Pakistan J. Sci. Ind. Res. Vol. 20, Nos. 4-5, August-October 1977

SIMPLE OVIPOSITION APPARATII AND OVIPOSITION RATE OF *PECTINOPHORA GOSSYPIELLA* (SAUNDERS) EMERGED FROM FIELD COLLECTED LARVAE AND THOSE REARED ON ARTIFICIAL DIETS. LEPIDOPTERA : GELICHIDAE

M. Rafi Shaikh, Khalique Ahmed, Mrs. Feeroza Khalique and Syed Firasat Ali Zaidi,
Department of Physiology, University of Karachi, Karachi-32

(Received July 10, 1976)

Abstract. Detailed description of procedures used in oviposition of *P. gossypiella* (Saunders) during mass rearing is presented. Data presented indicate oviposition results with respect to different number of adults released in cages, total number of eggs per cage, eggs laid by single female, preoviposition period, duration of oviposition experiments, duration of maximum oviposirion period, temperature, and humidity range.

Description and Procedure

Breeding Apparatus: *Oviposition Cage*. A breeding apparatus was taken (Fig. 1) consisting of a metallic part (A) in which water is kept. This metallic part fits into a lamp glass (D). Before fixing the lamp glass a piece of muslin cloth (B) was placed in order to cover metallic water container and this muslin piece was held in place by mounting rubber bands. Three or four unopened cotton bolls (C) placed on the muslin cloth piece covering the water container and the cotton boll twigs after passing through the holes of the muslin cloth were kept dipped in water. The lamp glass was covered at the top with another muslin cloth piece (E) having a 1.5 cm hole (F) in the centre and was held in position by Scotch tape. The hole was used for releasing the adults and could be closed from above by placing the sieve lid in position G. Lamp glass was then fixed on metallic part (Fig. 2). The whole assembly was covered with black paper.

Observations were made by opening the cage after about 24-48 hr. Cotton bolls were taken out and examined; the eggs were found to be deposited mostly on the edges and the inner sides of the calyx, inner and outer sides of the epicalyx as well as on the boll surface. Considerable number of eggs were also deposited on the muslin cloth, especially near the holes made for dipping the cotton boll twigs in water. The adults in all experiments were taken out and individually fed with 10% sucrose solution and again caged with fresh cotton bolls and muslin cloth pieces. The experiments continued until the adults died or became quite inactive. The results of oviposition experiments using this technique are given in the Table 1.

Lamp Glass with Feeding Tube Oviposition Cage. This cage (Fig. 3) comprises a lamp glass (A), 10.2 cm. high, with a 7.9 cm. lower-end dia. and a 6.6 cm. upper-end dia. was made into an oviposition cage holding adults for mating and oviposition. The lamp glass was enclosed on both ends by a nylon net (B) having smaller holes than the size of adults and attaching the net through Scotch tape. A hole (C) (for releasing adults) according to the dia. of the feeding tube was made in the centre of the nylon net at the upper side so that the hole-bearing end of the lamp glass became the top of the cage while the end opposite to it was the bottom. Then the cage bottom was placed on a petri dish (E) (9.5×1.5 cm) containing a 2.5 cm. thick absorbent cotton wool pad (F) so that the cotton wool pad lay in between the nylon net and the petri dish. The cotton wool pad served as the oviposition site.

The feeding tube (D) was an ordinary glass test tube, filled with a 10% sucrose solution. The test tube mouth was closed with a nearly 11.5 cm. long absorbent cotton wool wick, keeping 6.3 cm. if it outside and the rest inside the tube. The wick was tightly inserted into the tube so that no drop of the sucrose solution could drop down into the cage. The feeding tube was then supported by round piece of packing foam, the dia. of which being nearly equal to the upper part of the lamp glass. After releasing the required number of adults, the exposed 6.3 cm. of cotton wool part of the feeding tube was inserted into the cage through the nylon net hole; the rest of the tube was kept outside the cage (Fig. 4). A small round piece of absorbent cotton wool was also placed in between the packing foam and the upper nylon net for providing further oviposition surface. Both oviposition sites were tightly kept in a pressed position against the nylon net by mounting rubber bands vertically (Fig. 4). The whole assembly was wrapped around with black paper for providing darkness.

The oviposition pads were daily checked and replaced with new ones for further oviposition. Feeding tubes was also changed after every 48 hr.

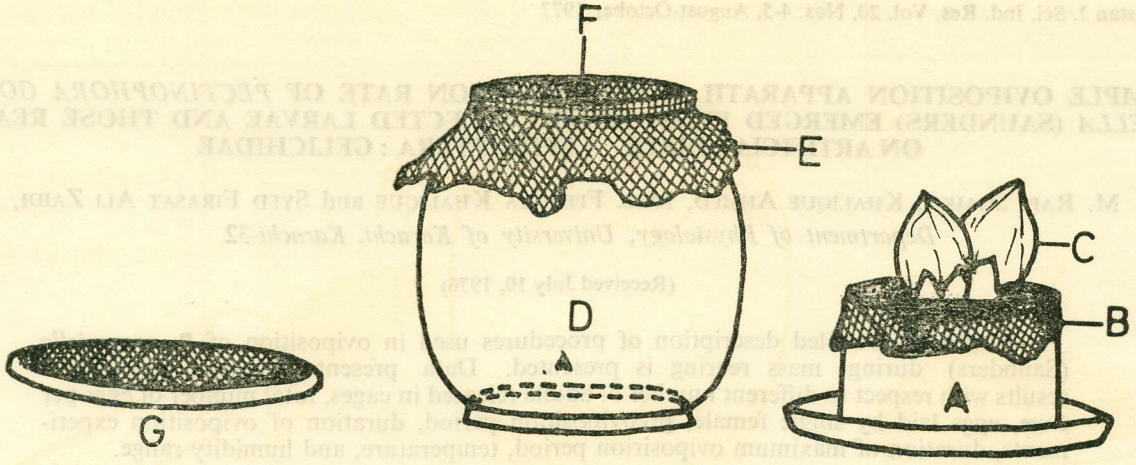

Fig. 1. Parts of the breeding apparatus oviposition cage : (A) metallic part, (B) muslin cloth, (C) unopened cotton bolls, (D) lamp glass, (E) muslin cloth, (F) releasing hole, (G) sieve lid.

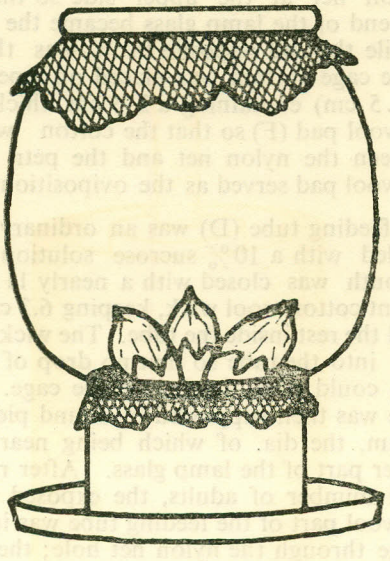

Fig. 2. Assembled breeding apparatus oviposition cage.

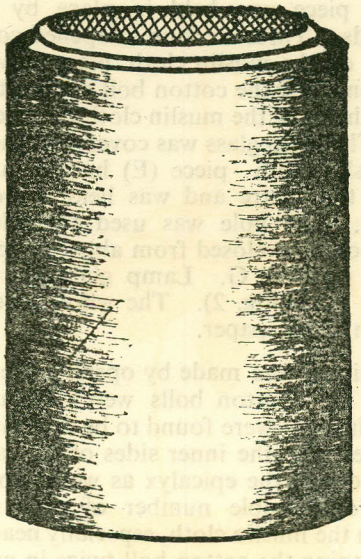

Fig. 3. Oviposition cage wrapped with black paper.

The results of oviposition experiments conducted through this technique are given in Tables 2-5.

Results and Discussion

Oviposition records of the adults arising from the field collected larvae, wheat germ diet and bean containing diet (BCD) (Shaikh *et al.* 1976 in press) reared, have been presented in Tables 1-5.

A comparison of two oviposition techniques with respect to field population adults indicates that the average number of eggs per female using the breeding apparatus oviposition cage is greater than that of the feeding tube cage (Tables 1-2). There is no significant difference in the average preoviposition period, duration of the experiment, duration of the maximum oviposition period, temperature and humidity except that the number of eggs laid by adults of field population during maximum oviposition period through feeding tube cage technique is greater than the eggs obtained by using the breeding apparatus cage technique.

Further comparisons of averages among Tables 2 to 5 (conducted through feeding tube technique)

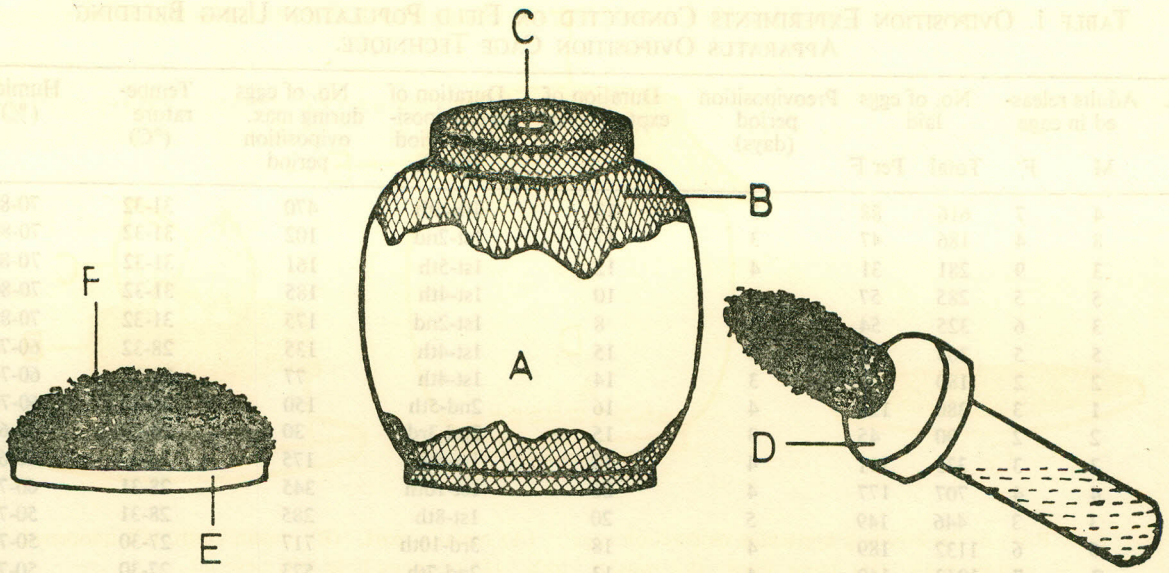

Fig. 4. Parts of the lamp glass with feeding tube oviposition cage: (A) lamp glass, (B) nylon net, (C) nylon net hole, (D) feeding tube, (E) petri dish, (F) cotton wool oviposition pad.

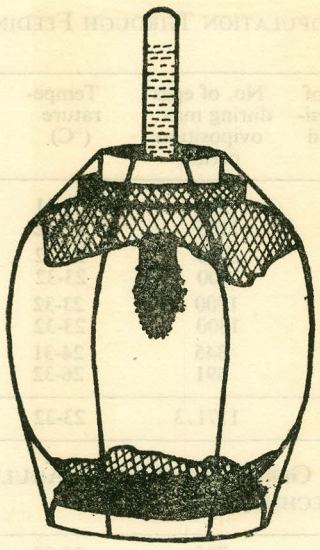

Fig. 5. Assembled feeding tube oviposition cage.

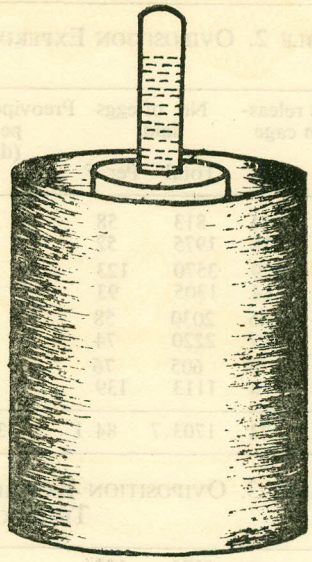

Fig. 6. Cage wrapped with black paper.

show that the adults reared on wheat germ diet produced the greatest number of eggs (103.6), field population adults (84.1), first generation adults of BCD (80.0) and the least number of eggs (54.7) produced by the adults of the second generation of BCD per female. There is no significant difference regarding the preoviposition period, though the duration of experiment varied with the type of adults. The duration of experiments conducted on the field population adults (longest), wheat germ diet reared, first generation adults (BCD) and second-generation adults of BCD (shortest) are 17.2, 17.0, 13.6 and 12.8 days respectively. The duration of maximum oviposition period also differs. The longest duration (2.7 to 9.0 days) was noted in the experiments carried out on the adults reared on wheat germ diet (1.1 to 6.8 days) in experiments done on field population adults (1.8 to 4.5 days), in experiments performed on the first-

TABLE 1. OVIPOSITION EXPERIMENTS CONDUCTED ON FIELD POPULATION USING BREEDING APPARATUS OVIPOSITION CAGE TECHNIQUE.

S. No.	Adults released in cage		No. of eggs laid		Preoviposition period (days)	Duration of expt. (days)	Duration of max. oviposition period (days)	No. of eggs during max. oviposition period	Temperature (°C)	Humidity (%)
	M	F	Total	Per F						
1	4	7	616	88	3	13	4th-6th	470	31-32	70-80
2	8	4	186	47	3	11	1st-2nd	102	31-32	70-80
3	3	9	281	31	4	12	1st-5th	161	31-32	70-80
4	5	5	285	57	3	10	1st-4th	185	31-32	70-80
5	3	6	325	54	3	8	1st-2nd	175	31-32	70-80
6	5	5	303	60	3	15	1st-4th	135	28-32	60-70
7	2	2	180	90	3	14	1st-4th	77	28-32	60-70
8	1	3	380	126	4	16	2nd-5th	150	28-32	60-70
9	2	2	90	45	3	15	2nd-3rd	30	24-29	40-60
10	3	3	333	111	4	18	1st-5th	175	24-29	40-60
11	4	4	707	177	4	26	1st-10th	345	28-31	60-70
12	3	3	446	149	5	20	1st-8th	285	28-31	50-70
13	6	6	1132	189	4	18	3rd-10th	717	27-30	50-70
14	3	7	1043	149	4	13	2nd-7th	523	27-30	50-70
15	7	8	1071	134	3	24	1st-9th	556	27-30	50-70
16	13	12	1345	112	5	27	12th-17th	800	26-30	50-70
17	8	5	595	119	6	18	2nd-6th	410	26-31	50-70
18	10	12	281	24	4	16	6th-8th	135	24-30	50-70
19	9	13	1196	92	3	18	2nd-8th	873	25-31	50-70
Average	5	6	508.1	97.6	3.7	16.4	2.1-6.1	331.3	24-32	40-80

TABLE 2. OVIPOSITION EXPERIMENTS CONDUCTED ON FIELD POPULATION THROUGH FEEDING TUBE CAGE TECHNIQUE.

S. No.	Adults released in cage		No. of eggs laid		Preoviposition period (days)	Duration of expt. (days)	Duration of max. oviposition period (days)	No. of eggs during max. oviposition period	Temperature (°C)	Humidity (%)
	M	F	Total	Per F						
1	14	14	813	58	3	17	1st-9th	520	25-31	50-70
2	29	38	1975	52	4	16	2nd-8th	1185	23-32	40-60
3	27	29	3570	123	3	23	1st-9th	2730	23-32	40-60
4	23	14	1305	93	4	19	1st-6th	900	23-32	40-60
5	29	35	2030	58	3	13	1st-6th	1700	23-32	40-60
6	30	27	2220	74	3	18	1st-4th	1300	23-32	40-60
7	11	8	605	76	4	11	1st-4th	345	24-31	40-60
8	8	8	1113	139	2	21	1st-9th	691	26-32	40-60
Average	21	22	1703.7	84.1	3.2	17.2	1.1-6.8	1171.3	23-32	40-70

TABLE 3. OVIPOSITION EXPERIMENTS PERFORMED ON WHEAT GERM DIET REARED ADULTS THROUGH CAGE WITH FEEDING TUBE TECHNIQUE.

1	5	9	1175	130	4	16	4th-9th	795	23-32	40-60
2	17	14	1950	139	3	22	1st-6th	1050	23-32	40-60
3	5	6	575	96	3	10	1st-5th	325	23-32	40-60
4	11	10	810	81	2	16	3rd-6th	570	24-31	40-60
5	5	6	804	134	3	11	3rd-5th	600	26-31	40-60
6	4	6	587	98	4	23	1st-5th	281	26-33	40-60
7	9	9	403	45	3	16	1st-3rd	258	24-32	40-60
8	3	8	819	102	3	24	3rd-13th	675	25-32	40-60
9	11	8	755	94	3	16	2nd-8th	567	26-31	40-60
10	7	5	438	88	3	18	2nd-4th	275	26-32	40-60
11	5	8	1060	133	3	16	1st-8th	995	26-32	40-70
Average	7	8	852.3	103.6	3.0	17.0	2.7-9.0	581.0	23-33	40-70

TABLE 4. OVIPOSITION EXPERIMENTS CARRIED OUT ON FIRST GENERATION ADULTS REARED ON BCD USING FEEDING TUBE CAGE.

S. No.	Adults released in cage		No. of eggs laid		Preoviposition period (days)	Duration of expt. (days)	Duration of max. oviposition period (days)	No. of eggs during max. oviposition period	Temperature (°C)	Humidity (%)
	M	F	Total	Per F						
1	6	4	278	69	3	11	2nd-5-th	207	27-36	40-60
2	7	7	496	71	3	12	1st-4th	342	27-36	40-60
3	8	8	242	30	3	10	1st-3rd	123	27-36	40-60
4	10	10	831	83	4	16	1st-4th	470	27-32	40-60
5	10	10	683	68	4	14	3rd-6th	484	27-32	40-60
6	10	10	1689	169	3	17	1st-4th	943	27-32	40-60
7	10	10	1348	135	3	14	3rd-6th	742	27-53	40-60
8	10	10	777	78	3	13	2nd-3rd	567	27-35	40-60
9	10	10	920	92	3	14	3rd-8th	650	27-35	40-60
10	15	15	1990	133	3	15	1st-4th	1010	28-35	40-60
11	15	15	700	47	4	7	1st-3rd	534	28-35	40-60
12	15	15	1130	75	2	9	1st-2nd	630	29-35	40-60
13	16	19	1565	82	3	17	3rd-6th	1035	29-35	40-60
14	10	20	896	45	2	15	3rd-6th	650	29-34	40-60
15	20	20	1030	52	3	13	2nd-4th	695	29-34	40-75
16	14	14	930	58	2	10	3rd-6th	750	29-34	40-75
17	5	11	926	84	3	18	2nd-5th	616	29-35	40-75
18	9	14	1131	81	4	19	1st-3rd	625	29-35	40-75
19	12	12	825	69	3	14	1st-4th	520	30-35	40-75
Average	11	12	967.7	80.0	3.2	13.6	1.8-4.5	610.7	27-36	40-75

TABLE 5. OVIPOSITION EXPERIMENTS CARRIED OUT ON 2ND GENERATION ADULTS REARED ON BCD USING FEEDING TUBE CAGE TECHNIQUE.

1	7	8	380	48	3	18	1st-6th	260	29-35	40-75
2	24	24	1168	50	2	13	1st-4th	765	31-35	50-80
3	10	10	593	59	3	14	2nd-5th	330	30-35	50-80
4	30	24	952	40	4	14	1st-5th	664	30-35	50-80
5	26	30	1893	63	4	13	1st-5th	1320	31-35	60-90
6	23	23	2112	92	2	15	1st-5th	1537	31-34	60-90
7	10	8	329	41	3	8	1st-2nd	186	31-34	65-90
8	10	10	454	45	2	8	1st-4th	234	31-34	65-90
Average	17	17	985.1	54.7	2.8	12.8	1.1-4.5	662.0	31-35	40-90

generation adults of BCD and (1.1 to 4.5 days), the shortest duration was observed in the experiments carried out on the second generation adults of BCD.

There appeared a relationship between the duration of experiments and the number of eggs. The minimum number of eggs were produced by the adults of second-generation BCD having the minimum duration of experiment.

The average temperature and humidity of the experiments carried out on field population adults and wheat germ diet reared adults were approximately the same (Tables 2-3), while the temperature and humidity of the first and second generation BCD reared adults experiments varied from 27-36° and 40-70% and 31-35° and 40-90% (Tables 4 and 5 respectively).

Further comparison among Tables 3 to 5 with respect to average egg production per female, duration of the experiment, and duration of the maximum oviposition period and temperature range reveals that the egg production, duration of the experiment and the duration of maximum oviposition period decreased as the temperature increased.

Acknowledgment. This research has been financed in part by Grant (No. Fg-Pa-206, Project No. PK-ARS-11) made by the US Department of Agriculture, Agriculture Research Service under PL-480.

References

1. K. Dang, M. Anand and M. G. Jotwani, Indian J. Entomol., **32 2**), 130-133 (1970).
2. P. L. Adkisson, J. Econ. Entomol., **54 (4)**, 1224-1227 (1961).
3. M. Ahmed and R. Perveen, Proc. Entomol. Soc. Karachi, **2,** 47-50 (1972).
4. R. Patana, Agr. Res. Service., US Dept. Agr., pp. 1-5 (1969).
5. P. L. Adkisson, E. S. Vanderzant, D. L. Bull, and W. E. Allison, J. Econ. Entomol. **53,** 759-762 (1960).
6. C. M. Ignoffo, J. Invertebrate Pathol., **7(2),** 217-226 (1965).
7. C. A. Richmond, and C. Ignoffo, J. Econ. Entomol, **57(4),** 503-505 (1964).
8. B. Greenberg, Boll. Entomol. Soc. Amer., **16,** 31-36 (1970).
9. M. R. Shaikh, K. Ahmed and Mrs. F. Khalique, Pakistan J. Sci. Ind. Res. (In press).