SUMMARY

Experiments on the interactions between red flour beetle, Tribolium castaneum and cigarette beetle, Lasioderma serricorne were carried out. Hundred percent control of L. serricorne population occurred when mixed sexes of T. castaneum were used. The female beetles and the larvae of T. castaneum also reduced the cigarette beetle population highly significantly (upto about 95%). However, the male T. castaneum could not produce effect on the population growth of L. serricorne as much as other stages and females. The larvae and adults of the T. castaneum were voracious feeders of the eggs and larvae (upto 2nd instar) of the L. serricorne. The destruction due to predatory T. castaneum larvae being dependent on life of active feeding stages, the 5th and 6th instars (short lived stadia) were less destructive in comparison with the other early instars. It has been suggested on the basis of present experimental observations that only unmated female T. castaneum or suitably sterilized adult beetles of either sex can be employed to control L. serricorne infestation, particularly in stores of tobacco and spices. This would not permit any build up of population of T. castaneum itself.

EXPERIMENTAL PROTOCOL

Experimental arrangements of different stages of *Tribolium castaneum* (Hbst.) cultured together with various stages of *Lasioderma serricorne* (F.)

	1	2	3	4	5
20 individuals of *T.castaneum* added to each of the vials of all batches under columns 1 to 5	5 vials per batch each containing 20 eggs of *L. serricorne*	5 vials per batch each containing 20 individuals of 1st instar larvae of *L.serricorne*	5 vials per batch each containing 20 individuals of 2nd instar larvae of *L.serricorne*	5 vials per batch each containing 20 individuals of 3rd instar larvae of *L. serricorne*	5 vials per batch each containing 20 individuals of 4th instar larvae of *L. serricorne*
1st Instar	Batch 1	Batch 1	Batch 1	Batch 1	Batch 1
2nd Instar	" 2	" 2	" 2	" 2	" 2
3rd Instar	" 3	" 3	" 3	" 3	" 3
4th Instar	" 4	" 4	" 4	" 4	" 4
5th Instar	" 5	" 5	" 5	" 5	" 5
6th Instar	" 6	" 6	" 6	" 6	" 6
Male	" 7	" 7	" 7	" 7	" 7
Female	" 8	" 8	" 8	" 8	" 8
Control (Without *T. castaneum* stadia)	" 9	" 9	" 9	" 9	" 9

Table 1. Number of emerged Lasioderma sericorne (F.) at the end of 35 days, when reared in listed combinations with Tribolium castaneum (Hbst.) and alone.

Combinations (Batches)	Number of emerged adults per replicate					Mean value
5 pairs of L. sericorne + 20 T. castaneum larvae (mixed instars)	58	146	66	160	148	115.6 bc
5 pairs of L. sericorne + 5 pairs of T. castaneum	0	0	0	0	0	0 bcd
5 pairs of L. sericorne + 10 male T. castaneum	196	253	195	284	195	224.6 a
5 pairs of L. sericorne + 10 female T. castaneum	55	52	22	25	28	36.4 b
5 pairs of L. sericorne (control)	210	295	265	205	185	232 a

Mean values appended with dissimilar letters are significantly different from each other ($P < 0.01$).

Table 2. Number of emerged Tribolium castaneum (Hbst.) at the end of 35 days, when reared alone and in combination with adult Lasioderma serricorne (F.)

	Number of emerged adults per replicate					Mean value
5 pairs of *T. castaneum* (control)	393	391	427	452	422	417 a
5 pairs of *T. castaneum* + 5 pairs of *L. serricorne*	306	453	344	345	363	362.2 a

Mean values appended with similar letter are not significantly different from each other ($P > 0.05$).

Table 3. Hatchability of Lasioderma serricorne (F.) when 20 eggs were allowed to develop with T.castaneum (Hbst.) larval instars and adults

With T. castaneum stadia	Number of larvae hatched per replicate					Mean hatchability value per 20 eggs
1st Instar	9	7	11	13	7	9.4 bcd
2nd Instar	8	8	7	10	8	8.2 bcd
3rd Instar	12	12	11	8	10	10.6 bc
4th Instar	10	11	9	12	13	11.0 b
5th Instar	14	13	14	15	17	14.6 a
6th Instar	12	14	14	13	9	12.4 b
Male	13	11	16	14	14	13.6 b
Female	8	10	11	18	9	11.2 b
Control	18	18	17	20	19	18.7 a

Mean values appended with disimilar letters are significantly different from each other ($P < 0.01$).

Table 4. Number of emerged Lasioderma serricorne (F.) from among the surviving larvae that hatched from 20 eggs reared with Tribolium castaneum (Hbst.) larval instars and adults

With *T. castaneum* stadia	Number of emerged adults per replicate					Mean value
1st Instar	0	3	1	0	1	1.0 bcde
2nd Instar	1	0	0	0	1	0.4 bcde
3rd Instar	3	5	3	3	6	4.0 bed
4th Instar	10	5	9	4	12	8.0 bc
5th Instar	14	13	14	12	14	13.4 b
6th Instar	14	13	11	8	10	11.4 b
Male	4	13	8	4	10	7.9 bc
Female	1	2	1	2	1	1.4 bcde
Control	18	17	17	19	18	17.8 a

Mean values appended with disimilar letters are significantly different from each other ($P < 0.01$).

Table 5. Number of emerged Lasioderma serricorne (F.) when 20 separately hatched 1st instar larvae were reared with Tribolium castaneum (Hbst.) larval instars and adults

With T. castaneum stadia	Number of emerged adults per replicate					Mean value
1st Instar	5	10	7	9	8	7.8 bc
2nd Instar	2	1	1	0	1	1.0 bcd
3rd Instar	1	0	0	0	1	0.4 bcd
4th Instar	1	0	0	1	1	0.42 bcd
5th Instar	0	2	5	1	2	2.0 bcd
6th Instar	12	12	9	10	10	10.6 b
Male	10	6	10	8	8	8.4 b
Female	0	0	2	0	1	0.6 bcd
Control	17	16	18	18	19	17.6 a

Mean values appended with disimilar letters are significantly different from each other ($P < 0.01$).

Table 6. Number of emerged Lasioderma serricorne (F.) when 20, freshly emerged 2nd instar larvae were reared with Tribolium castaneum (Hbst.) larval instars and adults

With *T. castaneum* stadia	Number of emerged adults per replicate					Mean value
1st Instar	18	17	16	18	18	17.4 a
2nd Instar	15	17	16	16	17	16.2 a
3rd Instar	8	8	7	9	8	8.0 bc
4th Instar	1	4	3	0	2	2.0 bcde
5th Instar	5	8	6	8	7	6.8 bc
6th Instar	2	8	5	3	4	4.0 bcd
Male	14	14	14	17	16	15.0 b
Female	5	6	8	8	6	6.6 bc
Control	18	16	19	19	17	17.8 a

Mean values appended with disimilar letters are significantly different from each other ($P < 0.01$).

Table 7. Number of emerged Lasioderma serricorne (F.) when 20, freshly emerged 3rd instar larvae were reared with Tribolium castaneum (Hbst.) larval instars and adults

With *T. castaneum* stadia	Number of emerged adults per replicate					Mean value
1st Instar	16	16	16	18	17	16.6 b
2nd Instar	17	18	16	17	17	17.0 b
3rd Instar	14	17	17	18	18	16.8 b
4th Instar	11	15	14	11	10	12.2 a
5th Instar	19	17	18	16	18	17.6 b
6th Instar	17	17	18	18	17	17.4 b
Male	18	18	14	16	19	17.0 b
Female	15	15	14	18	18	16.0 b
Control	20	18	19	18	19	18.8 b

Mean values followed by similar letters are not significantly different from each other ($P > 0.05$).

Table 8. Number of emerged Lasioderma serricorne (F.) when 20, freshly emerged 4th instar larvae were reared with Tribolium castaneum (Hbst.) larval instars and adults

With *T. castaneum* stadia	Number of emerged adults per replicate					Mean value
1st Instar	16	17	16	17	15	16.2 b
2nd Instar	19	20	18	18	19	18.8 b
3rd Instar	12	15	18	14	16	15.0 a
4th Instar	17	13	20	15	17	16.4 b
5th Instar	20	19	17	17	18	18.2 b
6th Instar	18	18	17	20	19	18.4 b
Male	20	19	18	19	18	18.8 b
Female	19	20	18	18	18	18.6 b
Control	19	20	20	19	19	19.4 b

Mean values followed by similar letters are not significantly different from each other ($P > 0.05$).