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## Life History and Feeding Amount of *Amblyseius asetus* and *A. maai* (Acari: Phytoseiidae) on *Thrips palmi* (Thysanoptera: Thripidae) 【Research report】

### 馬氏捕植蟎及少毛捕植蟎捕食南黃薊馬之生活史和捕食量【研究報告】

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### Abstract

The life history and feeding amount of *Amblyseius maai* Tseng and *A. asetus* (Chant) were studied in an incubator at 28°C with a photoperiod of 13L:11D. Eggs of *Tetranychus kanzawai* Kishida and first instar larvae of *Thrips palmi* Karny were supplied as food to the immature and adult stages, respectively, of these two phytoseiid mites. The development stages of female and male individuals of *A. maai* lasted 6.5 and 5.9 days, respectively. Mated adult females lived 40.2 days, consumed 80.2 thrips larvae, and laid 22.6 eggs; virgin females lived 21.9 days with no egg laid, and consumed 24.3 thrips larvae; while adult males lived 17.5 days, and consumed 13 thrips larvae. No male individual of *A. asetus* was found during the testing period. *A. asetus* is apparently a thelytokous species. Its development stage lasted 5.8 days; adults lived 24.5 days, laid 43.5 eggs, and consumed 90.2 thrips larvae. *A. asetus* has the potential to be used for the biological control of thrips pest. *A. maai* were frequently found among the population of *T. palmi* on eggplant. It possibly plays a role in the reduction of thrips populations.

### 摘要

在28°C及13L:11D光照下，幼期取食神澤氏葉蟎(*Tetranychus kanzawai* Kishida)卵、成期取食南黃薊馬(*Thrips palmi* Karny)一齡幼蟲，馬氏捕植蟎(*Amblyseius maai* Tseng)雌和雄性的發育期分別為6.5及5.9天；交尾雌成蟎壽命40.2天，捕食薊馬幼蟲80.2隻，產卵22.6粒；未交尾雌蟎不產卵，壽命21.9天，捕食薊馬幼蟲24.3隻；雄蟎命17.5天，捕食薊馬幼蟲13隻。相同條件下，少毛捕植蟎(*A. asetus* (Chant))全為雌性個體，為產雌孤雌生殖。發育期5.8天，成蟎壽命24.5天，捕食薊馬幼蟲90.2隻，產卵43.5粒。少毛捕植蟎具有用以防治薊馬的潛力，馬氏捕植蟎常在茄園南黃薊馬族群中發現，應當扮演有抑制薊馬族群的角色。

**Key words:** phytoseiids, thrips, life history, feeding amount.

**關鍵詞:** 捕植蟎、薊馬、生活史、捕食量

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# 馬氏捕植蝽及少毛捕植蝽捕食南黃薊馬之生活史和捕食量

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## 摘 要

在 28 °C 及 13L:11D 光照下，幼期取食神澤氏葉剝(*Tetranychus kanzawai* Kishida)卵、成期取食南黃薊馬(*Thrips palmi* Karny)一齡幼蟲，馬氏捕植蝽(*Amblyseius maai* Tseng)雌和雄性的發育期分別為 6.5 及 5.9 天；交尾雌成蝽壽命 40.2 天，捕食薊馬幼蟲 80.2 隻，產卵 22.6 粒；未交尾雌成蝽不產卵，壽命 21.9 天，捕食薊馬幼蟲 24.3 隻；雄成蝽壽命 17.5 天，捕食薊馬幼蟲 13 隻。相同條件下，少毛捕植蝽(*A. asetus* (Chant))全為雌性個體，為產雌孤雌生殖。發育期 5.8 天，成蝽壽命 24.5 天，捕食薊馬幼蟲 90.2 隻，產卵 43.5 粒。少毛捕植蝽具有用以防治薊馬的潛力，馬氏捕植蝽常在茄園南黃薊馬族群中發現，應當扮演有抑制薊馬族群的角色。

關鍵詞：捕植蝽、薊馬、生活史、捕食量。

## 前 言

薊馬類為農作物上難防治之小型害蟲之一，體小、繁殖快，往往發生至極高數量，對農作物造成重大危害，利用天敵來壓抑薊馬族群乃成為被積極探討之題材。利用於防治薊馬之天敵，主要為小黑花椿象(*Orius*)類(Wang, 1994)及*Neoseiulus cucumeris* (Oudemans), *Amblyseius degenerans* (Berlese), *A. hibisci* (Chant), *A. barkeri* (Hughes) 等捕植蝽類(Ramakers and van Lieburg, 1982; Tanigoshi and Griffiths, 1982; Tanigoshi et al., 1984; De Klerk and Ramakers, 1986; Hansen, 1988; Taborsky et al., 1988; Lindqvist and Tiitanen, 1989; Hoy and

Glenister, 1991; Riudavets, 1995)。這些捕植蝽均未發現於臺灣，而臺灣本地產之捕植蝽中，必亦有能捕食薊馬之種類，Hua (1999) 及 Riudavets (1995) 所整理出的捕食薊馬的捕植蝽種類即超出上述種類甚多。筆者田野經驗中也發現有捕植蝽捕食薊馬，乃將所見之種類及可能會捕食之種類於實驗室中測試其對南黃薊馬的捕食情形，其中少毛捕植蝽(*A. asetus* (Chant)) 及馬氏捕植蝽(*A. maai* Tseng) 的表現較佳，乃將其以南黃薊馬為食物時之發育、壽命、產卵及捕食量發表於本文，以助益於瞭解本地捕植蝽在抑制南黃薊馬族群上的貢獻。

## 材料與方法

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馬氏捕植蠹採自南投縣國姓鄉茄園南黃薊馬族群中，少毛捕植蠹採自農業試驗所農場紫花藿香薊 (*Ageratum houstonianum* Mill.)。攜回實驗室後，以神澤氏葉蠹卵混合南黃薊馬幼蟲供食，在以壓克力製成的凹穴片 (長7 cm 寬4 cm, 凹穴直徑3 cm 深0.3 cm) 中行單隻飼育，俟產出後代。取樣製成玻片標本鑑定種類無誤後，合併成為試驗族群。少毛捕植蠹可在培養皿中刷入神澤氏葉蠹卵而飼養。

神澤氏葉蠹係以青皮豆苗飼養；南黃薊馬則參考Huang and Su (1997)的方法，以盆栽茄苗飼養。

取數十隻馬氏捕植蠹供以神澤氏葉蠹卵為食，繁殖為試驗母族群。自此族群挑取十隻雌成蠹，置於直徑4.5 cm之培養皿中，供以神澤氏葉蠹卵。每日將捕植蠹卵挑出，單粒移入凹穴載玻片，亦供以神澤氏葉蠹卵為食。凹穴緣置細吸水紙條，紙條末端垂入盛水皿中，提供濕度以防蠹卵脫水。而後覆上一般載玻片，並以長尾鉗夾緊，防止逃亡。每日觀察記錄發育情形，並適時補充食物。

此外，另在直徑3.5 cm之培養皿中鋪入黑色濾紙，滴水一滴提供濕度，而後置入剪成直徑2 cm之茄葉圓片。俟上述凹穴載玻片內之捕植蠹發育為成蠹後，立即予以配對或單隻移至此茄葉圓片上，並供以5隻第一齡之南黃薊馬幼蟲為食。如適無雄蠹完成發育，則自母族群中挑取雄成蠹配對。培養皿上以保鮮膜封蓋，防止水分散失及捕植蠹逃亡。每日觀察記錄捕食量、產卵量，並補足所消耗之食物，維持為5隻一齡薊馬幼蟲，如有薊馬幼蟲發育成第二齡，則以第一齡幼蟲取代。

對少毛捕植蠹之觀察亦以和馬氏捕植蠹相同的方法進行。經預備試驗熟悉飼養方式後，二種捕植蠹均取50粒以上的卵進行觀察。

除觀察時間外，所有參試個體均維持於28 ℃、13:11 (L:D) 之定溫箱中。所得結果需統計分析時，以SAS的 *t*-test 做比較， $\alpha = 0.05$ 。

## 結 果

### 一、馬氏捕植蠹

取食葉蠹卵時，雌性馬氏捕植蠹之發育期6.5天，略長於雄性個體之5.9天，但無顯著差異。成蠹期改供以薊馬一齡幼蟲為食，交尾雌蠹平均壽命為40.2天，5日齡後方有雌成蠹產卵，死亡前亦均有數天未產卵，明顯表現有產卵前期及產卵後期，產卵前期、產卵期及產卵後期分別為7.2、21.2及11.8天(表1)。一生平均產22.6粒卵，相當於日產0.6粒卵(表2)。未交尾雌蠹終生不產卵，成蠹期平均21.9天。雄蠹壽命17.5天。

觀測的馬氏捕植蠹雌成蠹產卵並不穩定，使得每日平均產卵量多在1粒或以下，且起伏不斷。主要產卵期約在第5至第31日齡間，由於逐日之平均產卵量多在1以下，並未表現出明顯的高峰(圖1)。

交尾雌蠹成蠹期平均可捕食南黃薊馬第一齡幼蟲80.2隻，約為每日捕食2隻，產卵期之每日捕食量則略高於此數，為2.5隻；未交尾雌成蠹平均可捕食24.3隻一齡薊馬幼蟲，平均每日1.3隻；雄蠹食量較小，僅捕食13隻一齡薊馬幼蟲，平均每日0.8隻(表2)。

### 二、少毛捕植蠹

整個試驗期間無論在試驗族群、母族群或觀察個體中，均未發現雄蠹，所有觀察的卵均發育成雌性個體，本種顯然為產雌孤雌生殖 (thelytoky) 之種類。

取食葉蠹卵時，發育期5.8天。成蠹期改食薊馬一齡幼蟲，平均壽命為24.5天，產卵前

表一 馬氏捕植蟎各發育時期及壽命之長短

Table 1. Duration (day, mean  $\pm$  SE) of various stages and longevity of *Amblyseius maai* at 28 and 13L:11D

Stage	Female (24)	Male (8)
Egg	1.9 $\pm$ 0.1	1.9 $\pm$ 0.1
Larva	1.7 $\pm$ 0.1	1.5 $\pm$ 0.2
Protonymph	1.7 $\pm$ 0.1	1.1 $\pm$ 0.1
Deutonymph	1.2 $\pm$ 0.1	1.4 $\pm$ 0.2
Total	6.1 $\pm$ 0.2	5.9 $\pm$ 0.2
Mated adult	40.2 $\pm$ 7.7 (6)	17.5 $\pm$ 2.5 (2)
Pre-ovipositing period	7.2 $\pm$ 2.1	-
Ovipositing period	21.2 $\pm$ 3.1	-
Post-ovipositing period	11.1 $\pm$ 5.9	-
Non-mated adult	21.1 $\pm$ 2.3 (9)	-

Fed with Kanzawa spider mite eggs and first instar larvae of *Thrips palmi* during the developmental period and adult stage, respectively.

Numbers in parentheses indicate the number of individuals observed.

表二 馬氏捕植蟎成蟎捕食南黃薊馬第一齡幼蟲量及產卵量

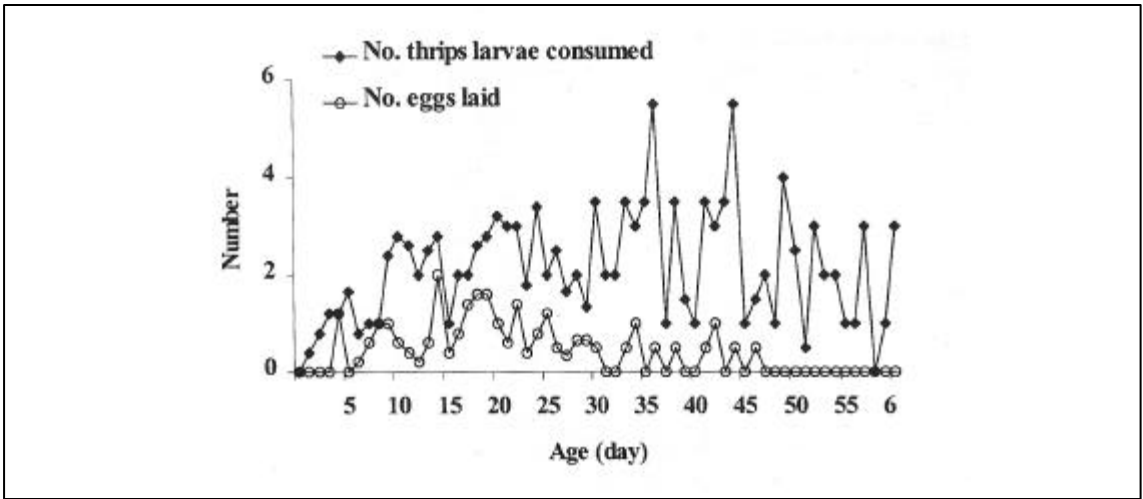
Table 2. Feeding amount and fecundity (Mean  $\pm$  SE) of adult *Amblyseius maai* at 28 and 13L:11D while being fed first instar larvae of *Thrips palmi*

	Mated female	Virgin female	Non-mated male
Daily feeding amount	2.0 $\pm$ 0.2	1.3 $\pm$ 0.1	0.8 $\pm$ 0.1
Total feeding amount	80.2 $\pm$ 22.5	24.3 $\pm$ 4.5	13.0 $\pm$ 3.0
Daily fecundity/female	0.6 $\pm$ 0.1	0	-
Eggs/female	22.6 $\pm$ 4.6	0	-
No. larval thrips eaten/No. eggs laid	4.4 $\pm$ 1.8		

期2.9天，產卵期16.1天，產卵後期5.5天(表3)。所有受測個體在第一日齡均未產卵，產卵前期明顯存在；但許多個體產卵至死亡日，是以產卵後期不一定存在。一生平均產43.5粒卵，每日產卵1.5粒(表4)。產卵有明顯的高原期，約在第4-20日齡(圖2)。成蟎期終生捕食南黃薊馬一齡若蟲90.2隻，平均每日捕食3.8隻。產卵期食量略高，全期捕食72.3隻，平均每日4.5隻。以成蟎期食量計算，平均每捕食2隻薊馬若蟲可產一粒卵，若以產卵期食量計算，則為捕食1.6隻薊馬若蟲可產卵1粒(表4)。

## 討 論

本文報導的兩種捕植蟎在發育期中似無能力捕捉薊馬幼蟲，即使是第一齡的薊馬幼蟲亦然。初次測試時，僅供以薊馬幼蟲為食物，幼期發育成功率極低，常不能活過前若蟎期。因此，乃改供應神澤氏葉蟎卵為其發育期之食物，進行觀察，至成蟎期方改為以南黃薊馬一齡幼蟲為食物。以此觀之，除南黃薊馬外，兩種捕植蟎應尚有其它種類的食物。筆者過去常於茶樹葉片上之落花下採得馬氏捕植蟎，其個體皆飽滿壯碩，而除花粉外未見可能之食物。此蟎或亦能食花粉，以花粉飼養之試驗當可檢驗此點。筆者目前仍缺乏有關少毛捕植蟎其它食物的資訊，然懷疑其與馬氏捕植蟎可能都會



圖一 馬氏捕植蟎於 28 及 13L:11D 光周期下捕食南黃薊馬第一齡幼蟲時的每日產卵量與捕食量  
 Fig. 1. Daily fecundity and food consumption of adult female *Amblyseius maai* while being fed first instar larvae of *Thrips palmi* at 28 and 13L:11D.

捕食細蟎。

兩種捕植蟎在 28 下發育期均為 6 天上下，與 *Neoseiulus cucumeris* (Gillespie and Ramey, 1988; Gillespie, 1989; Castagnoli et al., 1990) 及 *A. barkeri* (Bonde, 1989) 相似；少毛捕植蟎的每日產卵量及捕食量也與前二種相似，但馬氏捕植蟎則較前二種低而不如。因此，在選擇薊馬天敵進行生物防治時，可考慮使用少毛捕植蟎，馬氏捕植蟎則可能不

是好的對象，至少對南黃薊馬如此。

然而從另一方面來看，筆者在南投縣茄園調查南黃薊馬的發生時，每每於採回的南黃薊馬族群中發現馬氏捕植蟎，實驗室中也曾觀察到雌成蟎捕食南黃薊馬長成幼蟲，方始觀察其以南黃薊馬為食物時的發育與繁殖，試驗結果證實其確可捕食南黃薊馬而繁殖，雖然食量與產卵量不盡理想。馬氏捕植蟎也是台灣田間常見的捕植蟎，筆者的採集經驗中，此蟎在蔬果

表三 少毛捕植蟎各發育時期及壽命之長短

Table 3. Duration (Mean ± SE) of various stages and longevity of *Amblyseius asetis* at 28 and 13L:11D

Stage	Time (day)
Egg	2.0 ± 0.1
Larva	0.7 ± 0.1
Protonymph	1.2 ± 0.1
Deutonymph	1.8 ± 0.1
Total	5.8 ± 0.2
Adult longevity	24.5 ± 2.2
Pre-ovipositing period	2.9 ± 0.3
Ovipositing period	16.1 ± 1.1
Post-ovipositing period	5.5 ± 1.5

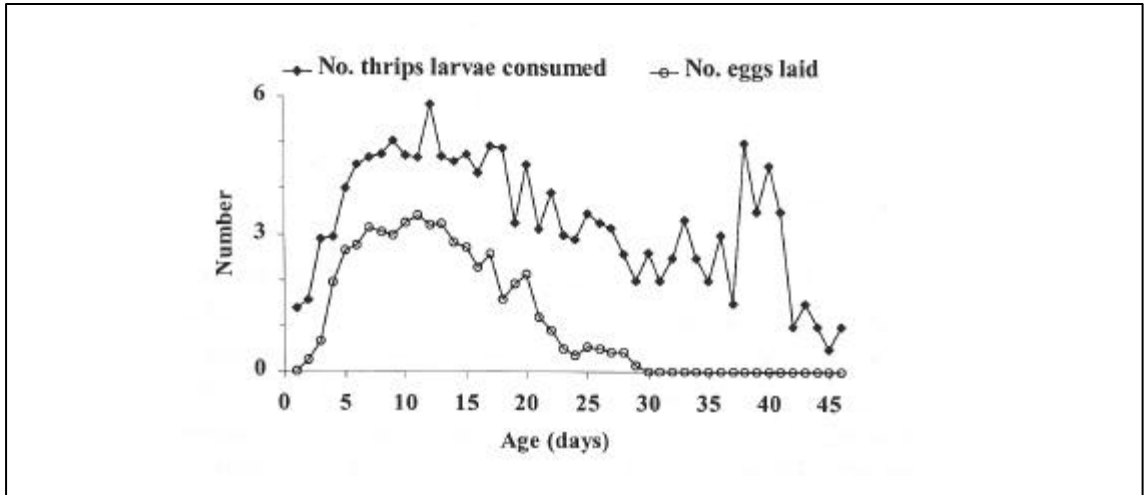
*n* = 21, fed with Kanzawa spider mite eggs and first instar larvae of *Thrips palmi* during the developmental period and adult stage, respectively.

表四 少毛捕植蟻成蟻捕食南黃薊馬第一齡幼蟲量及產卵量

Table 4. Feeding amount and fecundity (Mean  $\pm$  SE) of adult *Amblyseius asetus* at 28 and 13L:11D while being fed first instar larvae of *Thrips palmi*

	Adult stage	Ovipositing period
Daily feeding amount	3.8 $\pm$ 0.3	4.5 $\pm$ 0.3
Total feeding amount	90.2 $\pm$ 9.5	72.3 $\pm$ 6.6
Daily fecundity	1.5 $\pm$ 0.1	2.7 $\pm$ 0.1
Total fecundity	43.5 $\pm$ 3.2	-
No. larval thrips eaten/No. eggs laid	2.0 $\pm$ 0.1	1.6 $\pm$ 0.1

n = 21



圖二 少毛捕植蟻於 28 及 13L:11D 光周期下捕食南黃薊馬第一齡幼蟲時的每日產卵量與捕食量

Fig. 2. Daily fecundity and food consumption of adult female *Amblyseius asetus* while being fed first instar larvae of *Thrips palmi* at 28 and 13L:11D.

類作物上的發現率高於長尾捕植蟻 (*Amblyseius herbicolus* (Chant)) 及卵形捕植蟻 (*A. ovalis* (Evans)) (一般植物上最常見的兩種), 它在抑制薊馬類族群上所扮演的角色不容忽視。

兩種捕植蟻皆可以葉蟻為食物而繁殖族群, 唯馬氏捕植蟻繁殖速率較慢, 葉蟻應非其理想食物, 在發展出更好的繁殖方法以前, 較難進行對馬氏捕植蟻的進一步研究。而少毛捕植蟻雖可利用葉蟻為食物而繁殖, 族群數量足供試驗研究, 但如欲進行田間測試, 規模明顯不足。筆者亦曾在發生南黃薊馬的胡瓜葉片上

釋放少毛捕植蟻, 觀察薊馬族群的數量變化, 可能由於釋放的捕植蟻隻數不足, 釋放葉上的薊馬族群增長似乎有被暫時減緩的跡象, 卻不顯著而未能顯示出有抑制效果。由於少毛捕植蟻的食量與產卵能力與 *N. cucumeris* 和 *A. bakeri* 相若, *N. cucumeris* 為目前最常用於薊馬生物防治之種類, 已商業化供應上市; 而少毛捕植蟻為產雌孤雌生殖, 後代全為雌性個體, 在繁殖能力上實勝過 *N. cucumeris* 及前述其它應用於防治薊馬的捕植蟻種類, 是以少毛捕植蟻極具應用於薊馬生物防治之潛力。

筆者曾經觀察到捕食薊馬的蟻類尚有卵

形捕植蟲、*A. bellatulus* 及採自本所農場胡瓜植株上薊馬族群中之一種囊蟲 (ascid mite)，均包含入本研究，測試其捕食南黃薊馬之情形，惜皆未能飼養成功，彼等可能更需有其它食物同時存在。

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# Life History and Feeding Amount of *Amblyseius asetus* and *A. maai* (Acari: Phytoseiidae) on *Thrips palmi* (Thysanoptera: Thripidae)

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## ABSTRACT

The life history and feeding amount of *Amblyseius maai* Tseng and *A. asetus* (Chant) were studied in an incubator at 28 °C with a photoperiod of 13L:11D. Eggs of *Tetranychus kanzawai* Kishida and first instar larvae of *Thrips palmi* Karny were supplied as food to the immature and adult stages, respectively, of these two phytoseiid mites. The development stages of female and male individuals of *A. maai* lasted 6.5 and 5.9 days, respectively. Mated adult females lived 40.2 days, consumed 80.2 thrips larvae, and laid 22.6 eggs; virgin females lived 21.9 days with no egg laid, and consumed 24.3 thrips larvae; while adult males lived 17.5 days, and consumed 13 thrips larvae. No male individual of *A. asetus* was found during the testing period. *A. asetus* is apparently a thelytokous species. Its development stage lasted 5.8 days; adults lived 24.5 days, laid 43.5 eggs, and consumed 90.2 thrips larvae. *A. asetus* has the potential to be used for the biological control of thrips pest. *A. maai* were frequently found among the population of *T. palmi* on eggplant. It possibly plays a role in the reduction of thrips populations.

**Key words:** phytoseiids, thrips, life history, feeding amount.