P 1.5 FLOWERING PHENOLOGY OF OLIVE TREES (*OLEA EUROPEA* L.) IN NORTH SARDINIA (ITALY) AND ITS RELATIONSHIPS WITH AIRBORNE POLLEN PATTERN

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1. INTRODUCTION

Aerobiology and phenology studies are focused on different natural phenomena. Aerobiology is the scientific discipline focused on the presence and distribution patterns of pollen in the air, whereas phenology studies the timing of periodic biological phenomena and their relationships with the environment. The presence of pollen in the air is related to the release of pollen from anthers and, consequently, to reproductive cycle of plants. For this reason, the two disciplines are often considered interconnected (Jato et al., 2002).

Airborne concentration pattern reflects flowering phenology of a given species, and so it may represent a sensitive regional indicator in climate change studies. Moreover, it might be used instead of long-term phenological observation series.

In the Mediterranean basin olive tree is one of the most economically important fruit tree crop. It is widely cultivated both in countryside and in sub-urban areas. Despite the importance of olive tree for production, many studies have shown the high allergenicity of olive pollen and the related risk for human health (Atzei et al., 1993; Galan et al., 2001).

In this paper the results of aerobiological and phenological studies on *Olea europea* L. (olive) are presented. The main aim of this research was to investigate relationships between flowering phenology of olive and its airborne pollen seasonal pattern. In particular this study was carried out in order to: i) verify the synchronization between the release of pollen from anthers and its occurrence in the atmosphere, and ii) evaluate the effect of the environment on pollen release and dispersion.

2. MATERIALS AND METHODS

The study site (40° 45' N, 8° 29' E, 170 m a.s.l., NW exposure) is located 5 km from an urban area, in an extensively cultivated area for olive oil production. The experimental grove site is representative of the entire cultivated region for main characteristics: cultivar *Bosana*, calcareous soil, dominant NW wind, similar management practices.

From April to June, phenological observations were carried out every day on three olive trees; for each individual, three one-year shoots were selected for each cardinal point of the crown (12 shoots per plant). The following phenological stages based on the BBCH scale system (Meier 1997; 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).

Airborne olive pollen concentration was recorded both in the olive grove and in the urban area. In each area two Burkard 7-days recording volumetric traps were used to perform pollen counts.

Meteorological parameters were also recorded during the experimentation. The influence of meteorological parameters on pollen concentration in the atmosphere was determined by simple regressions.

3. RESULTS AND DISCUSSION

Olive pollen daily concentration showed different trends both in the countryside and in the urban area, during the 2-years trial (Fig. 1 and 2).
Pollen concentration in the urban area recorded during flowering period (from May 17 to June 8) was about ten times lower than in the grove.

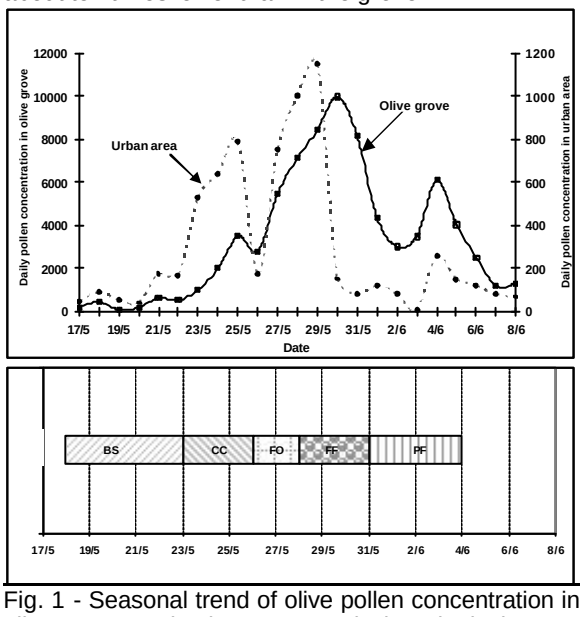

Fig. 1 - Seasonal trend of olive pollen concentration in olive grove and urban area and phenological stage occurrence (inflorescence buds swelling, BS; corolla changes colour, CC; first flowers open, FO; full flowering, FF; first petals falling, PF) for 1st year of experimentation.

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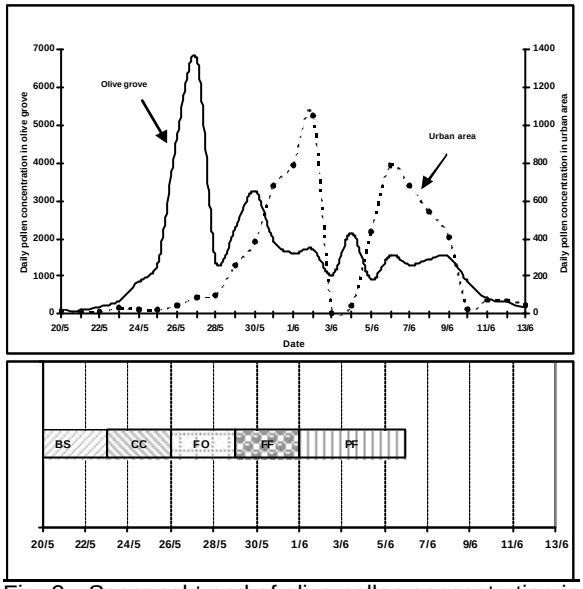

Fig. 2 - Seasonal trend of olive pollen concentration in olive grove and urban area and phenological stage occurrence (inflorescence buds swelling, BS; corolla changes colour, CC; first flowers open, FO; full flowering, FF; first petals falling, PF) for 2nd year of experimentation.

Relationship between flowering stage timing and pollen concentration in the grove and consequent pollen dispersal in the urban area atmosphere was clearly evidenced during the first experimentation year (Fig.1). Full flowering phase was almost simultaneous to pollen concentration peaks, both in the grove and in the urban area. In the following year (Fig. 2) the full flowering period and the highest pollen concentration in the grove was observed six days earlier than the greatest amount of airborne pollen in the urban area. In both years, a significant positive regression was observed between hourly temperature and hourly pollen concentration recorded during the flowering stage period in the grove (Fig. 3). Differences were recorded between the years, with higher regression coefficient calculated during the first year.

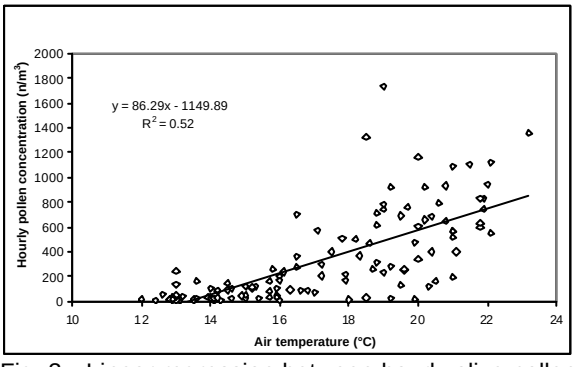

Fig. 3 - Linear regression between hourly olive pollen concentration and hourly air temperature during the flowering stage period (first experimentation year).

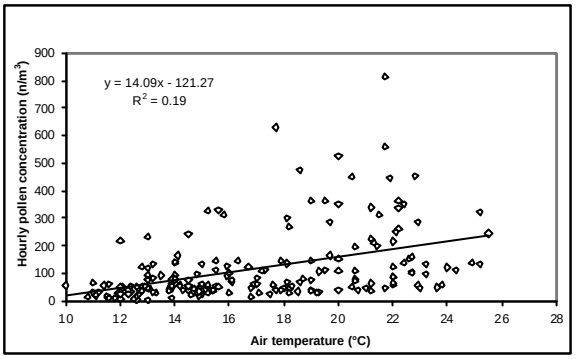

Fig. 4 - Linear regression between hourly olive pollen concentration and hourly air temperature during the flowering stage period (second experimentation year).

4. CONCLUSIONS

The yearly differences between the flowering period and the pollen peaks in the grove and in the urban area, seems to indicate that airborne pollen concentration is dependent on the rate of pollen production, the rate of release of pollen and the dispersal conditions in the atmosphere. A clear correspondence between the full flowering stage date and the airborne pollen concentration peaks was observed both in the grove and in the urban area.

Regressions between hourly pollen concentration and hourly air temperature showed that meteorological parameters influence flowering rhythms and thus daily air pollen concentration seasonal pattern, mainly during the years with the higher pollen production.

5. REFERENCES

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