

文章编号 :1003-8701(2005)03-0021-02

熊蜂和苜蓿切叶蜂在网室内对大豆不育系授粉效果的研究

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摘 要 :报道了熊蜂和苜蓿切叶蜂在网室内对大豆不育系授粉效果。结果表明 ,两种昆虫都是大豆不育系的有效传粉昆虫 ,用它们授粉后可使网室内大豆不育系的单株结荚数和单株粒数明显提高。释放熊蜂的不育系大豆平均单株结荚数和粒数分别为 21.3 个和 43.1 粒 ,释放苜蓿切叶蜂的不育系大豆平均单株结荚数和粒数分别为 56.8 个和 128.2 粒 ,苜蓿切叶蜂的授粉效果显著高于熊蜂。

关键词 :大豆不育系 ;传粉昆虫 ;授粉效果

中图分类号 :S186

文献标识码 :A

如何提高大豆不育系的结实率 ,降低杂交种的制种成本 ,特别是如何提高昆虫传粉效率和增加传粉昆虫种类 ,寻找替代苜蓿切叶蜂的传粉昆虫 ,降低授粉成本 ,对大豆杂种优势在生产上的应用非常重要。

苜蓿切叶蜂和熊蜂均可人工繁殖。苜蓿切叶蜂是专门用于苜蓿等豆科牧草制种田授粉的昆虫 ,授粉后可使制种产量增加数倍 ;熊蜂则主要用于果树和保护地蔬菜的授粉 ,授粉后可显著改善果型 ,提高产量和品质。李建平等(2002)研究报道了苜蓿切叶蜂是杂交大豆制种田以及不育系的选育和繁殖过程中最有效的传粉昆虫 ,在网室内授粉后可使大豆不育株的结实率达到 70% 以上 ,部分不育株的结实率达到了 100% ,未放蜂的对照不育株的结实率仅达 5%。作者 2003 年在人工控制的条件下 ,进行了熊蜂和苜蓿切叶蜂在网室内对大豆不育系的授粉研究 ,现将相关结果报道如下 :

1 材料和方法

1.1 供试昆虫和大豆不育系材料

红光熊蜂(*Bombus ignites Smith*)由北京市农林科学院科技信息研究所提供 ;苜蓿切叶蜂(*Megachile rotundata* F.)由吉林省农科院植保所自繁。

msA、msB、msC、msD 和 msE 来自吉林省农科院杂交大豆育种课题选育的不育系 ,是用作配制杂交组合亲本。种植比例为 1:1(♀:♂) ,行距为 70 cm ,株距为 10~12 cm。网室规格 :长×宽×高为 18 m × 6 m × 2.5 m。

1.2 熊蜂的释放

在大豆不育系开花的初期 ,将部分羽化的熊蜂 1 箱(约 250 头蜂) ,一次性放到网室内 ,蜂箱内的蜂逐步羽化。蜂箱放在防护棚内 ,距地面 0.5 m ,前面放一定浓度的糖水 ,每隔 3~5 d 换 1 次 ,作为补充蜜源。

1.3 苜蓿切叶蜂的释放

在网室内的大豆不育系开花的初、盛和末期 ,按一定比例将羽化 1~2 d 的约 120 头雌蜂逐步释放

收稿日期 :2005-04-04

基金项目 :科技部“863”计划项目(2002AA207007)

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到网室内,网室内种植一些蜜源植物,用以补充蜜源和防止雌蜂外逃。

1.4 调查方法

花期全部结束后掀掉棚上的纱网,在收获前对不同放蜂棚内不育系进行单株调查,分别记录单株荚数和粒数。

2 结果与分析

试验结果表明(表 1),两种传粉昆虫对同一品系的传粉效果不同。从整体看,苜蓿切叶蜂的传粉效果明显好于熊蜂。释放苜蓿切叶蜂棚内的大豆不育系平均单株结荚数为 56.8 个,平均单株粒数为 128.2 粒,单株最多结荚数为 92 个,单株最多粒数为 213 粒,不同品系间的差别不大;释放熊蜂棚内的大豆不育系平均单株结荚数为 21.3 个,平均单株粒数为 43.1 粒,单株最多结荚数为 74 个,单株最多粒数为 152 粒。

表 1 释放传粉昆虫棚内的不育系植株结荚(粒)数

昆虫种类	不育系名称 (组合)	调查株数	最多 荚/株	最少 荚/株	平均 荚/株	最多 粒/株	最少 粒/株	平均 粒/株
熊 蜂	msA ♀ × 9405 ♂	15	24	6	15.1	50	11	29.8
	msB ♀ × 9405 ♂	15	47	8	17.4	116	13	38.8
	msC ♀ × 9405 ♂	10	42	14	25.4	83	22	49.9
	msD ♀ × 9405 ♂	11	32	8	17.2	73	17	33.1
	msE ♀ × 9405 ♂	12	74	4	31.5	152	7	64.5
	平 均		43.8	8.0	21.3	94.8	14.0	43.1
苜蓿切叶蜂	msA ♀ × 9410 ♂	10	92	21	46.9	179	38	98.3
	msB ♀ × 9410 ♂	10	86	36	57.4	182	79	136.0
	msC ♀ × 9410 ♂	10	72	31	51.9	143	60	98.7
	msD ♀ × 9410 ♂	10	92	40	65.4	213	93	157.7
	msE ♀ × 9410 ♂	8	87	38	62.6	202	77	150.4
	平 均		85.8	33.2	56.8	183.8	69.4	128.2

3 讨 论

苜蓿切叶蜂和熊蜂均为大豆不育系有效传粉昆虫。释放熊蜂棚内的大豆不育系不同品系间、同一品系不同植株间结荚(粒)数间差异很大。授粉不匀的原因很可能与植株密度、花的形态和大小、花期、花粉量及蜜腺等有关。在试验中发现,有很大数量的熊蜂死在大棚内,其原因还有待于进一步研究。在试验过程中观察到,熊蜂每天的活动时间较早,天刚一亮,就在植株的上方及株、行间飞行,同时也访花,但此时的大豆花还没散粉,故此时活动是无效的;而苜蓿切叶蜂活动需要一定的温度,并且需要一定的光照,这与大豆开花散粉时间相吻合,虽然苜蓿切叶蜂活动时间短,但授粉效率高,同时释放苜蓿切叶蜂棚内的大豆不育系的不同品系间、同一品系不同植株间结荚(粒)数差异相对较小,授粉比较均匀,这和昆虫本身的生物学特性有关。从体型特点、采集花粉的方式及大豆花的特征来看,苜蓿切叶蜂更适合为大豆授粉。目前,苜蓿切叶蜂是豆科植物、特别是大棚网室内大豆杂交制种及不育系亲本等繁殖过程不可替代的优良传粉昆虫。

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Studies on Pollinating Soybean Male Sterile Plant in Caged Plots
Using Bumble Bee (*Bombus ignites*) and Alfalfa
Leaf-cutting Bee (*Megachile rotundata*)

Progress of Studies on Artificial Propagation and Application of *Trichogramma Chilonis*

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Abstract: The morphology and biological character of *Trichogramma Chilonis* was informed in the paper. The method for artificial propagating *Trichogramma Chilonis* and its application in agriculture in China was summarized. Current related researches were reviewed. Several suggestions were put forward in the end, such as strengthening the basic studies, reproducing in large scales and raising the effect of pest controlling.

Key words: *Trichogramma Chilonis*; Propagation; Application; Effect of pest controlling

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Studies on Low Temperature Storage in Industrial Production of *Trichogramma dendrolimi* Matsumura

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Abstract: A long-term storage test under constant temperature of 3℃ was carried out to undiapause *Trichogramma dendrolimi* of six stages of growth including young larvae, middle larvae, old larvae, prepupa, initial pupa, middle pupa. The results showed that the storage effect was influenced by different stage of growth. The middle larva is the best stage and young larva is better stage for storage. The storage time of young larvae and middle larvae may not exceed sixty day, others may not exceed fifteen days. As the storing lasted, the number of *Trichogramma dendrolimi* in a single host egg reduced in first twenty days. Later, it no longer changed. If young larva was stored, the number of *Trichogramma dendrolimi* in a single host egg reduced greatly. The change of the single female adult oviposition was not significantly correlated with the length of storage. In case initial pupa and middle pupa were stored, the number of the single female adult oviposition reduced greatly.

Key words: *Trichogramma dendrolimi*; Storage; Eclosion-rate; The number in the single host egg; The number of the single female adult oviposition

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Abstract: The results of using bumble bee and leaf-cutting bee to pollinate soybean male sterile plants in cages were reported in the paper. The results showed that both of them are effective pollinator of soybean male sterile strains. Numbers of pods and seed on a single plant were significantly increased by using these two pollinators. Average pods and seeds per plant were 21.3 and 43.1 respectively in cage releasing bumble bee, whereas in cage releasing alfalfa leaf-cutting bees it was 56.8 and 128.2 respectively. Therefore, alfalfa leaf-cutting bee is a better pollinator for pollinating soybean male sterile plants in cages.

Key words: Soybean male sterile plants; pollinator; Effect of pollination