A sub-culture of the fungus has been deposited at Centraalbureau voor Schimmelcultures, Baarn, Netherlands.

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A NOTE ON THE RECOVERY OF *CHELONUS BLACKBURNI* CAMERON (BRACONIDAE: HYMENOPTERA), AN EXOTIC EGG-LARVAL PARASITE OF COTTON BOLLWORMS

AMONGST the number of insect pests attacking the cotton crop, bollworms are the most noxious pests in Maharashtra State. Since a species of *Chelonus* has been reported to parasitise the cotton bollworms, *Earias vitella* and *E. insulana* Boisduval in India[2], trials were conducted to investigate the possibilities of establishment of *Chelonus blackburni* Cameron, an egg-larval parasite in parasitising *Heliothis armigera* Hubn. and *Pectinophora gossypiella* Saund. and *Earias fabia* under field conditions. *C. blackburni* is an egg-larval parasite of pink bollworms *P. gossypiella* Saund. in Egypt[5]. It has been successfully introduced for the control of *P. gossypiella* in U.S.A.[1,3] and in West Indies[4]. A nucleus culture of this parasite (originally procured from C.I.B.C., Bangalore) was obtained from the Central Biological Control Station, Bangalore and multiplied by using the eggs of *Corcyra cephalonica* Staint as an alternate host in this laboratory. In the preliminary trials conducted under laboratory conditions, the parasite was observed to readily oviposit in the eggs of *C. cephalonica*. The adults reared from this host were quite normal. Further, for its establishment under field conditions, the freshly emerged adult parasites were released in the cotton field, severely affected by bollworms. Parasites were released in batches and totally 2,637 adults were released from July to September 1977. After the lapse of 8–10 days of each release, young larvae of *E. fabia*, *H. armigera* and *P. gossypiella* were collected at random from the parasite released plots and were reared separately in 3" × 2" plastic containers with a pinhole screw cap. Out of 166 larvae of *Heliothis* sp., 9 larvae of pink bollworms and 50 larvae of spotted bollworms, collected from the field, 4, 1 and 3 adults of *C. blackburni* emerged in the laboratory. The percentage of parasitisation of *H. armigera*, *P. gossypiella* and *E. fabia* was found to be 3·8, 11·1 and 6·0 respectively. It is also reported from Dharwar by Thontadarya and Jairao[6] that *C. blackburni* has accepted spotted bollworm eggs *E. vitella* Stoll as a host under laboratory and field conditions. However, it has been observed from the present investigations that the parasite is capable of parasitising all the three bollworms *viz.*, *H. armigera*, *P. gossypiella* and *E. fabia* in fields. Although a few adult parasites have been recorded from the field collected larvae of *H. armigera* Hubn., *P. gossypiella* Saund and *E. fabia*, the parasite has accepted all the three species of bollworms indicating that this parasite may become promising against cotton bollworms.

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LINEAR MOVEMENT OF GRANULAR INSECTICIDES IN SOIL

SOIL application of granular insecticides in cotton is a common practice principally to tide over the early infestation of sucking insect pests. Though huge amounts of these insecticides are used, the plants actually take only small quantities. It has been emphasized by Getzin and Chapman[1] and Zeki and Reynolds[2] that the uptake of soil insecticides is affected by the soil type and the organic matter in the soil.

Four granular insecticides, *viz.*, aldicarb, carbofuran disulfoton and phorate were tested during 1972–73 for their linear movement in a cotton row, at 1·0 kg,

a.i./hectare. The efficacy of these insecticides was determined on the basis of the population of jassid nymphs per 6 leaves from the plants near about 12·5, 25·0, 37·5 and 50·0 cm within the row of cotton plants, from the site of application. The data were recorded before the application of the insecticides and after 10, 18, 22 and 27 days of application (Table I) and it was evident that the four insecticides travelled up to 50·0 cm on either side of the application within the row, with varying degrees of efficacy. Aldicarb, carbofuran and phorate were found toxic up to the 22nd day of application while disulfoton persisted only up to 18 days.

TABLE I

Population of jassid nymphs (per 6 leaves)

Days after application	Left side				Right side			
	Distance in cm				Distance in cm			
	50·0	37·5	25·0	12·5	12·5	25·0	37·5	50·0
				ALDICARB				
Pretreatment	39	51	x	36	30	x	13	28
10	1	9	x	1	4	x	1	18
18	4	2	"	4	2	x	3	3
22	6	2	x	12	2	x	3	7
27	26	24	x	35	22	x	19	25
				CARBOFURAN				
Pretreatment	38	19	7	11	11	x	23	x
10	14	4	5	1	1	x	0	x
18	6	1	3	0	5	x	5	x
22	0	2	0	1	2	x	5	x
27	6	6	13	7	9	x	10	x
				CONTROL				
Pretreatment	22	22	22	22	22	22	22	22
10	19	19	19	19	19	19	19	19
18	31	31	31	31	31	31	31	31
22	28	28	28	28	28	28	28	28
27	46	46	46	46	46	46	46	46
				DISULFOTON				
Pretreatment	14	x	2	12	18	16	x	20
10	0	x	0	3	1	3	x	6
18	2	x	0	0	1	0	x	1
22	13	x	10	4	6	5	x	4
27	18	x	26	12	15	13	x	18
				PHORATE				
Pretreatment	9	27	x	11	7	x	17	2
10	7	22	x	14	11	x	14	2
18	1	3	x	2	2	x	3	1
22	2	8	x	4	6	x	3	0
27	11	29	x	24	15	x	21	5

x = No plants.
Pretreatment = Jassid population 24 hours before the application of the insecticide.

It could be concluded from these observations that aldicarb and carbofuran could effectively control the sucking insect pests up to 3 plants on either side of their application in the row while disulfoton and phorate were effective up to 1–2 plants only. Therefore, the general practice of basal application of granular insecticides to each cotton plant in the row should be suitably modified, for an economical use of the insecticide.

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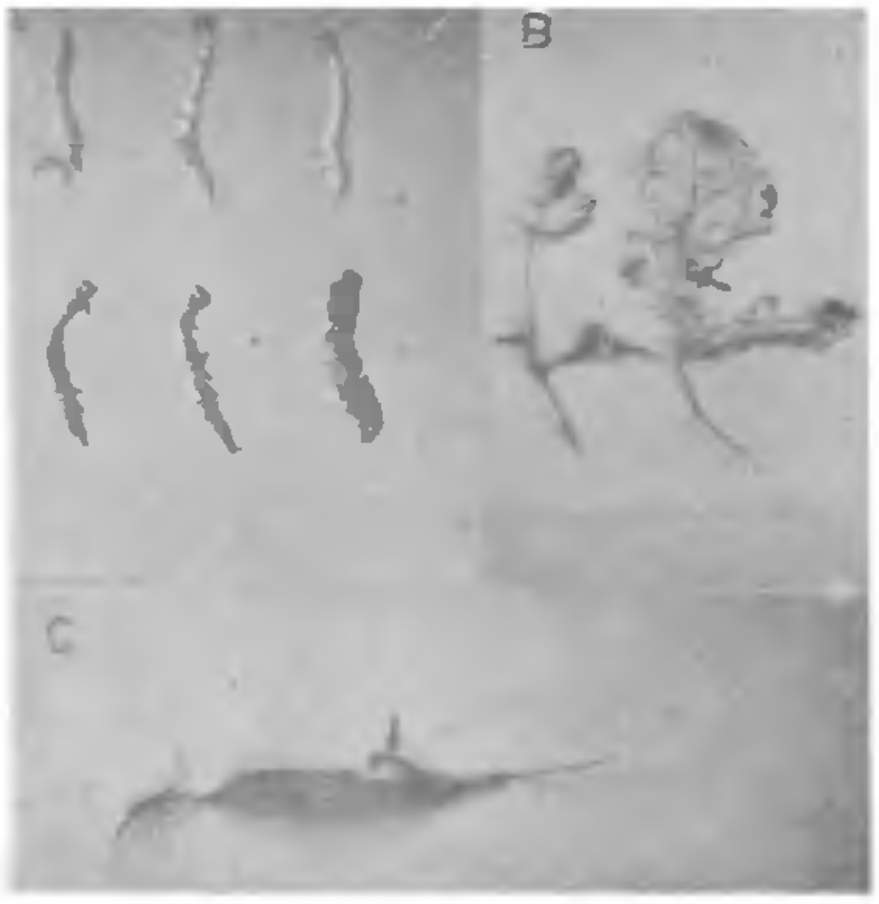
NATURAL OUTBREAK OF THE MUSCARDINE FUNGUS *NOMURAEA RILEYI* (FARLOW) SAMSON ON LEAF-EATING CATERPILLAR, *SPODOPTERA EXIGUA* HB. IN MAHARASHTRA

IN the course of their survey for entomogenous fungi in and around Poona, the authors observed widespread infestation and outbreak of leaf-eating caterpillar (*Spodoptera exigua* Hb.) locally known as "*Lashkari Ali*" inflicting serious damage to the standing crops of Urid (Black gram) and bajra (Pearl millet) during the *Kharif* season (September 1977), following heavy downpour of late rains accompanied by high humidity. The leaves were completely skeletonised by the caterpillars leaving perforations in the lamina and often with only their midribs intact (Fig. 1 B and C).

Examination of the infested crops revealed the natural and wide-spread attack by a greenish fungus over-growing the caterpillars of the pest and still hanging on to the damaged leaves (Fig. 1 B and C), resulting in high degree of mortality of the pest ranging from 80–90%. This was in addition to the damage caused by the insect-pest (*Spodoptera exigua* Hb.) to the standing crops of Urid and Bajra. Such mummified caterpillars were found to be covered with dense, cream-coloured glistening fungus growth, turning greenish at later stages typical of the muscardine fungus (Fig. 1 A). Microscopic examination of the fungus revealed its identity as *Nomuraea rileyi* (Farlow) Samson on the basis of morphological characters[1], The fungus sporulated profusely on the body of the mummified caterpillars in nature, although, as already noted earlier by the authors[2], it was found to be a shy-sporulator in artificial culture (P.D.A.). This fungus thus proved to be a virulent pathogen on the leaf-eating caterpillar *Spodoptera exigua* Hb. in nature, inflicting large scale mortality of the pest



FIGS. 1 A–C. A. Mummified caterpillars of *Spodoptera exigua* covered with growth of *Nomuraea rileyi*. B and C. Naturally infested caterpillars on Urid and Bajra leaves.

This muscardine fungus *Nomuraea rileyi* appears to have a wide host-range particularly among lepidopterous insect-pests, such as: tobacco leaf-eating caterpillar (*Spodoptera litura*)[3], castor semilooper (*Achoea janata* L.), jowar web-worm (*Stenachroia elongella* H.) and now, an additional insect-host, *i.e.*, the leaf-eating caterpillar (*Spodoptera exigua* Hb.) which is a serious pest of cereals and pulses.

The material of the entomogenous fungus has been deposited at the Institute under No. AMH 3700. This constitutes the first known report of the occurrence of this fungus on the leaf-eating caterpillar *Spodoptera exigua* from India[2].

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