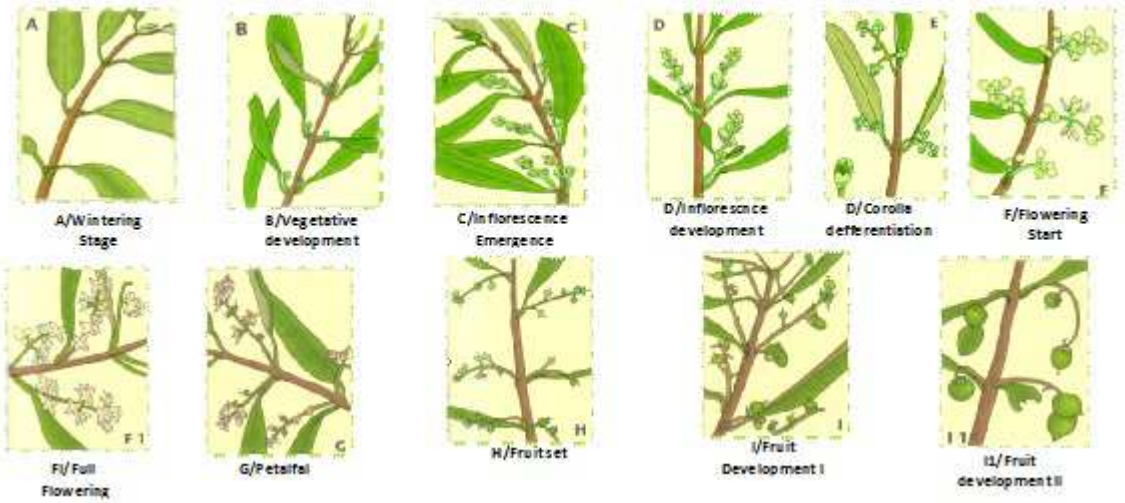
In the present work we study the impact of global warming on the olive tree in the South east of Tunisia, where nowadays starts a certain doubt about the future of this crop.

This study has been focus on floral phenology observations during 18 years (1992-2009) It has been investigated on three Tunisian olive oil cultivars (*Zalmati, Chemlali,* and *Zarrazi*)

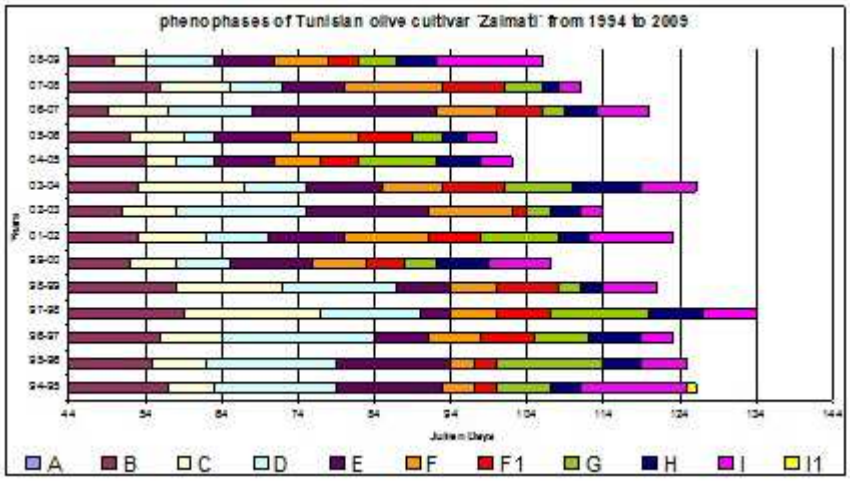
METHODOLOGY:

Phenophases series observations on 20 trees (Collebran and Fabre, 1978) **Site** Zarzis (South of Tunisia): Longitude: 33°36'N; Latitude: 11°02'E; Altitude: 9 metre. Annual rainfall: 180 mm Minimum temperature: 4.7°C inJanuray Maximum temperature: 35°C in August	

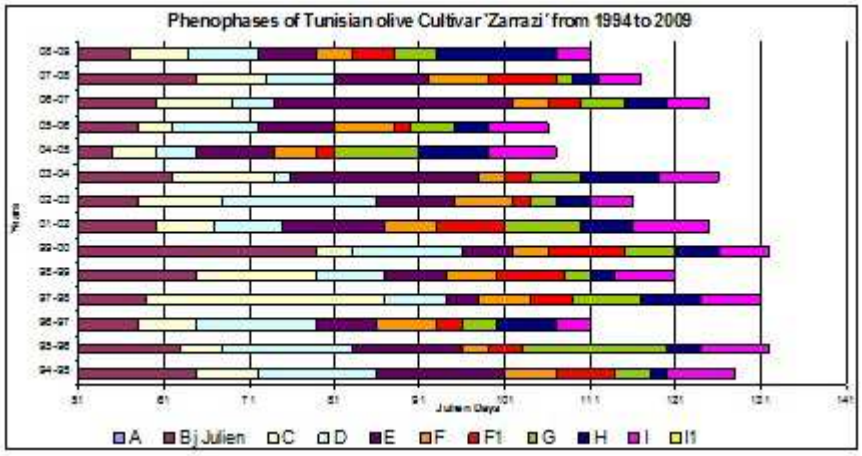
Reference phenological stages of Collebran and Fabre scale



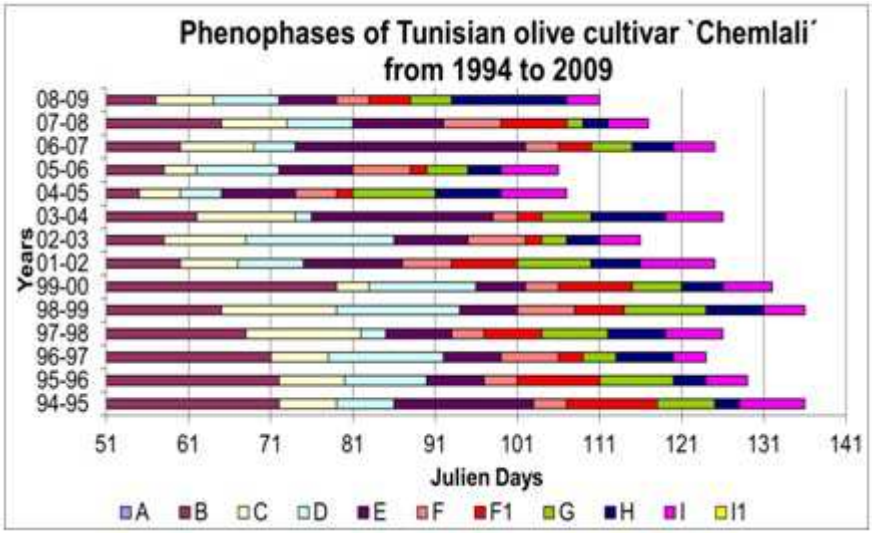
RESULTS



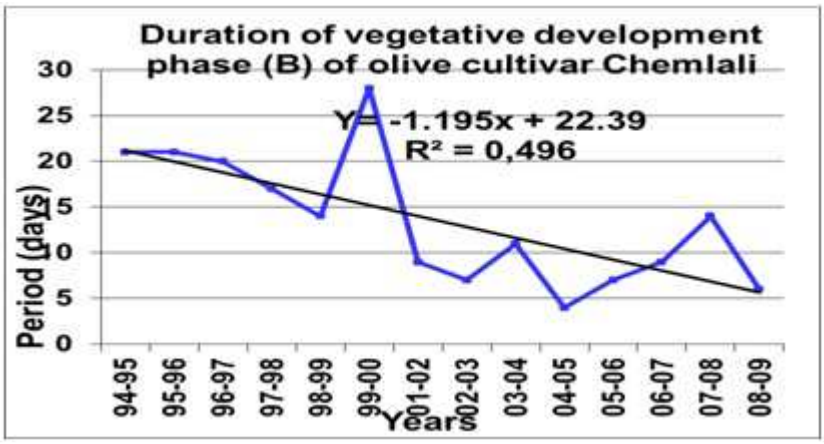
Phenologic phases of the Zalmati variety



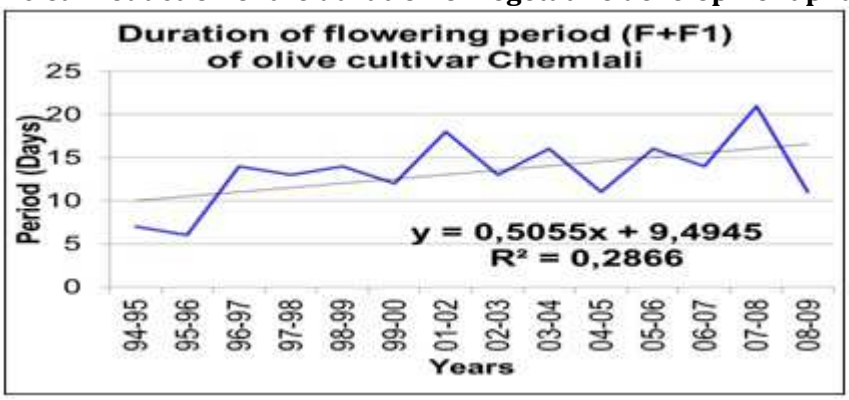
Phenologic phases of the Zarrazi variety



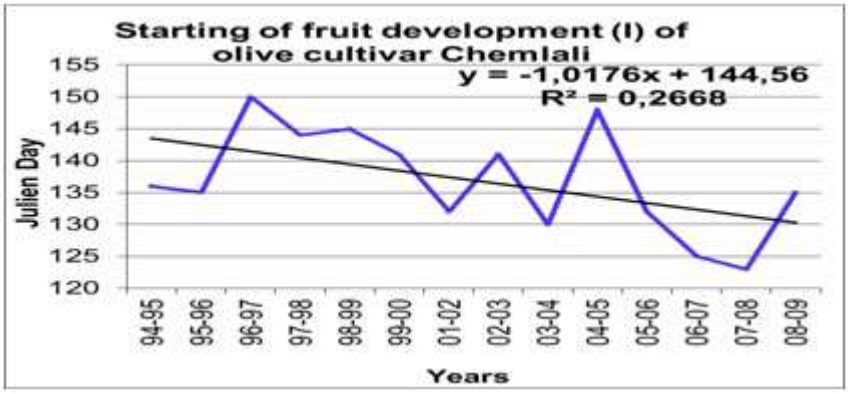
General trends of phenophases to the precocity



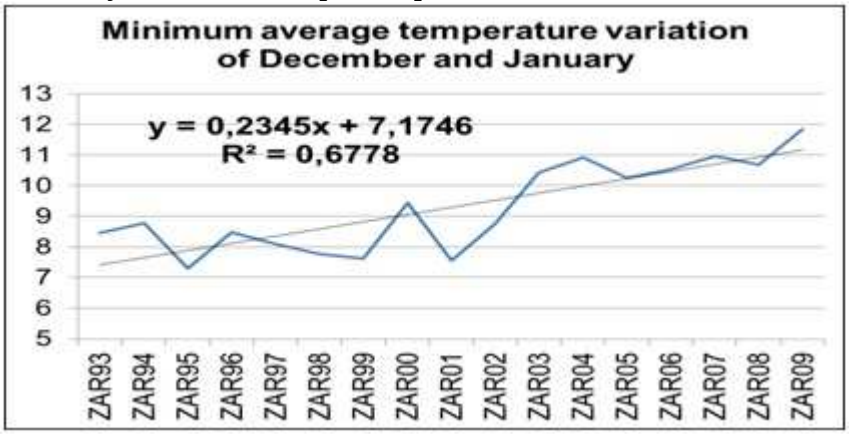
A clear reduction of the duration of vegetative development phase



Spreading of flowering period



Precocity of fruit development phase



The minimum average temperature of the two more cold months marked a growing tendency

South Tunisia present a climate characterized by hot, dry summers and mild, rainy winters. However, it is also characterized by a marked year-on-year variations in weather patterns and present a great spatial variability of his features. Also, the south Tunisia region has been identified as one of the most affected in future climate change projections

Especially for the Cultivar Chemllali : Starting from 2000, the years with very early flowering are increasingly numerous, with records of precocity ever reached before (2009) and this precocity is valued to 25 days. From the year 2004, the years with late flowering became rarer, but it is the observation of a trend and not of a systemic projection of flowering. This flowering advanced can be explained by the wintry maximal temperature is more and more elevated.

Flowering advance leads to a more advantageous exposition of the fruits to the attack of the olive-tree's fly (*Bactocera oleae*). Knowing that this fly attacks the fruit when he is becomes receptive (6mm size) and with this precocity, the fly can escape of the heat excessive of the month of June what can eliminate this fly naturally,

This condition causes the intensive use of chemical treatments.

Falling fruits caused by olive fruit fly

CONCLUSION

Climatic variability has increased during the last decades

-The phenophases of Cultivar Chemlali is more precocious that before .

- The intensive growing system is more sensitive to the effect of climatic change and conducted to deterioration of the soil and reduction of vegetative cover leading to water and wind erosion

- In the Tunisian south, it is necessary to restore and rehabilitate the traditional agro systems olive-growing which respect the good health of the grounds and their biodiversity, a better impact strength by report to the climatic change
- In addition to fostering environmental sustainability through soil and water conservation, conservation agriculture can contribute to the social and economic pillars of Sustainable Agriculture and Rural Development

The results of this paper are very important to determine the actual requirements of the olive tree in the Mediterranean Basin, where it is the main resource of thousands of families and generates economic wealth each year. This paper may be of vital importance from the standpoint of environmental, economic and social development in a changing environment.

ACKNOWLEDGMENTS

This work was supported by the Tunisian Ministry of Agriculture and Water Resources-. The part of the study related to cereals was supported by a bilateral cooperation Tunisian-Spanish project(A/020887/08: Impact of climate change on agricultural productivity in Tunisia and Spain).