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Effects of releases of *Orius laevigatus* (Fieber) (Rhynchota Anthocoridae) and hand pollination on Cherimoya (*Annona cherimola* Mill.) fruit production in Sicily(**)

Abstract - In addition to a previous research, trials were carried out in 1997 to verify the effects of releases of *O. laevigatus* on the pollination of cherimoya in Sicily. The anthocorid confirmed its efficacy. Releases of *O. laevigatus* to improve the fruit setting and fruit quality of cherimoya, could be useful in orchards where the species is present at a low percentage and the efficacy of other species is poor. Hand pollination was tested using a small pump during 1998. Fruits produced through hand pollinated flowers were significantly more abundant and well-proportioned in comparison with those obtained in the control. The used technique allows to save time and labour considerably in comparison with the common hand pollination technique of using a small brush.

Riassunto - *Effetti di lanci di* Orius laevigatus *(Fieber) (Rhynchota Anthocoridae) e dell'impollinazione manuale sulla fruttificazione dell'Anona (*Annona cherimola *Mill.).*

L'impollinazione dell'anona è principalmente dovuta all'azione di insetti, tra i quali in Sicilia è risultato abbondante l'antocoride *Orius laevigatus* (Fieber). A completamento di una ricerca a suo tempo iniziata nel 1997 sono state effettuate prove per verificare l'effetto di *O. laevigatus* nell'impollinazione dell'anona, che ne hanno confermato il ruolo positivo, anche se immissioni di questo antocoride potrebbero essere giustificate solo in frutteti in cui tale specie non è abbondante e dove l'efficacia degli altri insetti impollinatori è scarsa. Nel 1998, inoltre, sono state effettuate prove di impollinazione manuale, con un'apposita pompetta, che hanno favorito un incremento di produzione quantitativo e qualitativo rispetto alla produzione ottenuta con l'impollinazione naturale, svolta quasi esclusivamente da *O. laevigatus*. Inoltre la tecnica utilizzata permette un considerevole risparmio di manodopera rispetto all'impollinazione manuale comunemente realizzata con un pennellino.

Key words: pollination, *Orius laevigatus,* pump, Sicily.

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INTRODUCTION

Pollination is one of the main limiting factors of cherimoya production. Because of the characteristic morphology and biology of its flowers, the fruit setting is usually low and the fertilisation of the carpels is not complete, therefore producing asymmetrical low quality fruits. Cherimoya pollination is usually due to insects, but they are not always able to obtain a good production, both at quantity and quality levels. In some countries where cherimoya is cultivated (i.e. Florida, Spain, Israel), Coleoptera Nitidulidae are the most common insects visiting flowers and considered the main pollinating agents (Gazit *et al.*, 1982; Nadel & Peña, 1994). Furthermore, because of the unsatisfactory natural insect pollination, attention has been paid in California, Chile and Spain to different currently used techniques of hand pollination, (Schroeder, 1971; Farrè Massip, 1993; Vargas-Mesina, pers. com.).

Several differences were found among the entomofauna visiting flowers in some Italian regions (Caleca *et al.*, 1996; Continella *et al.*, 1996; Palmeri & Longo, 1997). Besides nitidulid beetles, other Coleoptera and Heteroptera were found, sometimes reaching high percentages. The anthocorid *Orius laevigatus* (Fieber), frequently found both in Sicily and Calabria (Caleca *et al.*, 1996; Continella *et al.*, 1996; Palmeri & Longo, 1997), represented up to 70% of the insects visiting flowers (Caleca *et al.*, 1996). The present paper deals with the role of *O. laevigatus* in the pollination of cherimoya.

Furthermore, we tested the additional effects of hand pollination by means of a pump commonly used in Chile, in the same orchard where *O. laevigatus* was abundant.

MATERIALS AND METHODS

Trials were carried out in a cherimoya orchard located at Sciacca (Agrigento province), on eight/nine year old trees of the cv. Fino de Jete.

Pollinating role of O. laevigatus

Trials on pollination by the anthocorid *O.laevigatus* were carried out from 13th June to 11th July 1997, on the basis of the results of a previous work (Caleca *et al.*, 1996). An average number of eight branches per week on the twelve trees of the trial were randomly selected and covered with anti-aphid net sleeves. About 80 nymphs and adults of *O. laevigatus* were introduced into each sleeve. The same number of branches was marked as control, leaving the flowers to be pollinated by the insects naturally present in the orchard. Flowers in the male stage were removed from both the control and the trial branches, while those in the female stage or close to the opening, were counted and marked. Each branch was uncovered after a week, and set

flowers were counted. In October, at the harvest-time, mature fruits were counted, distinguishing the asymmetrical and well-proportioned ones.

Hand pollination

Weekly tests on hand pollination were carried out from 8th June to 10th July1998, using a pump, commonly employed for cherimoya pollination in Chile (Vargas-Mesina, pers. com.). A branch as test and another as control were randomly chosen on each of the ten trees selected for the experiment; flowers in the male stage were removed, while those in the female stage were counted and marked. Few minutes before the hand pollination operation, ca. 50 flowers in the male stage were collected, and after shaking them on a sieve, the pollen was sprinkled through the pump into the flowers in the female stage.

The branches of the control were pollinated by insects naturally present in the field. At the end of the blooming period set flowers were counted; in October during the harvest-time fruits were counted and their quality level was recorded.

All the data recorded in both years were analysed by using the(x^2) test (P=0,01).

RESULTS AND DISCUSSION

Pollinating role of O. laevigatus

As shown in tab. 1, in the 1997 trials 1,163 flowers, 582 of the test and 581 of the control, were examined. The fruit setting was, at the uncovering, 69.1% in the *Orius* test and 68.7% in the control, while in October fruits represented 14.6% and 13.3% of marked flowers respectively. No significant differences were recorded between the test and the control, also as the fruit quality was concerned (tab. 1). These results confirm the pollinating activity of *O. laevigatus*. Furthermore, since the entomofauna recorded in this site on cherimoya flowers consists of 70% of this anthocorid (Caleca *et al.*, 1996), we can consider it the only insect significantly influencing the fruit production of this orchard.

Tab. 1 - Data on pollination of cherimoya flowers by O. laevigatus.

	No. of marked flowers	No. of set flowers at the uncovering	No. of fruits in October	Fruit setting %	Fruits in October %	Fruit Quality			
						I*		II**	
						No.	%	No.	%
Sleeves with *Orius laevigatus*	582	402	**85**	69.1 a	14.6 a	**40**	47.1 a	**45**	52.9 a
Control	581	399	**77**	68.7 a	13.3 a	**34**	44.2 a	**43**	55.8 a

Different letters denote significant differences ($\chi 2$, P=0,01)
* symmetrical fruits
** small asymmetrical fruits

As a consequence, releases of *O. laevigatus* to improve the pollination level of cherimoya could be useful in fields where such a species is present at a low percentage and the efficacy of the other species is poor.

Hand pollination

The results of the trial carried out during 1998 are reported in tab.2. A total number of 550 flowers was considered, of which 243 were hand pollinated and 307 in the

Tab. 2 - Additional effects of hand pollination on fruit production of cherimoya.

	No. of marked flowers	No. of set flowers at the end of blooming period	No. of fruits in October	Fruit setting %	Fruits in October %	Fruit Quality			
						I*		II**	
						No.	%	No.	%
Hand pollination	243	76	**57**	31.3 a	23.5 a	**31**	54.4 a	**26**	45.6 a
Control	307	46	**20**	15.0 b	6.5 b	**6**	30.0 b	**14**	70.0 b

Different letters denote significant differences ($\chi 2$, P=0,01)
* symmetrical fruits
** small asymmetrical fruits

control. At the end of the blooming period the fruit setting was 31.3% in the test and 15.0% in the control, while in October fruits represented 23.5% and 6.5% of marked flowers respectively. The differences between the results obtained both in the test and in the control are in both cases significant, as well as the differences between the percentage of asymmetrical and well-proportioned fruits (54.4% in the test and 30.0% in the control). It should be said that the value of fruit setting obtained through hand pollination, is the average of the whole blooming period, while the highest value (53%) was recorded in the first week of the trial, when the crop was in full blooming (fig. 2); this might, therefore, explain differences between the present values and those obtained by Schroeder (1971). It has, however, to be considered, that, even if the same technique of hand pollination is adopted, results may vary greatly due to factors such as temperature and relative humidity

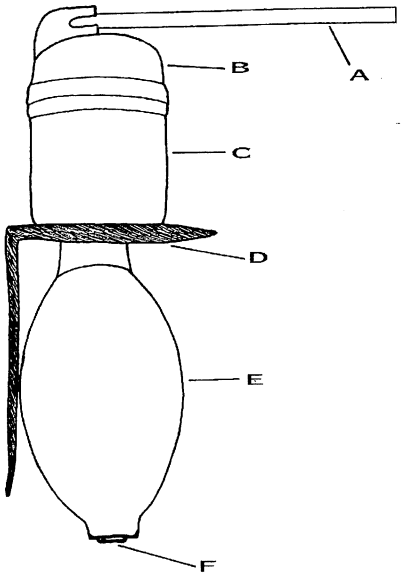

Fig. 1 - Diagrammmatic drawing of the pump used for hand pollination (A, pollen exit channel; B, lid; C, plastic pollen container; D, stiff plastic handle; E, gum pump; F, air injection valve).

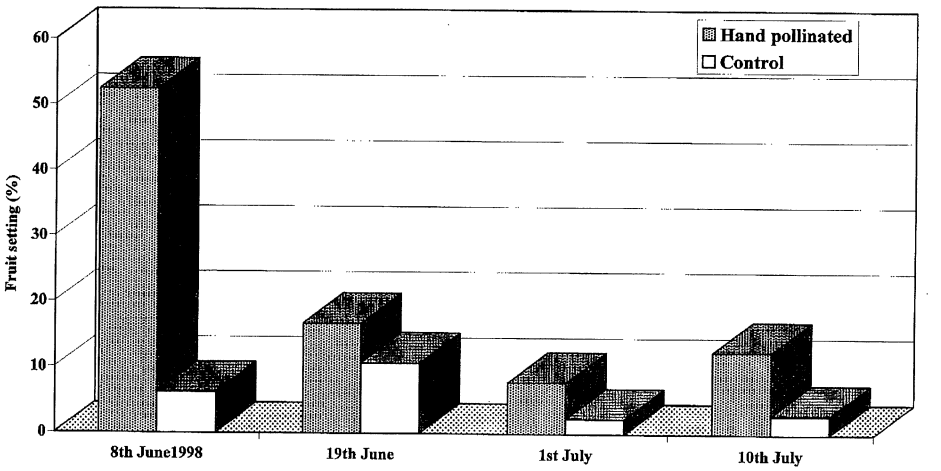

Fig. 2 - Fruit setting in hand and naturally pollinated flowers of cherimoya.

rate during pollination time, plants' nutritional conditions and varieties (Schroeder, 1971).

Furthermore, the pump used in the present trials allows to save time and labour considerably in comparison with the common hand pollination technique of using a small brush (Schroeder, 1971; Farrè Massip, 1993).

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