

盲蝽寄生蜂在美国的利用现状*

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摘要 盲蝽是一类世界性害虫,寄主广泛,主要为害棉花、苜蓿、果树和蔬菜等作物。在美国,对农业生产危害较严重的是美国牧草盲蝽 *Lygus lineolaris* (Palisot de Beauvois),农民每年用于控制盲蝽的费用和盲蝽造成的损失达数亿美元,目前美国对牧草盲蝽的控制逐渐从化学防治转向生物防治。美国从欧洲引入用来防治欧洲长毛草盲蝽 *Lygus rugulipennis* Poppius 的寄生性天敌常室茧蜂属 *Peristenus* Foerster,在东北部苜蓿地释放后,成功地控制了该地区牧草盲蝽数量,取得了巨大的经济和生态效益。美国同时对这类寄生性天敌的生理生态及生产应用技术等进行了大量的研究,这对我国开展盲蝽生物防治具有良好的借鉴作用。

关键词 盲蝽,寄生蜂,北美洲

Status of parasitic wasps for biological control of *Lygus* and other mirid bugs in North America

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Abstract Mirid bugs are worldwide pests with a wide host range, including cotton and alfalfa. The damage caused by the mirid genus *Lygus* Hahn, is particularly great; the cost of controlling this pest and the losses caused by it amounting to hundreds of millions dollars per year in the United States alone. In the U. S., biological control has increasingly replaced chemical pesticides for the control of this pest. For example, *Peristenus* Foerster (Hymenoptera: Braconidae), introduced from Europe, has successfully prevented outbreaks of *Lygus lineolaris* (Palisot de Beauvois) in northeastern USA. Extensive studies on the ecology and physiology of these groups of parasitoids and their application in biological control have been carried out. This experience should be used in China to improve control of the cotton mirid bug.

Key words plant bug, parasitoid, *Peristenus* Foerster, USA

1 盲蝽

盲蝽是一类刺吸式害虫,行动活泼,颇善飞翔。多数类群为植食性,寄主广泛,包括被子植物、针叶树和蕨类。除取食植物的叶片外,尤其喜食花、蕾、果实等繁殖器官。世界已知盲蝽近万种,世界各大动物区均有分布。盲蝽对棉花及牧草苜蓿的危害较严重,但同时危害蔬菜 (Varis, 1978; Boivin *et al.*, 1991; Jacobson, 2002)、水果 (Michaud *et al.*, 1989; Michaud and Stewart, 1990;

Arnoldi *et al.*, 1991; Rhainds *et al.*, 2002; Pree, 1985)和花卉 (Hardman *et al.*, 2004; Fleury *et al.*, 2006)等。

在美国为害严重的盲蝽主要有3种:美国牧草盲蝽 *Lygus lineolaris* (Palisot de Beauvois), 豆英草盲蝽 *Lygus hesperus* Knight 及苜蓿盲蝽 *Adelphocoris lineolatus* (Goeze) (Hank, 1997)。其中牧草盲蝽和豆英草盲蝽为同属,分别广泛分布于落基山脉的东部和西部。

美国牧草盲蝽 *L. lineolaris* (Palisot de

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Beauvois) 是北美分布最广本土盲蝽, 为害广泛 (Kelton, 1975), 寄主植物达到 328 种, 其中 130 种是重要的经济作物, 包括棉花、苜蓿、树苗、草莓及番茄等 (Young, 1986)。豆英草盲蝽是加利福尼亚棉田重要害虫 (Nordlund, 2000), 主要取食植物上部和端部的果实部分, 尤其喜食花芽。苜蓿盲蝽, 占北区种, 欧亚大陆的外来入侵种, 危害美国东部和加拿大的牧草等。尽管这 3 种盲蝽在牧草上只是偶尔会达到很高水平, 但当苜蓿被收割后, 牧草盲蝽和豆英草盲蝽会转移到附近其他蔬菜和水果上危害, 给农作物带来巨大损失 (Hank, 1997)。

2 盲蝽寄生蜂

至今, 已报道的盲蝽寄生性天敌有 20 多种, 主要为长缘缨小蜂属 *Anaphes* Haliday (膜翅目 Hymenoptera: 缨小蜂科 Mymaridae) 和常室茧蜂属 *Peristenus* Foerster (膜翅目 Hymenoptera: 茧蜂科 Braconidae) 的寄生蜂。

卵寄生蜂: 盲蝽长缘缨小蜂 *Anaphes iole* Girault, 对 1~4 日龄的盲蝽卵具有较好的寄生作用, 在苜蓿地, 其最高寄生率达 53%, 但其在棉田的寄生率不是十分理想 (Graham *et al.*, 1986), 其中以点脉缨小蜂 *Anagrus* sp.、盲蝽黑卵蜂 *Telenomus* sp.、柄缨小蜂 *Polynema* sp. 3 种寄生蜂的寄生作用较大, 自然寄生率达 20%~30%。

成虫、若虫寄生蜂: 主要是常室茧蜂属 *Peristenus* (Stream *et al.*, 1968), 主要包括①双代盲蝽茧蜂 *P. digoneutis* Loan, 欧洲本土寄生蜂, 二化性, 对当地的欧洲长毛草盲蝽 *Lygus rugulipennis* Poppius 有良好的控制作用 (Day, 1987; Day *et al.*, 1990), 现已在美国东北部以及加拿大的部分地区成功定殖, 控制了美国东部及加州北部苜蓿及草莓上牧草盲蝽 (Day, 1996; Day *et al.*, 1998)。②白腹常室茧蜂 *P. pallipes* Curtis, 一化性昆虫, 美国东北部美国牧草盲蝽及一些其他盲蝽的本土寄生蜂 (Day *et al.*, 1990; Day, 1996), 但寄生率很低, 不足以控制本土牧草盲蝽的发生。③康拉德常室茧蜂 *P. conradi* Marsh, 欧洲本土寄生蜂, 一化性, 孤雌生殖, 80 年代引入美国, 并成功定殖, 对美国苜蓿盲蝽有一定的控制作用 (Day, 1987; Day *et al.*, 1992), 但其传播范围不及双代盲蝽茧蜂 (Hank, 1997)。④黑足盲蝽茧蜂 *P. relictus*

(Ruthe), 欧洲本土寄生蜂, 二化性, 只在美国加利福尼亚州的部分地方成功定殖, 但对牧草盲蝽和豆英草盲蝽都有很好的控制作用。

3 盲蝽寄生蜂在美国的研究和利用

3.1 盲蝽寄生蜂在美国的引进及利用效果

1978 年, 美国农业研究部欧洲生防室的生防学家 Day 在欧洲采集了常室茧蜂等寄生蜂, 并船运到美国特拉华州的纽瓦克生防室。共 4 种寄生蜂从欧洲引入, 即双代盲蝽茧蜂、黑足盲蝽茧蜂、朱红常室茧蜂 *P. rubricollis* Thomson 和苜蓿常室茧蜂 *P. adelphocoridis* Loan, 其中双代盲蝽茧蜂及黑足盲蝽茧蜂用于防治美国牧草盲蝽和豆英草盲蝽, 朱红常室茧蜂及苜蓿常室茧蜂用于防治苜蓿盲蝽, 朱红常室茧蜂 3 种害虫均可寄生, 被引入以防治苜蓿盲蝽并在新泽西、特拉华州及加拿大释放 (Day, 1987)。

1984 年 Day 等发现双代盲蝽茧蜂在新泽西州成功定殖, 1989 年扩散到纽约, 且在苜蓿上的寄生水平均显著高于本地寄生蜂 (Day *et al.*, 1990)。Day 等 (1990) 于 1988 年首次发现康拉德常室茧蜂在美国定殖, 且寄生苜蓿盲蝽 (Day *et al.*, 1990)。1998 年初, 黑足盲蝽茧蜂及双代盲蝽茧蜂在加利福尼亚释放并确立, 在特拉华州释放控制苜蓿盲蝽的朱红常室茧蜂及苜蓿常室茧蜂未成功定殖 (Day, 1999)。

1998 和 2001 年调查发现, 康拉德常室茧蜂对苜蓿盲蝽的寄生率达到 50%, 已经扩散到两个州的两个县; 黑足盲蝽茧蜂和双代盲蝽茧蜂对美国牧草盲蝽的寄生率分别达到 64% 和 70%, 1998 年已经扩散到 4 个州的 36 个县, 2001 年扩散到 8 个州的 51 个县, 综合控制盲蝽效果分别达到 75% 和 65%, 地区苜蓿田中没有盲蝽暴发 ((Day, 2005)。盲蝽茧蜂在北美的扩散路线如图 1 所示。

3.2 美国对盲蝽寄生蜂的生物学及其安全性的研究

美国农业部有益昆虫研究所 (USDA-ARS, Beneficial Insects Introduction Research Unit) 在室内条件下成功饲养了多种盲蝽寄生蜂, 并对它们进行了深入研究。目前 USDA-ARS 生防室可以批量饲养黑足盲蝽茧蜂和双代盲蝽茧蜂这两种寄生蜂, 饲养条件要求在 $(24 \pm 1)^\circ\text{C}$, 光暗周期 L:D = 16:8, 相对湿度 50%~60%, 使用蜂蜜作为补充营

植棉铃虫得到了有效的控制,但由于减少了棉花化学杀虫剂的使用,盲蝽上升为主要害虫,其发生 and 危害日趋严重。中国已记录的盲蝽约 200 种左右,实际可能达 600 种 (Leyi, 2004)。在我国,盲蝽除为害棉花外,也为害苜蓿及豆科作物等。棉盲蝽主要有绿盲蝽 *Lygocoris lucorum* (Meyre-Dur)、牧草盲蝽 *Lygus pratensis* (Linnaeus)、中黑盲蝽 *Adelphocoris suturalis* (Jakovlev)、苜蓿盲蝽 *Adelphocoris lineolatus* (Goeze) 等几种 (Yanhui et al 2007)。盲蝽若虫和成虫均可危害棉株,以刺吸式口器吸食花、果实、种子汁液,在棉花上形成“破头疯”和“破叶疯” (Mauney and Henneberry, 1979) 造成严重的经济损失。

目前,我国对盲蝽的防治主要依赖于化学农药,引发了一系列环境问题,且化学药剂的长期使用使盲蝽产生一定的抗药性。盲蝽寄生性天敌的应用是适应当代生态环境要求,持续有效控制盲蝽数量的理想措施。2010 年 8 月,中国农业大学从美国引进第一批黑足盲蝽茧蜂 *P. relictus* (Ruthe),采用我国严重发生的苜蓿盲蝽作为寄主,在室内增殖成功。美国盲蝽寄生蜂的成功应用经验对我国盲蝽的有效和可持续控制将有重要的借鉴意义。

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