Integrated management of tea tortricids in Japan.

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Summary

The oriental tea tortrix, *Homona magnanima* Diakonoff and the smaller tea tortrix, *Adoxophyes honmai* Yasuda are serious pests of tea in Japan. To control these two moths, chemical insecticides have been regularly sprayed four to six times a year. The pest control of tea will be directed to integrated pest management in which the amount of insecticides is reduced as much as possible. Therefore, more appropriate methods for control of pests were studied. The granulosis viruses of *H. magnanima* (*Hm*GV) and *A. honmai* (*As*GV) were used to control tea torticids. A mixed homogenate of infected larvae were sprayed and these mortalities of two totricids were surveyed. These mortalities of two totricids of the GV-sprayed generation were high. Other components of integration are the use of sex pheromone such as mating disruptions. The disruptant of newly mixed pheromonal component of *A. honmai* and *H. magnanima*, was investigated in tea fields. The result indicated sexual communication and mating disruptions of the two tortricids were high level and succeeded until 3rd generation. The success of disruptions of the two tortricids with new mixture will lead to decrease in the needs for pesticides.

Keywords

Homona magnanima, *Adoxophyes honmai*, granulosis virus, mating disruption, IPM

Introduction

Many species of insect and mite pests are associated with the tea plant. Among them, the oriental tea tortrix, *Homona magnanima* Diakonoff and the smaller tea tortrix, *Adoxophyes honmai* Yasuda are serious pests of tea in Japan. These two tortricids have 4-5 generations a year and insecticides are applied 4-6 times a year for controlling these two species, because insecticide application is still the major control method for these pests. But it is desirable that the uses of insecticides are minimized, as tea is an important drink for Japanese and as the natural enemies should be protected from insecticides. The pest control of tea will be directed to integrated pest management in which the amount of insecticides is reduced as much as possible. Therefore, more appropriate methods for control of pests are studied, and some methods are already in practice.

The granulosis viruses of *H. magnanima* (*Hm*GV) and *A. honmai* (*As*GV) are used to control tea torticids (Kodomari, 1980; Nonaka et al,1994). Other components of integration are the use of sex pheromone such as mating disruptions (Ohtaishi,1988). Mating disruption is a technique used to prevent or reduce mating of insect pests by modifying adult behavior with synthetic pheromone. The disruptant of newly mixed pheromonal component of *A. honmai* and *H. magnanima*, was investigated in tea fields.

Materials and methods

granulosis viruses

A mixed homogenate of infected larvae of *A. honmai* and *H. magnanima*, at a concentration of 0.5 larvae per liter for *Hm*GV and 1.0 larva per litter for *As*GV, were

sprayed at the rate of 2000 l/ha in a tea field at the time of hatching of the first (or second) generation. To evaluate the effect of the granulosis viruses, these mortalities and larval densities of two totricids were investigated.

Mating disruption

The disraptant dispenser used was 'Hamakikon-N', containing several components of the sex pheromone of different species including *A. honmai* and *H. magnanima*. Dispensers were distributed over the treatment area (approximately 2 ha) by hanging them on branches, at the rate of 2,500 tubes per ha before the first flight period (overwinter generation). As they steadily released the pheromone for more than seven months, the effect was prolonged over the last flight period (3rd generation) of these two species in the tea field. To evaluate the effect of the mating disruption, total number of males captured by monitoring trap and the rate of mating female tethered (tethered female method) were surveyed.

Results and discussion

Effect of application of granulosis viruses

To evaluate the effect of the granulosis viruses, the rate of infected larvae and the larval densities were analyzed. In the GV-sprayed generations, the percentage of infected larvae of *H. magnanima* and that of *A. honmai* were from 83% to 95% and from 70% to 90%, respectively. And the succession on rates of infected larvae decreased gradually with generation to generation. In case of high larval density the rate decreased slowly, while decreased rapidly in the case of low larval density (Fig 1.).

Neonate larvae infected with the viruses usually die only in the last instar and quite often have an even longer larval life than uninfected insects. Therefore, in spite of the high mortality due to viruses dissemination, the injury caused by these two pests dose not decrease in the generation treated with the GVs.

Table 1. Effect of sexual communication disruption on *Adoxophyes honmai*

Generation	Total number of male moths trapped		Rate of communication disruption
	Pheromone treatment	Control	
Overwinter	4	2165	**99.8**
1st	9	2893	**99.7**
2nd	23	3442	**99.3**
3rd	36	1508	**97.6**

Table 2. Effect of sexual communication disruption on *Homona magnanima*

Generation	Total number of male moths trapped		Rate of communication disruption
	Pheromone treatment	Control	
Overwinter	3	727	**99.6**
1st	3	1937	**99.8**
2nd	14	1665	**99.2**
3rd	2	120	**98.3**

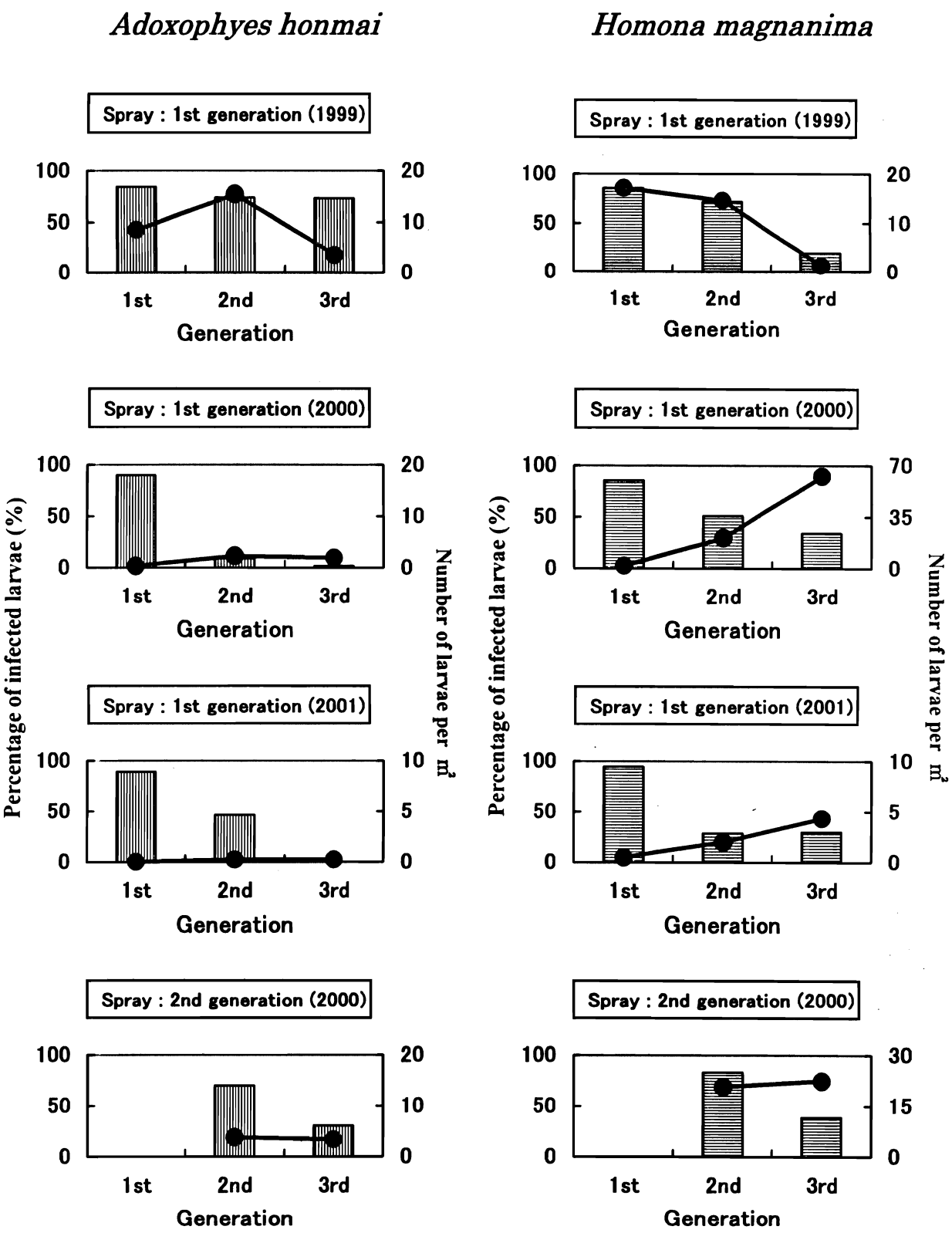

Fig 1. Changes in the percentage of infected larvae and larval density

Effect of mating disruption

In the sex pheromone treated area, total numbers of male moths captured by monitoring trap were very few, and the percentage of mating inhibition were up to 98% for *A. honmai* and up to 90% for *H. magnanima* (Table 1.~Table 4.). These results indicated that sexual communication and mating disruptions of these moths were high level and succeeded until 3rd generation. The success of disruptions of two tortricids with new mixture will lead to decrease in the needs for pesticides.

Table 3. Effect of mating disruption on *Adoxophyes honmai* .

Generation	Percentage of mating females (sample number)		Rate of mating disruption
	Pheromone treatment	Control	
Overwinter	0.0 (60)	74.0 (50)	**100.0**
1st	0.0 (93)	75.8 (95)	**100.0**
2nd	1.1 (95)	69.1 (94)	**98.3**
3rd	0.0 (82)	79.5 (83)	**100.0**

Table 4. Effect of mating disruption on *Homona magnanima*.

Generation	Percentage of mating females (sample number)		Rate of mating disruption
	Pheromone treatment	Control	
Overwinter	0.0 (46)	27.1 (48)	**100.0**
1st	0.0 (50)	72.0 (50)	**100.0**
2nd	1.5 (67)	77.6 (67)	**98.1**
3rd	6.8 (59)	71.2 (59)	**90.5**

References

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