**P 1.6** A DETAILED DESCRIPTION OF FLOWERING STAGES IN OLIVE TREE IN RELATION TO SIDE TREE CROWN EXPOSURE

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## 1. INTRODUCTION

Phenological observations are a valuable source of information for investigating the relationship between the development of plant vegetation cycle and the climate and weather variation. The knowledge of the phenological behavior of certain key indicator plant, and of the physical factors which are responsible of their phenological behavior, might help modelers to define more universal models for predicting phenological behavior of the same species in different weather condition (Kramer et al., 2000).

Several scales for defining phenological stages for olive tree were described by different authors (Morettini, 1972; Parlati, 1986). Recently, a relatively new scale for phenological observations, the BBCH (Biologische Bundersanstalt, Bundessortemt, Chemische, Industrie) system, is widely accepted for describing the growth and development stages of a wide range of crop and weeds. The extended BBCH-scale is a decimal system code divided into principal and secondary growth stages. The entire developmental cycle of the plants is subdivided into ten clearly recognizable and distinguishable longer-lasting developmental phases. The general scale forms the framework within which the individual scales are developed (Meier, 2003). Phenological stages for olive tree, using the BBCH scale system, was recently described by Sanz-Cortés et al. (2002).

The objective of this paper is to describe the phenological behavior of olive tree in relation to the possible influence of the environmental factors such as exposure and temperature.

## 2. MATERIALS AND METHODS

The experiment was conducted in a sub-urban area located in northern Sardinia, Italy. Phenological observation were performed in an olive orchard, on the cultivar *Bosana*, every day from March to June for two years. Three plants representative of the entire orchard were chosen. On each plant, three branches for each quadrant (North, West, South, and East) were selected and labeled. In total, 12 clusters for each plant were observed during the reproductive season until fruit set stage. The following phenological stages, based on the BBCH scale system (Sanz-Cortés et al., 2002) were observed: (1) Inflorescence buds start to swell (BBCH 51, BS); (2) Corolla changes colour from green to white (BBCH 59, CC); (3) First flowers open (BBCH 60, FO); (4) Full flowering: at least 50% of flowers open (BBCH 65, FF); (5) First petals falling (BBCH 67, PF); (6) End of flowering, fruit set, not fertilized ovaries fallen (BBCH 69, FS).

Maximum and minimum air temperature, precipitation, and air relative humidity were recorded during the 2-years experimental period by a standard meteorological weather station located in the field.

## 3. RESULTS AND DISCUSSION

The annual trend of meteorological parameters for the two-years of experimentation is shown in Figure 1a and 1b. No difference was observed for monthly mean temperature values between the two years. The total annual amount in rainfall was higher for the second years (630 mm) than in the first one (465 mm). The drought period was of about three months during the first year (from mid-May to mid-August) whereas in the second one ranged from end of June to mid September.

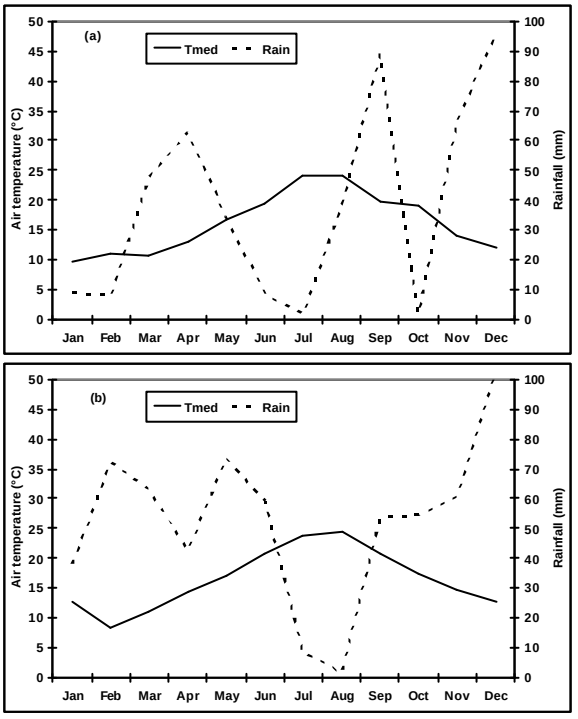


Fig. 1 - Annual trend of air temperature and rainfall for the two-years of experimentation: (a) 1st year, (b) 2nd year.

Differences in the annual phenological behavior for olive tree are shown in Fig. 2. The reproductive cycle started during the first year two days in advance but no difference was observed in the length (17

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days). Inflorescence of bud swell during the first year was one day longer than in the second year but the period between the beginning of flowering and full flowering was one-day shorter. All the others stages showed the same duration. The differences in phenological behavior can be related to the different meteorological conditions of the two years, in particular to the longer drought period observed during the first year.

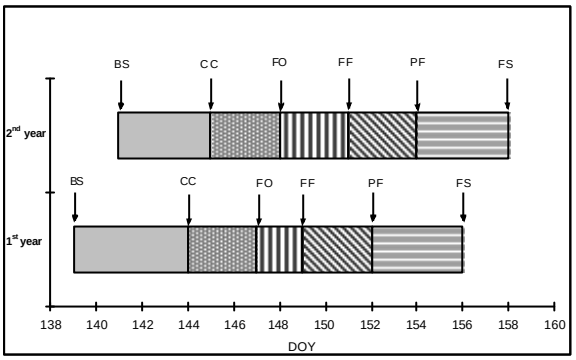


Fig. 2 - Phenological stages occurrence (BS inflorescence buds swelling; CC corolla changes colour; FO first flowers open; FF full flowering; PF first petals falling, FS fruit set) for the two years.

Although the anthesis period of a single flower was very short, lasting for a maximum of two days, in the whole tree as in the grove, flowering occurred along 20 days, with differences of about three days in the start of the process related to the canopy exposure (Fig. 3a and 3b).

Two peaks in the process trend were recorded during the first year at East and at South in the same dates. In the North and East sides only one peak in flowers percentage was observed 5 days later. In addition it was clearly evident that in the North crown side the flowers percentage was lower that in the others. In addition it was clearly evident that in the North crown side the flowers percentage was lower than in the others (Fig. 4).

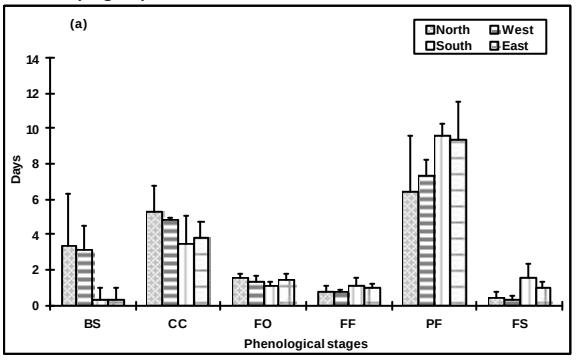


Fig. 3a - Phenological stages duration observed during the 1st year in the four sides of the crown (North, West, South, and East).

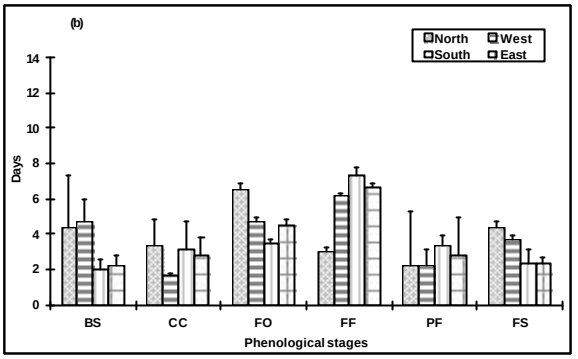


Fig. 3b - Phenological stages duration observed during the 2nd year in the four sides of the crown (North, West, South, and East).

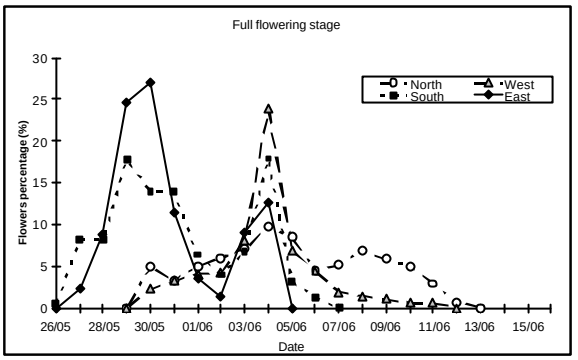


Fig. 4 - Flowers percentage observed in the different sides of the crown for the full flowering stage.

## 4. CONCLUSIONS

The results of this study indicate that phenological behavior of olive tree is largely influenced by environmental factors such as temperature and exposure. The influence of exposure on reproductive cycle is probably related to the differences in heat accumulation for the four sides of the crown. This influence was appreciable in term of both timing of reproductive stages and numbers of open flowers.

## 5. REFERENCES


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