

SOME FACTORS AFFECTING MASS REARING OF THE VANDA THRIPS, *DICHROMOTHRIPS CORBETTI* (PRIESNER) (THYSANOPTERA: THRIPIDAE)¹

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ABSTRACT

The following factors affecting mass rearing of *Dichromothrips corbetti* (Priesner) were studied: 1) cold storage on adult longevity and fecundity, 2) substrate on oviposition, 3) substrate on pupation, 4) oviposition access time. Females of *D. corbetti* did not survive prolonged cold storage in the refrigerator at 10°C. Females that withstand cold storage for 10 days lived and reproduced for 25 days whereas those which survived for 20 days stayed alive for 15 days only and reproduction was markedly reduced. *Vanda* flower was the most preferred substrate for oviposition. Eggs were also laid on pods of *Phaseolus vulgaris*. Among the materials offered as pupation substrates, the triple-ply tissue paper significantly reduced pupation along the sides and corners of the zip-lock plastic cages. The optimum oviposition access time was 24h.

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

INTRODUCTION

Dichromothrips corbetti (Priesner) is the most serious thrips pest of *Vanda* in the Philippines (Hirao *et al.*, 2001). It attacks mainly the flowers especially unopened ones. Furthermore, it has short generation time and long adult life.

Information on the natural history of *D. corbetti* in relation to the thrips fauna of the Philippines was reported by Reyes (1994). Its biology was studied by Hirao *et al.* (2001).

The rearing protocol developed by the late B.P. Gabriel (Hirao *et al.*, 2001) for this species was found inadequate in producing large numbers of test insects of uniform ages as prey for *Orius tantillus* (Mots.) in functional and numerical response studies and for insecticide bio-assay. These information are useful in developing an effective management scheme for *D. corbetti* with *O. tantillus* as the main component.

We had devised a rearing container using zip-lock plastic bags. The use of zip-lock plastic cage offers the following advantages. First, it is transparent making monitoring and collecting easy. The bag is secured by the lock, minimizing loss due

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to escape. Large numbers can be kept, minimizing the need to manipulate and transfer insects. Lastly, it is easy to construct and reusable (Schmidt *et al.*, 1995).

So far, no specific study has been conducted yet using zip-lock plastic bags for *D. corbettii*. However, before we could fully utilize these bags we had to determine some factors or requirements for successfully mass rearing this species of thrips. This paper reports our findings on the effects of cold storage on adult longevity and fecundity, substrate on oviposition and pupation, and oviposition access time.

MATERIALS AND METHODS

Stock culture of *D. corbettii*

A stock culture of *D. corbettii* was obtained from Dr. Henry T. Facundo, which had been maintained on petals of *Vanda* flowers in plastic glasses as rearing containers following the rearing protocol developed by the late B. P. Gabriel (Hirao *et al.*, 2001) (Fig. 1a). The culture was freed from predatory mites and infused twice with populations from Mayondon and Putho-Tuntungin, Los Baños, Laguna. The culture is being maintained at 25°C and 70% RH (Fig. 1b).

Zip-lock plastic cages

Zip-lock polyethylene plastic bags were devised as rearing cages for *D. corbettii*. Each bag was prepared by fastening the sides of a 10 cm by 10 cm tissue paper (Kotex®) with plastic tape on its center. The covered area of the tissue paper was then cut off with a pair of scissors and this served as aeration window. A bent wire was used as support

Some Factors Affecting Mass Rearing of *D. corbettii*

Effect of cold storage on longevity and fecundity. Under laboratory conditions adult thrips die within 24h without food or source of moisture. In their natural habitat, adults could easily transfer to new hosts/habitat by flight. To prevent untimely death, keeping adults in a refrigerator may increase their lifespan. Thirty to 120 two-to-three day old female adults (presumed to be mated) were placed in each plastic plate with cover containing a dried petal and a fresh one as refuge or source of moisture. Nine plates were used. After 10 days, three plates, selected at random were taken out from the refrigerator. When the thrips become mobile, 20 individuals were selected from among these plates and placed in labeled zip-lock bags containing fresh *Vanda* flowers as food and oviposition substrate. After 24h oviposition access time and daily thereafter, the flower was removed and replaced with a new one. After 10 days, the number of pupae was counted and recorded. The next three plates were taken out after 20 days and the last three after 30 days. The same procedure and data gathering as mentioned above were done.

Effect of substrate on oviposition. Flowers of *Vanda* and two species of *Dendrobium* were evaluated as oviposition substrates for *D. corbettii* in a free choice test.

In this test, flowers were arranged at random inside zip-lock plastic bags. Fifty pairs of adult *D. corbettii* were released at the center of the bag. After 24h oviposition access time the adult thrips were brushed off the flowers and placed singly in zip-lock plastic bags. Five days after, the progeny were counted and recorded.

The experiment was laid out in a Completely Randomized Design (CRD) with

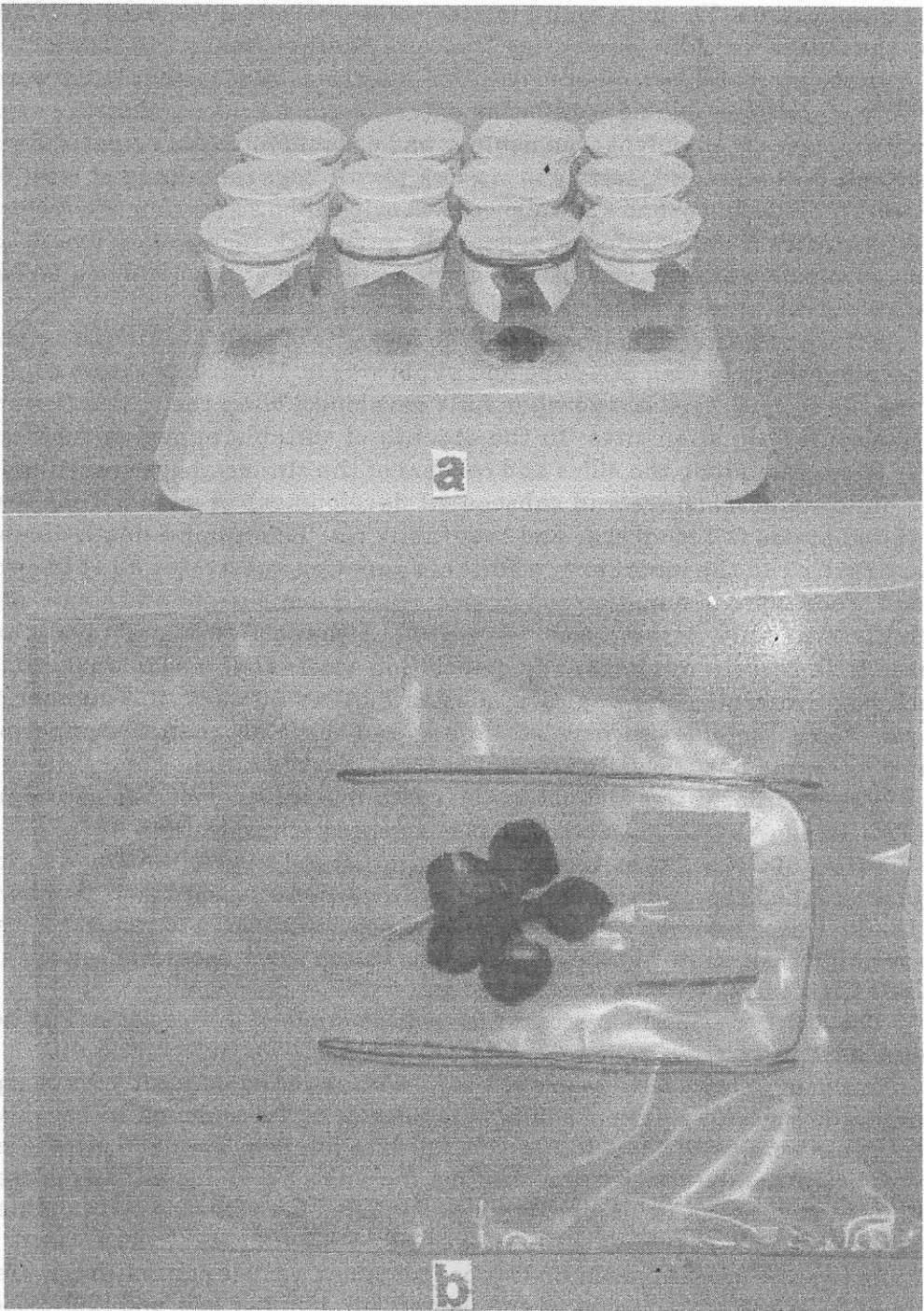


Figure 1. Set-up for mass rearing *Dichromothrips corbetti*, a) previous technique (Gabriel, 1999, unpublished; Hirao *et al.*, 2001), b) modified technique.

three replications. The data were analyzed using Analysis of Variance (ANOVA) and the means were compared using Duncan's Multiple Range Test (DMRT).

In the no-choice test, other oviposition substrates were tested. These were: flowers of *Cattleya*, palong rose (ornamental *Celosia argentea*), *Hibiscus rosa-sinensis*; leaves of succulent ornamentals; and pods of *Phaseolus vulgaris*. Each substrate was placed separately in zip-lock plastic bags containing at least 50 actively reproducing females and allowed 24h oviposition access time after which the substrates were transferred separately in zip-lock cages. After five days, each substrate was observed visually for the presence of larvae. When larvae were observed, these were allowed to develop into adults.

Effect of pupation substrate. The life cycle of thrips is unique among exopterygotes in having pre-pupa and pupal stages. Under laboratory conditions, the second stage larvae when fully developed, leave the *Vanda* flowers to search for pupation sites. In the absence of suitable pupation medium, they aggregate along the sides and corners of the zip-lock bags resulting in the build-up of moisture and subsequent development of molds. The overcrowded pupae fail to emerge and eventually die. To minimize death during mass rearing in the laboratory, a suitable pupation substrates must be provided. Four types of pupation substrates, namely, bond paper and single-ply, two-ply, three-ply tissue paper, were used. A *Vanda* flower previously exposed to *D. corbettii* adults for 24h oviposition access time was introduced in each bag containing the pupation substrate. After 10 days, the number of pupae along the sides/corners of the bag and those on or in the pupation substrates and host flower were counted and recorded.

The experiment was laid out in CRD with five replications. The data were analyzed using ANOVA and treatment means were compared by DMRT.

Effect of Oviposition Access Time. In its natural habitat, the *Vanda* thrips lays its eggs on fully expanded flowers but mostly within unopened flowers or buds of *Vanda*. Under laboratory conditions mature flowers are more convenient to use as oviposition substrate but the length of time within which these will remain attractive to the female adults must be known.

The effect of oviposition access time was determined in free-choice and no-choice tests.

In the free-choice tests, petals of *Vanda* were placed equidistantly inside zip-lock plastic bags. Fifty pairs of adults were released in the center of the bag. Five treatments were used: T1= 24h, T2=48h, T3=72h, T4= 96h, T5= 120h oviposition access time. After the designated access time, the petals were removed and replaced with new ones, except in T4 and T5. Five days after, the progenies were counted and recorded.

In the no-choice test, each zip-lock bag contained a single petal of *Vanda*. Ten pairs of *D. corbettii* were introduced and allowed 24h, 48h, 72h, 96h, and 120h oviposition access time after which they were removed and the petals transferred to new zip-lock bags to be observed for hatching of eggs. The same data as in the free-choice test were taken and recorded. Another set of the same set-up using *Dendrobium* as oviposition substrate was made.

RESULTS AND DISCUSSION

Mass Rearing of the *Vanda* Thrips

The *Vanda* thrips was successfully mass reared in the laboratory on detached fully expanded flowers of *Vanda* using zip-lock plastic cages. The details of the technique will be the subject of another paper.

Factors Affecting Mass Rearing of the Thrips

Effect of cold storage on adult longevity and fecundity. The results show that *D. corbettii* can tolerate low temperature inside the refrigerator for 20 days and still remain fertile. No adults remained alive after 30 days. Progenies of these refrigerated adults were able to complete their development up to adulthood. Adults subjected to 10 days of refrigeration (DOR) were found to have a reproductive period of 25 days compared to 15 days only for those subjected to 20 DOR (Fig. 2). About 50% of the progenies were produced within the first 10 days of oviposition by 10 DOR adults, however, the same proportion were produced within the first seven days by 20 DOR adults. The 20 DOR adults produced 65% less progenies than 10 DOR. The average temperature inside the refrigerator was 10°C and 70% RH.

Effect of substrate on oviposition. Females of *D. corbettii* laid eggs in all the substrates offered for oviposition in the free-choice test (Table 1). Among the orchid flowers, *Vanda* was the most preferred. The eggs of *D. corbettii* are so minute and inserted within the plant tissue that made counting difficult and impractical. Furthermore, the incubation of the eggs is three to five days but mostly three days (Hirao *et al.*, 2001). It was, therefore, more convenient and easy to count the progenies five days after oviposition. *Vanda* appeared to be the most suitable oviposition substrate because the flowers are big, succulent but firm and have longer vase-life.

The *Vanda* thrips also laid eggs on kidney bean pods (*Phaseolus vulgaris* L.) but the larvae developed into smaller adults. Kidney bean pods have been used by other authors as factitious substrate for oviposition for some species of *Orius* (Isenhour and Yeargan, 1982; Castane and Zalom, 1994; Schmidt *et al.*, 1995).

Effect of substrate on pupation. Table 2 shows the results of the effect of substrate on pupation.

In the zip-lock plastic bag with no pupation substrate added, 98% of the pupae were along the sides and corners of the bag. When a piece of bond paper was added, pupation in these sites was reduced to 78%. On the other hand, with the use of tissue paper that differed in the number of ply, pupation along the sides of the plastic bag was further reduced to about 67% on both single and double ply and 61% on triple-ply due to pupation in these substrates. Percentage pupation on bond paper was 20%; single-ply, 32%; double-ply, 33%; and triple-ply, 37%. About 50% of those in the triple-ply were concealed between the second and third layers. In all cases, negligible percentage of the thrips pupated on the flowers. Comparing the effects of the four pupation substrates, there was a significant difference in the percentage distribution of pupae among the substrates but there was none on the plastic bag.

The results indicate that the same phenomenon may occur in this species in its natural habitat. The larvae when fully developed leave their feeding sites and pupate among the crevices of the driftwoods or pots, protected sites within/among the plants, among litter and on the ground. Mituda-Sabado and Calilung (2000) ob

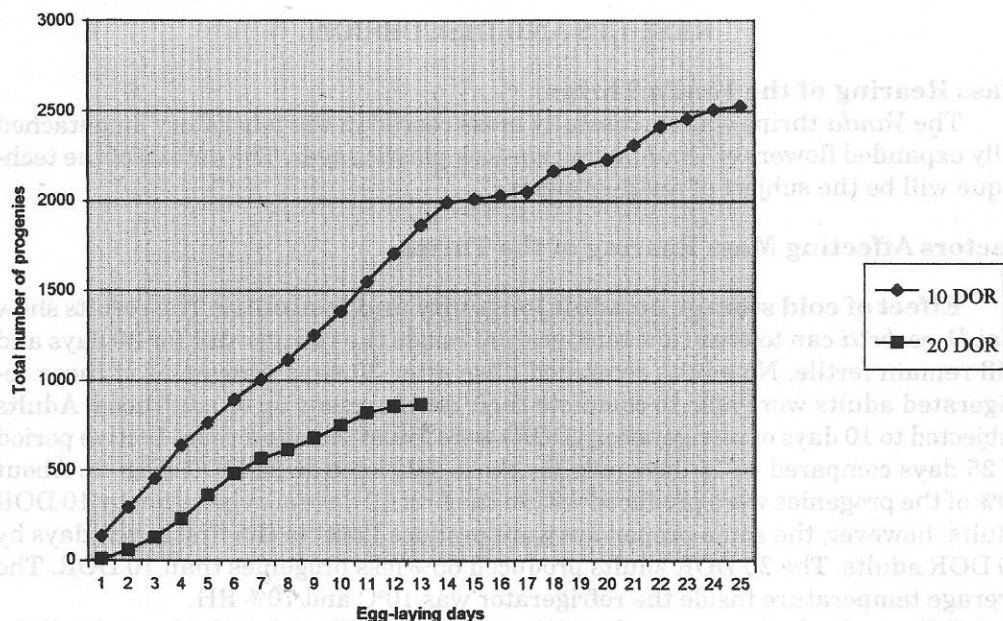


Figure 2. Cumulative number of progenies of *D. corbettii* stored at 10°C during the adult stage.

Table 1. Effect of oviposition substrate on the number of progeny of *Dichromothrips corbettii*.

Oviposition substrate	No. of Progeny*
<i>Vanda</i>	162.7a
<i>Dendrobium</i> sp. 1	2.3b
<i>Dendrobium</i> sp. 2	1.7b

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

Table 2. Effect of different materials on pupation of *Dichromothrips corbettii*.

Treatment	Mean Number of Pupa*			Per Cent Pupation		
	Sides of bag	Pupation Material	Flower	Sides of bag	Pupation Material	Flower
None	414.4a	-	6.8ab	93.4	-	1.2
Paper	312.2a	83.2b	5.0ab	78.1	20.1	1.2
1-Ply Tissue Paper	289.8a	140.0ab	5.0ab	66.7	32.2	1.2
2-Ply Tissue Paper	245.2a	119.4ab	0.6b	67.2	32.6	0.2
3-Ply Tissue Paper	260.8a	187.2a	12.6a	61.4	36.6	2.1

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

served that pupae of *Trichromothrips* sp., a pest of anthuriums, were often seen in groups along the leaf midribs or on the edges and sometimes, under spider webs.

It should be noted, however, that only about 1/9 of the bottom surface of the plastic bag was covered by each substrate. In actual mass rearing set-up, therefore, it is advantageous to cover most of the bottom of the bag with any of the substrates. Another advantage of the substrate is that it absorbs excess moisture which causes untimely death of pre-pupae and pupae due to drowning and/or growth of molds.

Effect of oviposition access time. Results showed that *D. corbettii* produced the greatest number of eggs (as indicated by the number of progeny) after 24h oviposition access time during a series of free-choice and no-choice tests (Table 3). The results also showed that beyond 24h, the flowers become less attractive for oviposition. This is important in the production of large numbers of uniform-age test insects. Timely removal and replacement of *Vanda* flowers for oviposition increases production efficiency.

Table 3. Effect of oviposition access time on the number of progeny of *Dichromothrips corbettii*.

Oviposition Substrate	Oviposition Access Time (h)	Total Number of Progeny	
		No-choice ^a	Free-choice ^b
<i>Vanda</i>	24	81	415
	48	55	264
	72	63	222
	96	34	159
	120	60	27
<i>Dendrobium</i>	24	27	128
	48	9	35
	72	0	38
	96	8	0
	120	1	3

^a 10 pairs/bag of *D. corbettii*

^b 50 pairs/bag of *D. corbettii*

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