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警惕椰子织蛾 *Opisina arenosella* Walker (鳞翅目:织蛾科)传入中国

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摘要:【背景】椰子织蛾是棕榈植物上的主要害虫。该害虫在印度和斯里兰卡危害严重,现已入侵泰国。【方法】在收集、整理椰子织蛾原产地或已知入侵地的生物学、生态学、地理学等信息的基础上,介绍了椰子织蛾的主要形态特征、寄主、分布、生物特性,并对该有害生物入侵我国的风险及后果进行综合分析。【结果】椰子织蛾幼虫通常为5龄,大多在棕榈植物叶背面为害。卵期约为5 d,幼虫期约为42 d,蛹期约为12 d,成虫产卵约为137粒。从适生性风险角度看,目前椰子织蛾在南亚和东南亚棕榈植物分布区危害严重,我国南方棕榈植物产区具有相似的生物气候,是椰子织蛾潜在的地理分布区;从传入扩散风险角度看,椰子织蛾成虫能够飞翔,且我国与该害虫发生国家特别是东盟国家的贸易日益频繁,加大了该害虫传入我国的可能性;从经济与生态风险角度看,椰子织蛾入侵我国后将危害椰子等棕榈植物,给相关产业带来损失,影响从业人员收入,同时影响本地生态环境,可能导致生态灾害。【结论与意义】椰子织蛾有入侵我国的可能,有效的检疫管理措施是防范其入侵的主要手段。生物防治是治理该害虫的重要措施之一。

关键词: 椰子织蛾; 棕榈植物; 风险分析; 检疫管理

Exotic pest alert: *Opisina arenosella* (Lepidoptera: Oecophoridae)

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Abstract: 【Background】*Opisina arenosella* Walker is an important pest on palm plants. The species is a severe pest in India and Sri Lanka; it has recently invaded Thailand. 【Method】Based on collected information about biology, ecology and the distbirution of *O. arenosella*, this paper presents its potential range in China. Invasion risk and consequences were also analyzed. 【Result】*O. arenosella* larvae usually have five instars and feed on the under surface of palm leaves. The egg stage lasts on average five days, larval stage lasts on average 42 days, pupae stage lasts on average 12 days, and a female lays on average 137 eggs. Areas with palms in south of China are potentially suitable distribution areas for *O. arenosella* as its phenology is similar to South and Southeastern Asia; Introduction and spread risk aspect: The flight ability of the adult and international trade, particularly with Association of Southeast Asian Nations (ASEAN) could enhance the pest entry possibilities; An eventual invasion of *O. arenosella* would damage coconut palms (*Cocos nucifera* L.), causing losses in palm-based industries, reduce the income of local residents and have a negative effect on local ecology. 【Conclusion and significance】Risk analysis of *O. arenosella* showed the pest might invade China and quarantine measures should be introduced for pest risk management. Biological control options should be explored.

Key words: *Opisina arenosella*; palm plant; risk analysis; quarantine management

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随着对外开放和国际贸易的不断发展,我国外来生物入侵形势十分严峻。在世界自然保护联盟(IUCN)公布的全球 100 种最具威胁的外来物种中,我国就有 50 种,是全球受外来生物入侵影响最大的国家之一(万方浩等,2005)。入侵物种主要分布在我国东南部省份,如广东、海南、云南、福建(万方浩等,2009)。1998 ~2008 年,海南和广东首次发现的入侵有害生物最多,各 5 种(万方浩等,2009)。例如,2002 年入侵我国海南省的椰心叶甲 *Brontispa longissima* (Gestro),给我国棕榈植物相关产业造成了巨大损失(吕宝乾等,2005)。因此,有必要关注有可能入侵我国的其他有害生物。

椰子织蛾 *Opisina arenosella* Walker 是棕榈植物上的重要害虫。在印度、斯里兰卡和缅甸,椰子织蛾严重危害椰子树(Jayaratnam,1941; Rao,1924)。据了解,近几年该害虫已扩散蔓延到东盟国家的泰国和马来西亚,尤其在泰国,该虫危害严重,引起了相关部门的高度重视。为了提高对椰子织蛾的认识,防范该有害生物入侵我国,本文对该虫进行介绍,并进行风险分析。

1 椰子织蛾概况

1.1 分类地位及形态特征

Walker 在 1864 年从不知名的寄主上发现了 *O. arenosella* (Becher,1981)。椰子织蛾英文名为 coconut blackheaded caterpillar,直译为椰子黑头履带虫。我国曾将其译为食叶履带虫、黑头履带虫(陈慧,2004)、椰蛀蛾(黄德聪,1987)。该害虫属鳞翅目 Lepidoptera 织蛾科 Oecophoridae,也曾被归为木蛾科 Xylorycitdae (Becher,1981; Perera *et al.*,1988)。

卵(图 1A):半透明乳黄色,长椭圆形,具有纵横网格,成堆产于叶片上。

幼虫(图 1B):5 ~8 个龄期。雌、雄幼虫大小相似,雄性 6 ~8 龄幼虫虫体第 9 节前缘腹中腺表面有一圆形凹陷,雌虫无此凹陷,这一特征可用于辨别幼虫的性别。

蛹(图 1C):红褐色,雌、雄虫蛹质量分别为(22.18 ± 0.99)、(17.73 ±0.09) mg (Santhosh & Prabhu,1987)。

成虫(图 1D):触角长 5 ~7 mm,38 ~42 节。中间各节呈圆柱形,最后一节呈锥形(Jayaprakash & Prabhu,1986)。

图 1 椰子织蛾(由泰国农业部生物防治中心提供)

Fig. 1 *O. arenosella* (provided by Biological Center, Department of Agriculture, Thailand)

A. 卵;B. 幼虫;C. 蛹;D. 成虫。

A. Egg; B. Larva; C. Pupae; D. Adult.

1.2　分布

椰子织蛾分布于印度、斯里兰卡、孟加拉国、缅甸(Venkatesan *et al.*,2009)、印尼、与印度古吉拉特邦毗邻的巴基斯坦、泰国和马来西亚等地。

1.3　寄主

椰子树 *Cocos nucifera* L.,扇叶树头槐 *Borrassus flabellifer* L.(Rao *et al.*,1948),枣椰树 *Phoenix dactylifera* L.(Butani,1975),贝叶棕 *Corypha umbraculifera* L.(Talati & Kapadia,1984),野生枣椰树 *P. theophrasti* Greuter,银海枣 *P. sylvestris* Roxb,西谷椰子 *Metroxylon sagu* Rottboell,董棕 *Caryota urens* L.(Rao *et al.*,1948),非洲棕 *Hyphaene thebaica* L.(Lever,1969),甘蓝椰子 *Oredoxa oleracea* Kurth,蒲葵 *Livistona chinensis* Rob(Talati & Kapadia,1984),香蕉 *Musa* spp.(Manjunath,1985; Talati & Butani,1988)。

从产卵和取食习性来看,椰子织蛾最喜欢扇叶树头槐,椰子次之,最不喜欢香蕉(Srinivasa *et al.*,1995)。

1.4　危害特征

椰子树整个生长阶段均易受到椰子织蛾的为害。椰子织蛾以幼虫为害叶片,留下排泄物,导致叶片光合作用效率下降。受害严重的植株叶子干枯,出现落叶。与椰子树上的另一种重要害虫椰心叶甲不同,椰子织蛾幼虫危害椰树老叶和新叶,而椰心叶甲只危害椰树新叶(图 2)。椰子织蛾幼虫不仅食叶,而且取食苞芽,造成椰树花穗减少、生长迟缓、过早落果的现象,进而严重影响椰子产量(Lever,1969; Manjunath,1985)。幼虫和蛹能够通过椰子传播。椰子织蛾严重侵染椰子后,可造成 45% 椰子减产,13% 叶片受损(Chandrika *et al.*,2010)。

图 2　椰子织蛾(A,由泰国农业部生物防治中心提供)和椰心叶甲(B)危害后的椰树

Fig. 2　Coconut harmed by *O. arenosella* (A, provided by Biological Center, Department of Agriculture, Thailand) and *B. longissima* (B)

1.5　生物学特性

据报道,雌蛾在叶片背面产卵。卵一般产在老叶上,卵量达 59 ~ 252 粒,平均 137 粒。在印度,椰子织蛾卵期大约 5 d,幼虫期 42 d,蛹期 12 d,成虫寿命 5 ~ 7 d,全世代需 2 ~ 2.5 个月,1 年发生 5 代(Nirula,1955)。

2　椰子织蛾入侵风险分析

2.1　传播扩散的可能性

椰子织蛾成虫可以飞行,大多在晚间活动,这为其传播扩散提供了可能。此外,贸易往来是外来生物入侵的一个渠道。2008 年中国检验检疫部门截获外来生物最多的 10 个国家中,东盟国家有 4 个,分别为泰国(13868 批次)、马来西亚(13492 批次)、越南(4623 批次)和缅甸(4041 批次)(万方浩等,2009)。我国与东盟国家贸易频繁,每年需从东盟国家进口 20 多亿个椰子,给椰子织蛾的远距离传播(主要靠苗木运输)打开了方便之门。

2.2　受害作物的经济重要性

根据海南省林业局统计,海南椰子每年直接产值约 5 亿元,槟榔每年直接产值约 10 亿元。棕榈植物是热带亚热带特有的树种,若该害虫入侵我国,将可能带来与椰心叶甲一样严重的生态灾害。

2.3　潜在的危害性

椰子织蛾幼虫取食叶片,并构筑丝网状虫道,

严重时整个树冠被侵染,树叶干枯,树势衰弱,产量减少。该害虫也危害香蕉,在香蕉上的习性和造成的危害与在椰子嫩叶上相似。虽然该害虫在香蕉上偶尔发现,但可能演变成香蕉的重要害虫。香蕉作为椰子害虫的转寄主曾有先例,如椰子二疣犀甲 *Oryctes rhinoceros* L.(黄德聪,1987)。我国公布的检疫性有害生物名录虽未将椰子织蛾列入其中,但也应警惕该害虫入侵我国。

3 椰子织蛾综合防治措施

3.1 加强检疫

1998 ~ 2008 年,具有危险性与暴发性的农林入侵种多达 19 种,其中 9 种为我国进境检疫对象(万方浩等,2009)。为防止椰子织蛾传播蔓延,必须实施严格的植物检疫措施,并建议相关部门将该害虫列入我国进境检疫对象;对疫区进入的可携带椰子织蛾的材料尤其是棕榈科植物进行必要的处理;检验过程中主要查看叶片上是否有危害状,如果有,应进一步从叶片上采集幼虫或蛹进行准确的鉴定。

3.2 生物防治

椰子织蛾受一些土著寄生性和捕食性天敌(表 1)控制。

表 1 椰子织蛾的天敌

Table 1 Recorded natural enemies of *O. arenosella*

天敌种类 Natural enemy species		分类地位 Taxonomic status	参考文献 Reference
寄生性天敌 Parasitic natural enemies	瓜野螟绒茧蜂 *Apanteles taragamae* Viereck	茧蜂科 Braconidae 绒茧蜂属 *Apanteles*	Nadarajan & Channa,1980
	棉卷叶螟鳞茧蜂 *Meteoridea hutsoni* Nixon	茧蜂科 Braconidae 鳞跨茧蜂属 *Meteoridea*	Sujatha & Singh,2004
	大腿小蜂属 *Brachymeria* spp.	小蜂科 Chalcididae	Nadarajan & Channa,1980
	Goniozus nephantidis Muesebeck	肿腿蜂科 Bethylidae 棱角肿腿蜂属 *Goniozus*	Nadarajan & Channa,1980; Venkatesan *et al.*,2003
	广赤眼蜂 *Trichogramma evanescens* Westwood	赤眼蜂科 Trichogrammatidae 赤眼蜂属 *Trichogramma*	Jalali *et al.*,2002
	Trichogramma sp.	赤眼蜂科 Trichogrammatidae 赤眼蜂属 *Trichogramma*	Jalali *et al.*,2002
	短管赤眼蜂 *T. pretiosum* Riley	赤眼蜂科 Trichogrammatidae 赤眼蜂属 *Trichogramma*	Jalali *et al.*,2002
	T. brasiliense Ashmead	赤眼蜂科 Trichogrammatidae 赤眼蜂属 *Trichogramma*	Jalali *et al.*,2002
	螟黄赤眼蜂 *T. chilonis* Ishii	赤眼蜂科 Trichogrammatidae 赤眼蜂属 *Trichogramma*	Jalali *et al.*,2002
	食胚赤眼蜂 *T. embryophagum* Hartig	赤眼蜂科 Trichogrammatidae 赤眼蜂属 *Trichogramma*	Jalali *et al.*,2002
	松毛虫赤眼蜂 *T. dendrolimi* Matsumura	赤眼蜂科 Trichogrammatidae 赤眼蜂属 *Trichogramma*	Jalali *et al.*,2002
	稻螟赤眼蜂 *T. japonicum* Ashmead	赤眼蜂科 Trichogrammatidae 赤眼蜂属 *Trichogramma*	Jalali *et al.*,2002
	暖突赤眼蜂 *T. achaeae* Nagaraja	赤眼蜂科 Trichogrammatidae	Jalali *et al.*,2002
	棉虫分索赤眼蜂 *Trichogrammatoidea armigera* Nagaraja	赤眼蜂科 Trichogrammatidae 分索赤眼蜂属 *Trichogrammatoidea*	Jalali *et al.*,2002
	卷蛾分索赤眼蜂 *T. bactrae* Nagaraja	赤眼蜂科 Trichogrammatidae 分索赤眼蜂属 *Trichogrammatoidea*	Jalali *et al.*,2002
捕食性天敌 Predators	印度树鹊 *Dendrocitta vagabunda parvula*	雀形目 Passeriformes 鸦科 Corvidae 树鹊属 *Dendrocitta*	Muhammad & Thomas,2012
	花蝽科 Anthocoridae	半翅目 Hemiptera	Lyla *et al.*,2006
	草蛉科 Chrysopidae	脉翅目 Neuroptera	Sujatha & Singh,2003
	黑带宽额步甲 *Parena nigrolineata* Chaudoir	步甲科 Carabidae	Pushpalatha & Veeresh,1995
病菌 Pathogens	核型多角体病毒 Nuclear polyhedrosis viruses	–	Narayanan & Veenakumari,2003

Sujatha & Singh (2004)于 1996 ~ 1997 年在印度的卡纳塔克邦对椰子织蛾的寄生蜂监测发现,瓜野螟绒茧蜂 *Apanteles taragamae* Viereck 在沿海夏季和内陆雨季活跃,棉卷叶螟鳞茧蜂 *Meteoridea hutsoni* Nixon 和大腿小蜂属 *Brachymeria* spp. 分别在冬季和夏季占主导地位。*Goniozus nephantidis* (Muesebeck)在印度不同地区对椰子织蛾的寄生率不同:如在喀拉拉邦奎隆地区的寄生率为 3.7% ~ 47.6% (Sathiamma *et al.*,1996);在马哈拉施特拉邦塔那地区为 57.6% (Desai *et al.*,2003);在古吉拉特邦默胡瓦地区为 31.0%;在安得拉邦贡土尔地区为 28.0% (Manjunath,1985);在班加罗尔地区为 48.0% (Nadarajan & Channa,1980)。在斯里兰卡的寄生率为 19.0% (Dharmaraju,1963)。Venkatesan *et al.* (2003)发现,*G. nephantidis* 扩散依靠爬行而不是飞行。在田间离地面 1.2 m 的椰子树干释放 *G. nephantidis*,90% ~ 100% 的寄生蜂可达到树冠。每棵树释放 10 头 *G. nephantidis*,连续释放 4 次效果最佳。在 2 种寄生蜂 *G. nephantidis* 和 *Bracon brevicomis* Wesm. 竞争互作过程中,*G. nephantidis* 能占有寄主保证后代繁衍,但却影响 *B. brevicomis* 对椰子织蛾的寄生控害效能(Venkatesan *et al.*,2009)。Jalali *et al.* (2002)从 11 种赤眼蜂中筛选出椰子织蛾卵期寄生蜂食胚赤眼蜂 *Trichogramma embryophagum* Hartig,大田释放寄生率达 82.1%。在印度每棵树释放 50 ~ 100 头花蝽 *Cardiustethus exiguous* Poppius,能够显著降低野外椰子织蛾的种群数量(Lyla *et al.*,2006)。

3.3　化学防治

在印度西海岸,0.1% 或 0.2% DDT 对棕榈树椰子织蛾具有很好的防治效果(Nirula *et al.*,1951)。Sathiamma & Kurian (1972)报道,几种农药对椰子织蛾的防效依次为敌敌畏 > 敌百虫 > 残杀威 > 亚砜吸磷 > 西维因。椰子织蛾暴发时,用 0.02% 敌敌畏、0.05% 马拉硫磷、0.05% 硫丹和久效磷,有时用 3% 印楝种核提取物,喷施于叶片背面能够马上缓解疫情(Anjaria *et al.*,1975; Ponnamma,1984)。Kanagaratnam & Pinto (1985)和 Nadarajan & Channa (1981)研究表明,通过树干注射杀虫剂对椰子织蛾有一定的防治效果。如通过树干注射印楝素水剂,24 h 药剂可从树基部传导到树冠,对幼虫的控制效果显著(Shivashankar *et al.*,2000)。

3.4　农业防治

农业防治是预防椰子织蛾暴发的辅助措施。通过削减和烧毁这些被害叶片或枯叶等(Rohitha,1982),可以减少虫源。

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