

MOTHS POPULATION MONITORING OF STORED PRODUCTS BY SEX PHEROMONE TRAPS

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Abstract: Have been tested two variants of the TDA synthetic sex pheromone, produced by Chemistry Research Institute „Raluca Ripan”, Cluj-Napoca, for the monitoring of pest lepidoptera population in stored produce. The experiments have been carried out in a grain stored produce naturally infested with seeds moth *Plodia interpunctella* where both pheromonal variants P-1 and P-2, showed a good efficacy in males capture. It was recorded a greater capture during July-August, that showed the development of first generation adulthood; the second flight maximum, recorded at the end of the experimental period (September) is supposed to show the beginning of the second generation, but in a reduced number caused by the lower store temperature. In the same time in a flour-mill silo were monitoring the population of *Ephestia kuehniella* and *Plodia interpunctella*, with good efficacy showed by the males captures from both species. On the basis of these observations it can be concluded that the use of synthetic sex pheromones traps can be a rapid, efficacy and no pollutant method for the pest control.

KEY WORDS: sex pheromone traps, stored products

INTRODUCTION

Pheromone traps are a good monitoring tools in stored produce for the observation of the presence or absence of the most important moths. The synthesis of synthetic sex pheromones of stored pest can be used for:

- earlier detection of the pest presence;
- monitoring of the population and its direct control by mass trapping or mating disorientation;
- optimal timing for insecticide treatment applications;
- control of efficacy treatment

The application of synthetic sex pheromones was aimed to replace the conventional insecticide treatments.

The importance of pheromones used in stored produce is demonstrated by the appearance in different country of a great number of published studies as: Bommer & Reichmuth (1980), Burkholder (1983), Fleurat-Lessard et al. (1987, 1988), Piniger & Chambers (1987), Süß & Trematerra (1987).

In Romania the experiments of monitoring moth population were carried out in a horizontal grain storage, and a flour- mill silo.

MATERIAL AND METHOD

In the experiments have been used two synthetic sex pheromone variants (P-1 and P-2), produced by the Chemistry Research Institute of Cluj-Napoca , with following compositions: P-1: (Z,E)-9,12- tetradecadien-1-il acetat (1 mg), Decil acetat (0.15 mg) și Z 9-tetradecen-1-il acetat (0.07 mg); P-2: (Z,E)-9,12- tetradecen-1-il acetat (1 mg), Decil acetat (0.25 mg) și Z 9-tetradecen-1-il acetat (0.07 mg);

The experiments carried out in a horizontal grain storage of a 6000 m³ capacity, were stored 2000 tons of wheat, at a 3.7 m. width layer, and have been naturally infested by the seeds moth *Plodia interpunctella*.

The two pheromone variants were applied alternatively above the grain layer from 1.80 m. high. Pheromone capsules were replaced every month. At each observation the temperature on the grain layer surface and at the depth of 5 cm. was recorded, and the counted number of the captured moth males.

The trapped period lasts about 17 weeks, between 10 June and 10 October, and when the grain layer temperature was 16°C ended.

In the flour-mill silo were used P-1 variant traps, and set up one trap in cell for each silo section (basement, ground level and first level). The traps were set up in June and pheromone capsules have been replaced in July and August, all the observations ended at the finish of November.

RESULTS

In the horizontal grain storage during the experiments carried out, the temperature at the grain layer surface was recorded 16°C (at the end of the experiment) and 28°C (at the middle of August).

At the beginning of the experiment the temperature at the grain layer surface was 20°C and it happened at the same moment with the beginning of moths flying. A maximum flight was recorded on 18 July, by 491 moth males captured in all four P-1 variant traps. Another important maximum flight was recorded on 16 August, by 368 captured moths, after that capture showed to decrease. By the end of the experimental time appeared another maximum on 28 September, but was expressed in a less number of captured insects (162 male moths).

In all P-1 variant traps during the experimental period the total number of captured males was of 2,310 (table 1).

Table 1

Moth population monitoring of *Plodia interpunctella* in a grain stored produce
P-1 pheromone variant

Data of capture	Trap				Total trap capture	Total sum
	1	2	3	4		
27.06*	2	0	0	1	3	3
3.07	0	5	1	0	6	9
10.07	11	52	35	10	108	117
18.07	112	177	112	90	491	608
27.07	49	38	28	74	189	797
1.08	84	105	40	94	323	1.120
9.08	43	121	28	62	254	1.374
16.08	60	170	36	102	368	1.742
29.08	31	150	11	43	235	1.944
5.09	10	31	0	26	67	2.044
11.09	13	25	2	6	46	2.090
28.09	32	81	15	34	162	2.252
10.10	9	19	11	19	58	2.310
Total	456	974	319	561	2.310	2.310

- Pheromone replaced monthly

In the P-2 variant traps were recorded more maximum flights, such as: 367 moth males (on 18 July), 396 (on 1 August), 281 (on 9 August), 386 (on 16 August) and 217 (on 29 August), after that the flight curve decrease, until another maximum appeared on 28 September (258 moth males). In these variant traps were captured a total of 2,642 moths (table 2).

Table 2

**Moth population monitoring of *Plodia interpunctella* in a grain stored produce
P-2 pheromone variant**

Data of capture	Trap				Total trap capture	Total sum
	1	2	3	4		
19.06*	4	5	7	22	38	38
27.06	0	8	14	2	24	62
3.07	0	7	13	2	22	84
10.07	20	102	44	14	180	264
18.07	49	175	106	37	367	631
27.07	34	131	51	59	275	906
1.08	105	151	97	43	396	1.302
9.08	32	159	63	27	281	1.583
16.08	60	203	92	31	386	1.969
29.08	26	77	48	66	217	2.186
5.09	16	48	11	6	81	2.267
11.09	8	29	7	4	48	2.315
28.09	25	111	56	66	258	2.573
10.10	9	34	14	12	69	2.642
Total	388	1.240	623	391	2.642	2.642

*Pheromone replaced monthly

The great number of captured insects recorded in both pheromone variant traps showed the adulthood evolution of F1 generation, and the maximum flight recorded at the end of the experimental period is supposed to be the beginning of the second generation, but weaker because of the store lower temperature.

The compared results between P-1 and P-2 traps variants showed that although the P-2 variant captures were in great number, the differences between two neighbour traps in variant P-1 and P-2, have been oscillatory (table 3).

Table3

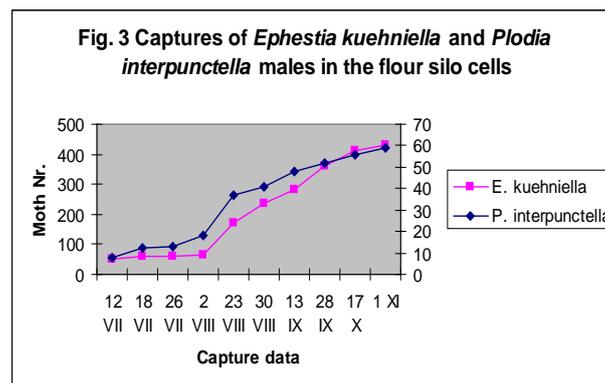
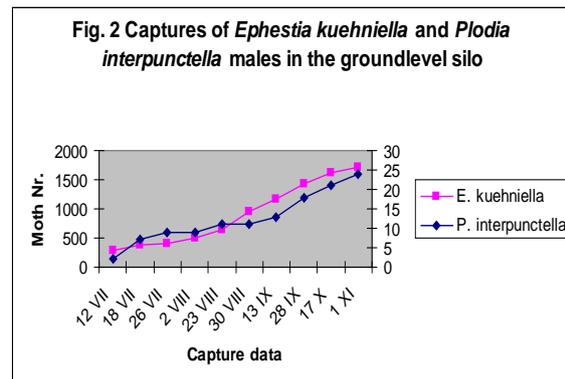
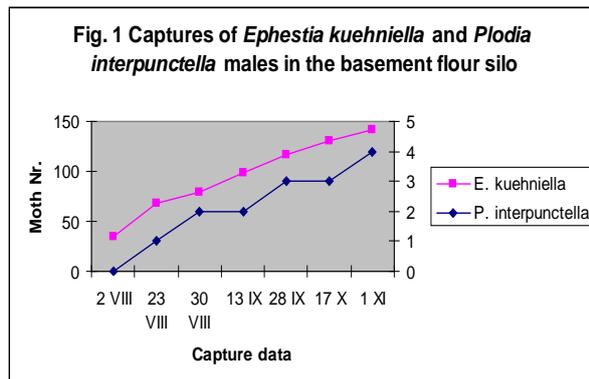
**Comparative captures in individual traps with both
P-1 and P-2 pheromone variants**

Pheromone variants		Trap				Total
		1	2	3	4	
P-1	number of captures	456	974	319	561	2.310
	%	19,47	42,16	13,81	24,29	100,0
P-2	number of captures	388	1.240	623	391	2.642
	%	14,69	46,93	23,58	14,80	100,0

In the traps set up in the flour-mill silo basement were captured 141 flour males moth (*Ephestia kuehniella*), their maximum flight was observed in the third decade of August, and four *Plodia interpunctella* adults (Fig.1), were captured in the same period.

In the traps set up on the silo ground level was observed a great number of *Ephestia kuehniella* the total number of captured insects was 1,726 but *Plodia interpunctella* males was 24 (Fig.2), during the whole experimental period (26 June to 1 November). In the traps set up on the silo first level the captured moths were in a total number of 430 *Ephestia kuehniella* males and 59 *Plodia interpunctella* (Fig.3), during the whole observation period.

The usage of pheromones traps in flour-mill silo has the disadvantage of the deposited flour powder on the traps adhesive plates, which must be replaced more frequently than the traps set up in a horizontal grain stored produce.



CONCLUSIONS

- the two pheromone variants P-1 and P-2 showed a good efficiency in the capture of moths males of *Plodia interpunctella* and *Ephestia kuehniella*;
- though the recorded total number of captured adults of *Plodia interpunctella* in both variants showed to be different (pest monitoring in grain stored produce), individual values are not keeping the same range of values, which means both pheromone variants showed a good efficacy;
- the observations carried out showed the sensitivity of pheromone traps, enabling us to trace the pest presence in the earliest stage of moths flight, and so to be recommended for the earlier discover of moth infestation and warning for chemical treatments applications;
- in the case of a limited space and presence of a weak infestation, the sex pheromone traps can be active reducing pest population, so being useful in small household where are not recommended chemical treatments;
- the sex pheromones of the stored produce moths and specially TDA/(Z,E)-9-12-tetradecadienil acetat, which showed a moderate specificity, enables the capture of many Phycitidae species, showing efficacy against a larger number of pest species.

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