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MASS REARING OF *DICHROMOTHRIPS CORBETTI* (PRIESNER) (THYSANOPTERA: THRIPIDAE) ON *VANDA* FLOWERS [1]

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ABSTRACT

A method to mass produce the *Vanda* thrips, *Dichromothrips corbetti* (Priesner) on flowers of *Vanda* under laboratory conditions is described. The method is easy, simple, convenient to use and sustainable. Large numbers of individuals of uniform ages can be produced in a short period of time. A total of 6,066 offspring can be produced by 100 female parents in mass culture.

Key words : *Dichromothrips corbetti,* mass rearing technique, Vanda thrips

INTRODUCTION

Dichromothrips corbetti (Priesner) is a serious pest of *Vanda* in the Philippines. Its biology had been studied quite extensively by Hirao *et al.* (2001) and Navasero *et al.* (2001). Reyes (1994) provided information on its natural history as part of the thrips fauna of the Philippines.

A cheap rearing container using commercially available ziplock plastic bag had been devised and the requirements to successfully mass rear *D. corbetti* in the laboratory had been determined (Navasero *et al.*, 2001). The method is simple and made use of whole flowers of *Vanda* orchids for oviposition and feeding; tissue paper as pupation material; and ziplock plastic cages. The ziplock plastic cage minimizes loss through escape and allows easy handling, manipulation and observation. It is useful in rearing large numbers of larvae, pre-pupae, pupae and adults of known and uniform ages as test material for predator-prey experiments, toxicological bioassays and other research activities. This paper discusses and presents the detailed procedures in the mass rearing of *D. corbetti* in the laboratory.

MATERIALS AND METHODS

The improvised rearing cage

Commercially available ziplock plastic cages were used with some improvisations as follows (Figure 1). Each bag was provided with an aeration window by

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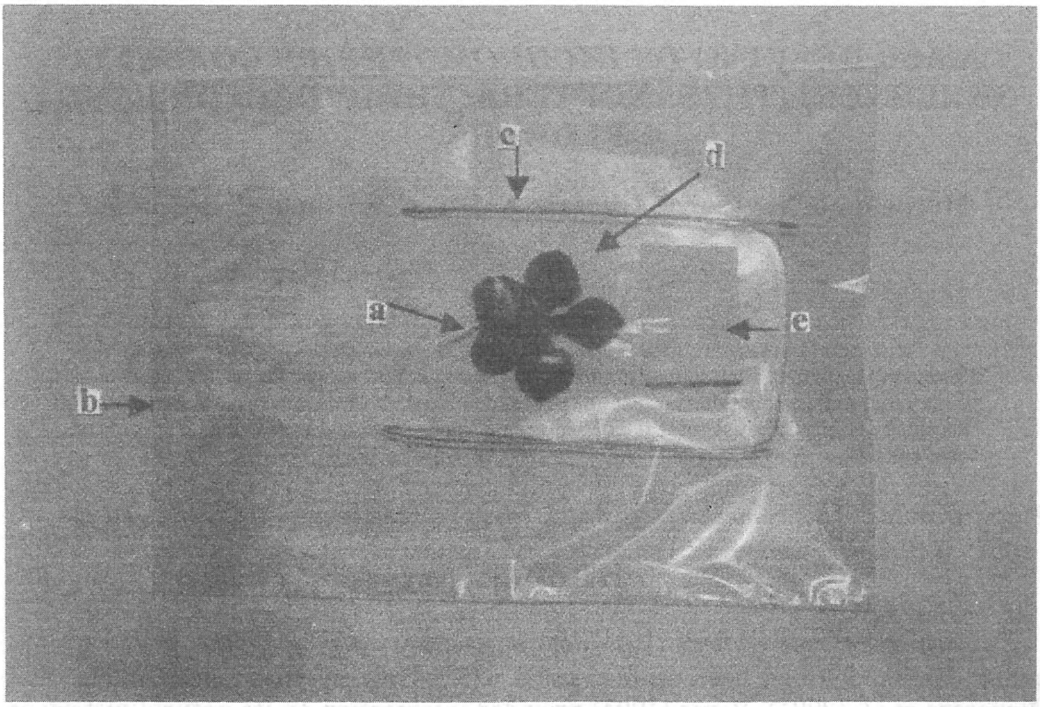

Figure 1. Set-up for mass rearing *Dichromothrips corbetti* (Priesner) showing the different materials: a) Vanda flower, b) zip-lock plastic bag, c) bent wire, d) 3-ply tissue paper and the cut-out window covered with e) paper towel.

cutting off a 10 x 10 cm square area at the mid-part of one side. The opening or window was covered with paper towel (Kotex^R) of the same dimension and held in place at its 4 edges with plastic tape.

The bottom side of the bag was lined with tissue paper which may be 1-,2- or 3-ply and the number of layers placed depended on the life stage being confined. Plain paper may also be used. The tissue or plain paper is an intervention for excess moisture and to regulate humidity. It serves also as a good pupation substrate as it prevents mature larvae from pupating along the sides or corners of the bag in crowded conditions that may result to high pre-pupal mortality. The bags were emptied, cleaned and dried after use. These are reusable for rearing another batch of thrips.

To provide more space, further increase aeration and prevent accumulation of unnecessary moisture a wire support was added. This was made from galvanized iron wire, size no. 22, 1 m long and bent as shown.

Provision for the feeding stages

Fully mature, pesticide-free flowers purchased from reliable growers were used. Fresh flowers are preferred. However, to insure continuous supply, flowers can be refrigerated at 10°C and 80% RH.

Parent Stock

To start rearing, an initial material of about 150 female and equal number of male *D. corbetti* was obtained from Dr. Henry T. Facundo of the Department of Entomology, College of Agriculture, UP Los Baños, College, Laguna.

Mass rearing procedure

Mating & Oviposition. Day-old adult female and male thrips at a ratio of 2:1 were confined per ziplock cage. A *Vanda* flower was placed inside to serve as food for both adult thrips and oviposition substrate for the females. After 24-hr oviposition access time, and daily thereafter, the flower was replaced with a new one. Extra care was observed to insure that thrips remained in the bag and not removed together with the replaced flower. This was done by brushing off the thrips with a camel's hair brush or slightly tapping the flower to dislodge all the thrips. The replaced flower was then washed under running water, blotted dry and transferred to a holding ziplock plastic bag for incubation. When most of the adults were no longer productive, these were discarded or fed to the predatory bug, *Orius tantillus* (Motschulsky).

Larval feeding and pupation. A new flower was introduced into the ziplock plastic cage 3-4 days after when almost all the larvae have hatched. Flowers were added as needed or depending on the density of the larvae remaining on the flowers. At about day 6 or 7, the mature larvae leave the flower in search of pupation sites. At this time, no new flower need to be introduced until day 9 when the adults start to emerge and when necessary up to day 13 at which time all the adults had emerged.

Mass culture of *D. corbetti*

To develop an efficient and productive method of mass culturing *D. corbetti*, it was necessary to determine the density level of one day old females that will result to the highest number of progeny. Three density levels were tried namely 25, 50 and 100 females in mass culture, or simply density 25, 50 and 100, respectively. The following data were also gathered: 1) reproductive period (number of egg-laying days), 2) daily mortality of parent thrips, 3) number of offspring, 4) development time (egg to adult), 5) emergence patterns, and 6) male to female ratio.

RESULTS AND DISCUSSION

Oviposition. *Vanda* is the best oviposition substrate (Navasero *et al.*, 2001). However, because the eggs are laid within the flower tissue and are so minute, it is difficult to determine the number of eggs laid as well as the percent hatchability. On parafilm, an artificial substrate for oviposition used by several authors (Laughlin, 1971; Murai & Ishi, 1983; Teulon, 1992), the eggs are visible and can be counted. However, *D. corbetti* does not readily oviposit and the rate of oviposition is reduced on parafilm. Other substrates did not elicit positive response and are inadequate in providing nourishment for growth and development resulting to smaller adults and shorter life span (Navasero *et al.*, 2001). Obviously, *Vanda* flowers appear to stimulate oviposition.

Larval feeding and pupation. Figure 2 shows the appearance of *Vanda* flowers fed upon by thrips from 0-4 days after egg-laying. Drying up is gradual during the first three days but becomes sudden on the fourth day, due to excessive feeding of first instar larvae.

Larval feeding is greatest on the fifth and sixth day and food becomes critical for proper growth and development of the second instar larvae prior to pupation. Well-fed larvae are bigger, developing to larger pupae and adults. Larger adults have longer life span and higher fecundity.

Normally, mature larvae leave the host flower to seek pupation sites. However, they seem to prefer and conceal themselves beneath the paper or in between each ply of tissue paper.

Mass culture of *D. corbetti*

Productive density level. Thousands of *D. corbetti* can be produced even at the lowest density of female parent thrips (Table 1). However, the greatest number of offspring was produced at density 100.

Daily mortality of parent thrips. The survivorship curves of *D. corbetti* at different densities are shown in Figure 3. Generally, adults had long lifespan, regardless of density level. However, adults at density 100 succumbed to death earlier than expected due to competition for food.

Number of offspring. A total of 4,267 offspring were produced at female density of 25 per bag, 5,075 at density 50 and 6,066 at density 100 (Table 1). Adult parent thrips kept on laying eggs, on the average, 25 days at density 50, 24 days at density 25 and 21 days at density 100.

The mean number of offspring regardless of density of parent thrips showed at least two peaks, the highest at about 650 offspring on day 4 and the second peak at about 550 on day 7 at density 100 (Figure 4). Such trend maybe inherent to *D. corbetti,* however, the most plausible explanation is due to nutrition. The *Vanda* flowers used in this experiment were purchased from different growers that differ in nutritional quality due to differences in cultural management particularly the kind and amount as well as frequency of fertilizer application. In addition, keeping the *Vanda* flowers inside the refrigerator for a period of time obviously decreased the nutritional quality of the flowers. The results suggest that *Vanda* flowers for mass rearing *D. corbetti* should be always fresh for optimum production of thrips.

The cumulative mean number of offspring showed that about 75% of total progenies were produced within the first 12 days of oviposition (Figure 5). Only 25 % was produced within the last 10 days. This is attributed to old age and death of parent thrips. Since *D. corbetti* was no longer productive beyond 12 days it was more appropriate and cost effective discarding the thrips and start another batch of layers. Discarded thrips were used as prey in the mass rearing of *Orius tantillus* (Motschulsky), an efficient predator of *D. corbetti* as well as *Thrips palmi* Karny (Mituda & Calilung, 1989; Navasero & Calilung, 1997; Calilung *et al.,* 1998).

Development time. Total development time (egg to adult) ranges from 9-13 days (Table 1). As in most cases, males developed faster than females.

Emergence patterns. Figure 6 shows the emergence patterns of adult progenies of *D. corbetti*. Adults start to emerge on the ninth day after oviposition. Adult emergence peaked on the 10th day after oviposition.

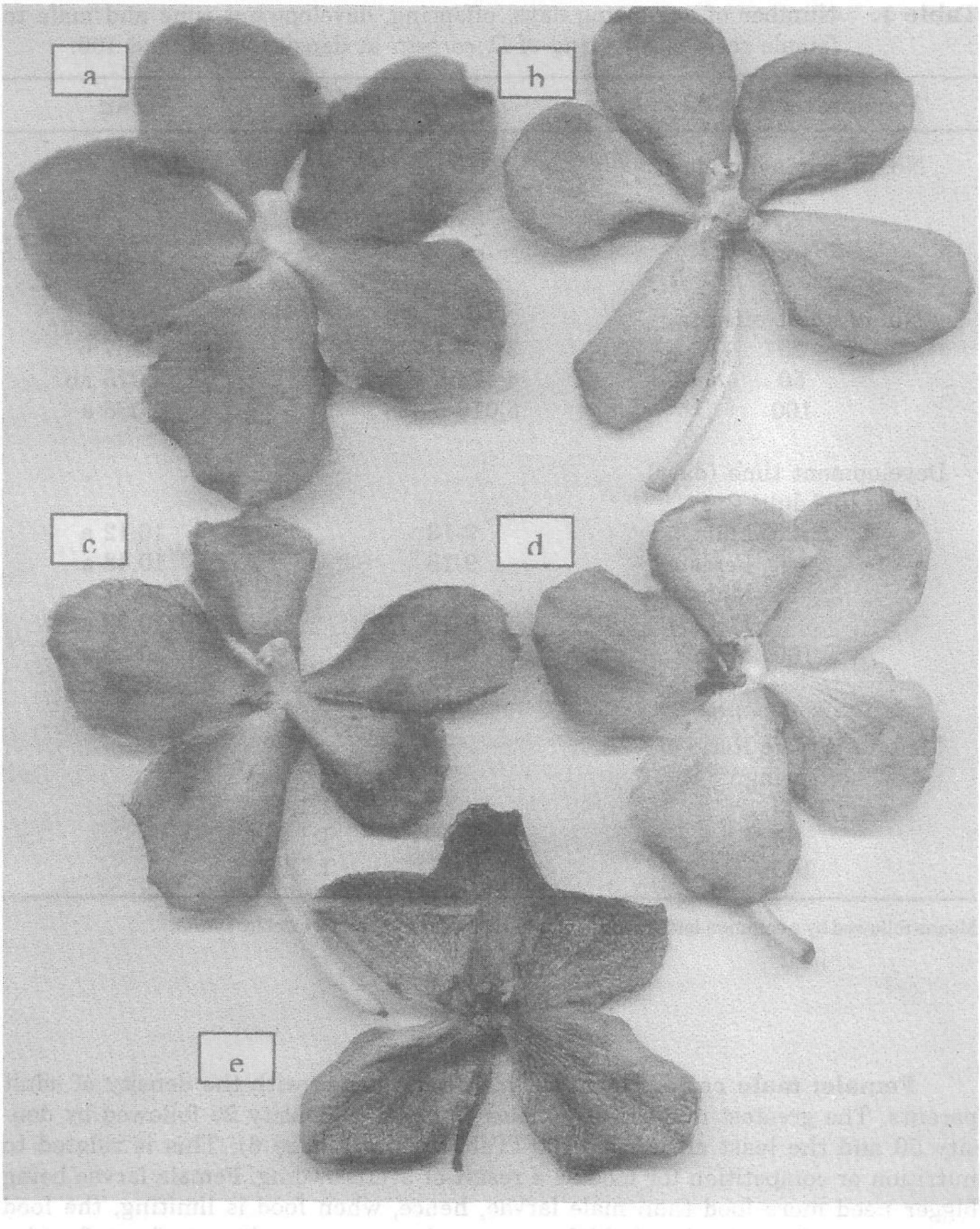

Figure 2. Appearance of *Vanda* flower from day 0 (a) and to 1-4 days after exposure as oviposition substrate (b-e, respectively).

Table 1. Number of egg-laying days, offspring, development time and male to female ratio of offspring of *D. corbetti* at density 25, 50 and 100.

Parameter/Density	Range	Mean
No. of egg-laying days		
25	22-26	24 ab
50	24-26	25 a
100	21-22	21 b
No. of adult offspring		
25	3,937-4,779	4,267 b
50	4,424-5,879	5,075 ab
100	5,016-6,628	6,066 a
Development time (days) (Egg to Adult)		
25 Male	9-13	10.12 a
Female	9-13	10.48 a
50 Male	9-13	10.27 a
Female	9-13	10.39 a
100 Male	9-13	10.15 a
Female	9-13	10.34 a
Male to Female Ratio of offspring		
25	1:1.46	
50	1:1.01	
100	1.18:1	

Means followed by a common letter are not significantly different at 5% level by DMRT.

Female: male ratio. Female to male ratio varies with the density of adult parents. The greatest number of females emerged at density 25 followed by density 50 and the least at density 100 (Table 1 and Figure 6). This is related to nutrition or competition for food as a result of overcrowding. Female larvae being bigger need more food than male larvae, hence, when food is limiting, the food requirement of females for vital life processes is not met resulting to fewer females than males reaching the adult stage.

SUMMARY AND RECOMMENDATION

Dichromothrips corbetti was successfully mass-produced in ziplock plastic cages on whole *Vanda* flowers ('Josephine van Brero' hybrid) under laboratory conditions. The flowers of this hybrid are big, succulent but firm and have longer

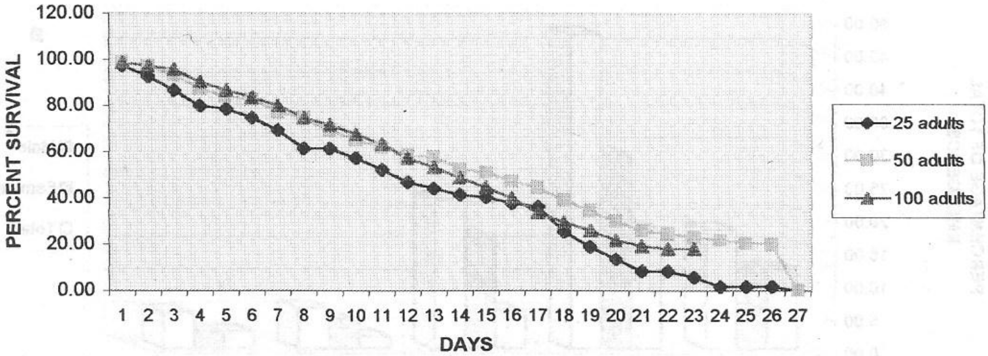

Figure 3. Survival of adult *D. corbetti* at density 25, 50 and 100.

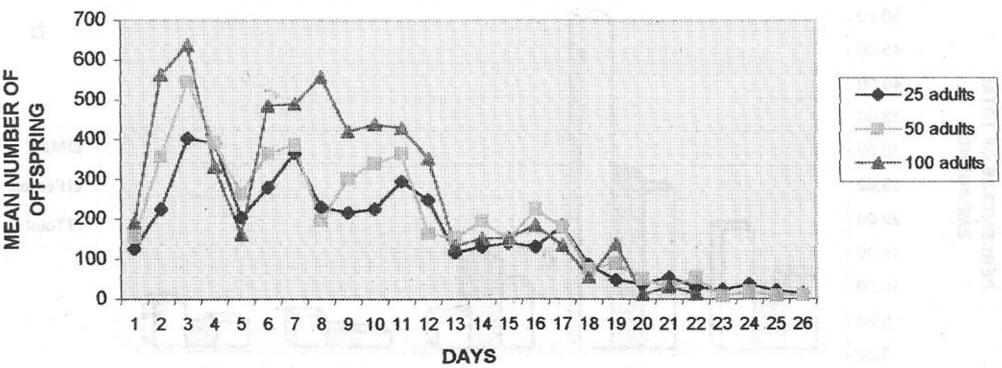

Figure 4. Mean daily offspring of *D. corbetti* at 25, 50 and 100 adult density.

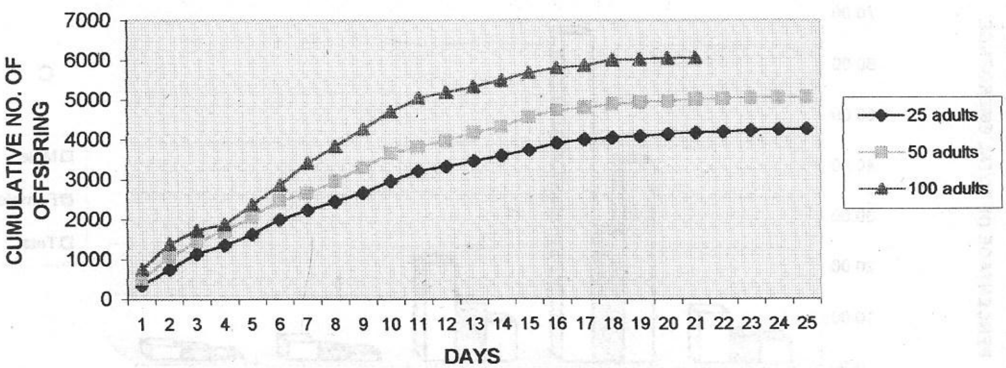

Figure 5. Cumulative mean progeny of *D. corbetti* at 25, 50 and 100 adult density.

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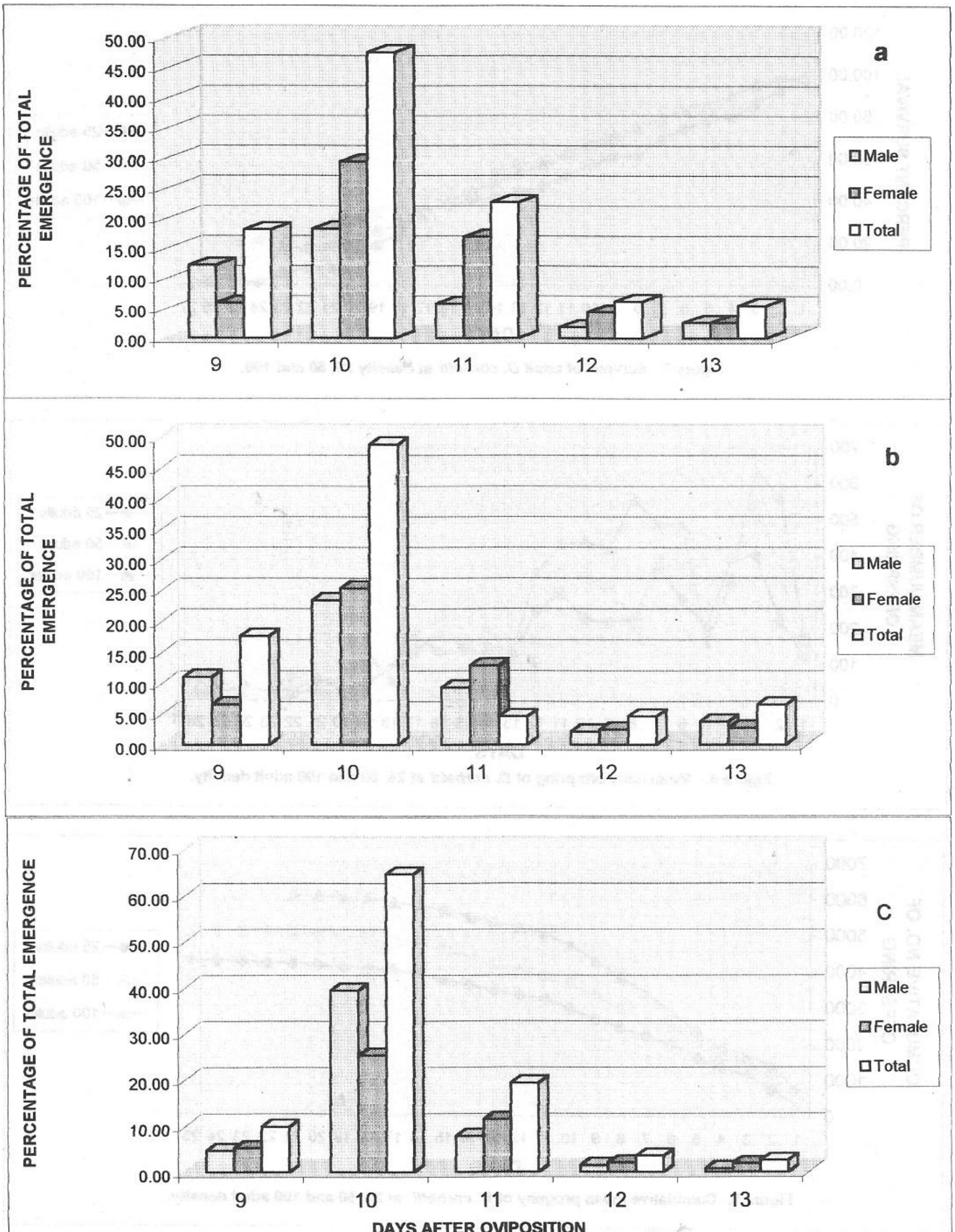

Figure 6. Daily emergence pattern of *D. corbetti* offspring at density 25 (a), 50 (b) and 100 (c) parents.

Figure 6. Daily emergency pattern *D. corbetti* offspring at density 25 (a), 50 (b) and 100 (c) parents.

vase-life ideal to support vital life processes of the developing embryos as well as the larvae and adults. This is readily available because it is one of the most commonly grown *Vanda* hybrids. However, for future research, it would be interesting to know the response of *D. corbetti* on other exotic varieties and species of *Vanda*. as well as on its other known host plants.

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