RESULTS

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A- The effect of chronic irradiation on the biology of the house fly, *M. domestica* L., through successive generations:

It is pointed out, that this experiment was carried out to explain the effects of chronic irradiation on the biological characters. The main aim of the work is to study the possibility of developing radioresistance in *M. domestica* L. populations which are successively irradiated in ancestral generations.

The irradiated subgroups left till emergence, the number of emerging adults and sex ratio were recorded. Daily mortality of both sexes was recorded, also number of laid eggs and egg hatchability were taken.

1- Adult emergence and sex ratio:

The effect of chronic exposure of gamma radiation on the adult emergence and sex ratio of both males and females *M. domestica* L. (irradiated as pupae in ancestral manner) was tested. The results obtained were tabulated in table (1) as well as graphically illustrated in figs. (1 and 2).

Results obtained as represented in this table indicate the following:

Table (1-a): Average adult emergence and sex ratio of *Musca domestica* L. successively irradiated in ancestral generation with substerilizing doses 0 and 700 rad in each generation. (* S.D.= standard deviation, **♂= male, ***♀= female).

Gerneration number	F_1	F_3	F_5	F_8	F_{11}	F_{14}
Control ± S.D.						
No. of pupae	200	213	190	187	233	205
No. of Adults	157	163	151	143	185	167
% of Adults	78.5± 2.5	76.53± 0.694	79.47± 1.528	76.48± 0.3606	79.4± 0.3606	81.46± 0.751
% of Males	50.35± 1.893	47.03± 2.7523	48.33± 0.577	38.23± 0.5774	40.6± 0.1155	40.77± 0.6807
% of Females	28.15± 1.5275	29.5± 2.3094	31.44± 2.0817	38.25± 1.5044	38.8± 0.2082	40.69± 0.2517
Sex ratio **♂: *** ♀	1:0.559	1:0.627	1:0.644	1:1	1:0.0956	1:0.998
700 r ± S.D.						
No. of pupae	190	213	228	207	219	193
No of Adults emerged	135	148	147	104	102	78
% of Adults emerged	71.05± 1.000	69.48± 1.1247	64.47± 1.5275	50.24± 1.81173	46.57± 0.7211	40.4± 0.9539
% of Males	39.85± 4.464	41.89± 2.7141	36.83± 2.0817	24.87± 1.047	23.2± 0.1732	19.87± 0.5859
% of Females	31.2± 3.173	27.59± 3.1273	27.69± 2.363	25.39± 1.0817	23.37± 0.6032	20.54± 0.5773
Sex ratio ** ♂: *** ♀	1:0.783	1:0.659	1:0.752	1:1.02	1:1.01	1:1.03

Table (1-b): Average adult emergence and sex ratio of *Musca domestica* L. successively irradiated in ancestral generation with substerilizing doses 900 and 1100 rad in each generation. (* S.D.= standard deviation, **♂= male, ***♀= female).

Gerneration number	F_1	F_3	F_5	F_8	F_{11}	F_{14}
900 r ± S.D.						
No. of pupae	202	228	220	197	224	235
No of Adults emerged	111	119	110	70	64	52
% of Adults emerged	54.95± 2.0817	52.19± 1.736	50.0± 1.2588	35.5± 2.7471	28.13± 0.30	22.13± 1.6703
% of Males	27.8± 2.754	31.0± 1.826	28.0± 1.641	18.1± 1.6523	13.9± 0.421	11.83± 0.7636
% of Females	27.15± 0.8660	21.19± 1.2645	22.0± 0.500	17.4± 0.4107	14.23± 0.2217	10.3± 0.9074
Sex ratio ** ♂: *** ♀	1:0.975	1:0.684	1:0.786	1:0.9613	1:1.024	1:0.871
1100 r ± S.D.						
No. of pupae	214	207	206	217	201	212
No of Adults emerged	104	95	83	58	--	--
% of Adults emerged	48.6± 3.4035	45.89± 1.768	40.29± 1.2583	26.73± 0.7932	-- --	-- --
% of Males	31.0± 1.50	45.89± 0.2637	24.5± 1.803	13.33± 0.5774	-- --	-- --
% of Females	17.60± 2.517	24.95± 1.5358	15.79± 3.056	13.40± 0.2517	-- --	-- --
Sex ratio ** ♂: *** ♀	1:0.0568	1.0.839	1:0.644	1:1.01	--	--

Table (1-c): Average adult emergence and sex ratio of *Musca domestica* L. successively irradiated in ancestral generation with substerilizing doses 1100 and 1300 rad in each generation. (* S.D.= standard deviation, **♂= male, ***♀= female).

Gerneration number	F_1	F_3	F_5	F_8	F_{11}	F_{14}
1300 r ± S.D.						
No. of pupae	218	207	209	215	--	--
No of Adults emerged	93	85	48	--	--	--
% of Adults emerged	42.66± 3.8188	41.06± 0.7255	22.49± 0.7636	-- --	-- --	-- --
% of Males	22.0± 1.323	24.21± 1.4823	14.7± 0.764	-- --	-- --	-- --
% of Females	20.66± 1.55	16.85± 2.1967	7.8± 1.00	-- --	-- --	-- --
Sex ratio ** ♂: *** ♀	1:0.939	1:0.696	1:0.531	--	--	--

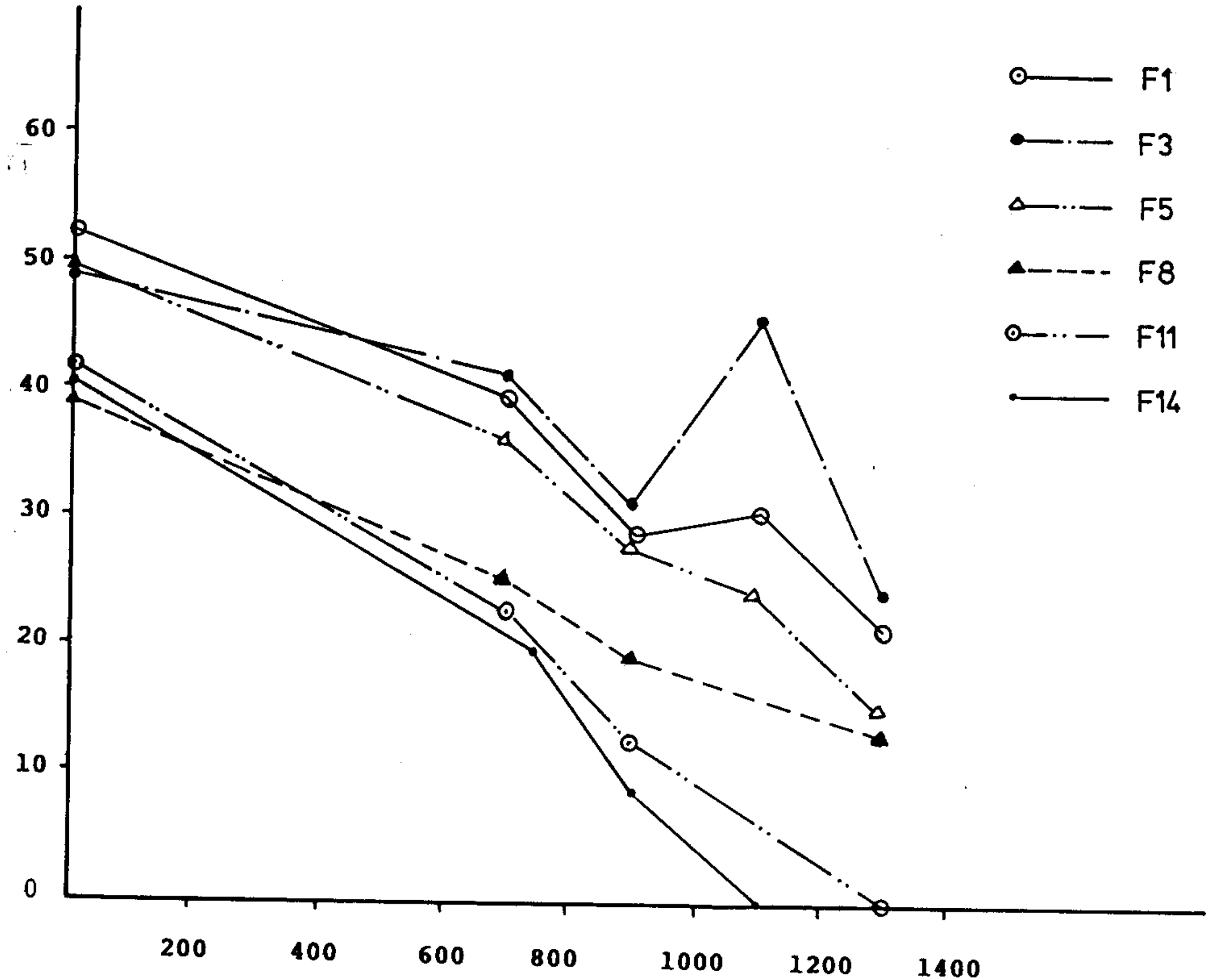

Fig (1): *Effects of chronic irradiation on percentage emergence of __Musca__ __domestica__ L. males sequentially irradiated in ancestor generations.*

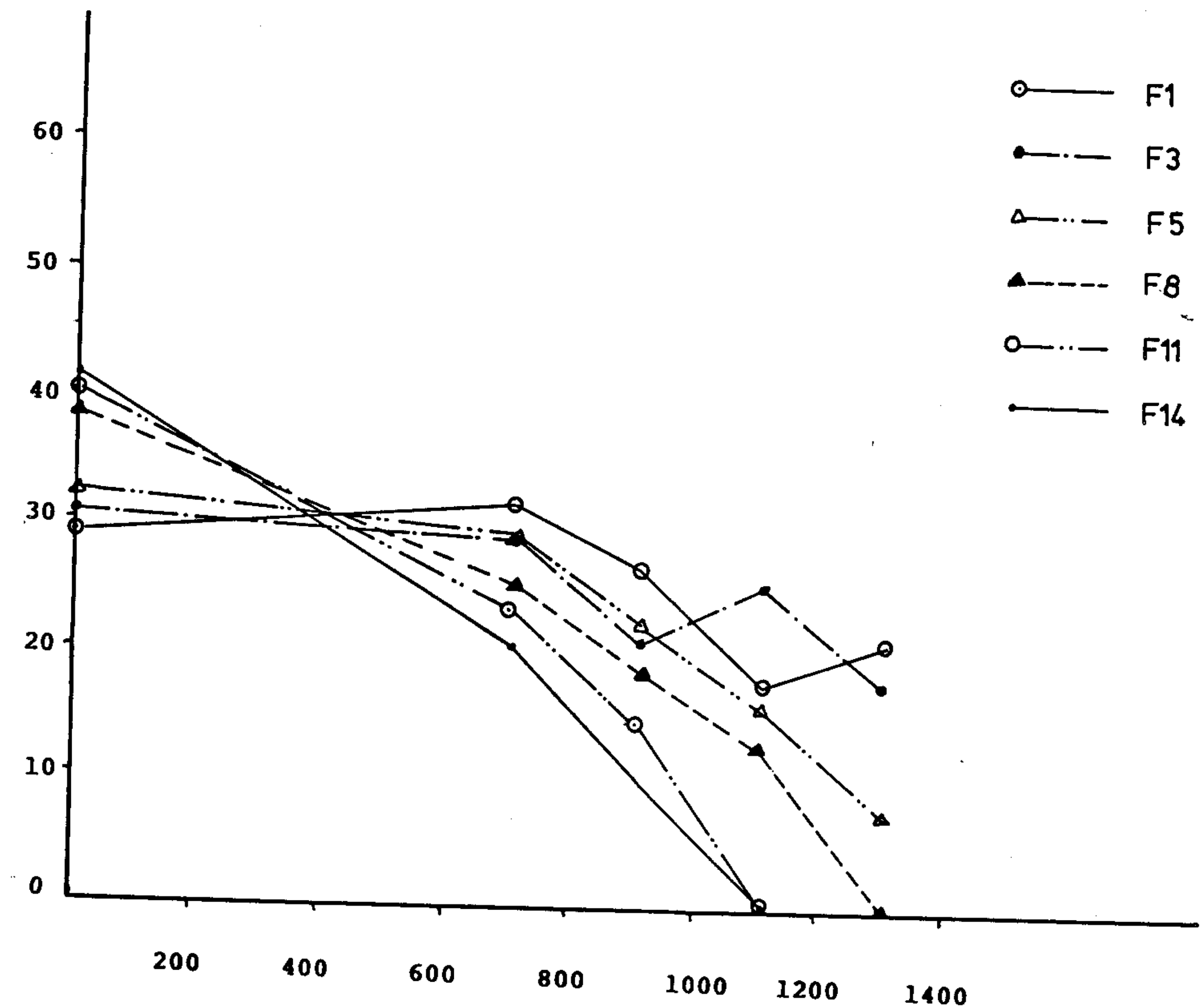

Fig (2): Effects of chronic irradiation on percentage emergence of Musca domestica L. females sequentially irradiated in ancestor generations.

a- Emergence of adult flies was adversely affected at all tested doses through successive generations.

b- The sex ratio was unaffected with increasing the dose level through successive generations.

Population recieved 900 rad showed significant decrease in percent adult emergence than their corresponding check group ($P<0.01$, 0.02 , 0.05). While populations recieved 1100 and 1300 rad showed irrigular significant decrease in adult emergence than their corresponding check group ($P<0.01$, 0.02 , 0.05).

The results tabulated in table (1) show that F_7 female adults emerged from pupae treated with 1100 rad did not lay any eggs and F_{10} female adults emerged from 900 rad population also did not lay any eggs.

The sex ratio was unaffected with increasing the dose level through successive generations.

2- Adult longevity:

Results in table (2) and (figs. 3 and 4) indicate the effect of chronic irradiation on the longevity of both sexes of M. domestica L. sequentially irradiated in ancestral generations. Tables (3, 4, 5, 6, 7, 8) Figs. 5 to 16 represent the effect of chronic exposure of gamma radiation on the percentage survival rate.

Table (2): Average life span of *Musca domestica* L. adults successively irradiated in ancestral generations with substerilizing doses 700, 900, 1100 and 1300 (r) in each generation (in days).

Generation Number	Sex	Control	Doses - Rads			
			700	900	1100	1300
		Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
F_1	Male	23.83 ± 0.60011	26.36 ± 0.2902	25.23 ± 0.6961	29.35 ± 0.5979	28.85 ± 0.5402
	Female	24.98 ± 0.49100	28.79 ± 0.3955	27.38 ± 0.6070	26.19 ± 0.7833	26.25 ± 0.8185
F_3	Male	24.60 ± 0.5291	25.30 ± 0.6083	26.05 ± 0.6144	24.70 ± 0.7810	23.22 ± 1.2186
	Female	25.30 ± 0.6033	25.90 ± 0.5196	26.80 ± 0.5000	24.80 ± 0.8185	25.30 ± 0.4243
F_5	Male	23.70 ± 1.3077	25.30 ± 0.4583	26.90 ± 1.2166	22.80 ± 1.480	20.10 ± 0.3606
	Female	26.30 ± 1.2490	27.11 ± 1.5605	27.82 ± 0.4657	23.16 ± 0.7024	22.11 ± 0.2646
F_8	Male	23.60 ± 0.6557	28.50 ± 0.3606	15.20 ± 0.6245	8.50 ± 0.1732	0.0
	Female	25.30 ± 0.7211	26.90 ± 0.755	16.40 ± 0.4580	9.10 ± 0.6557	0.0
F_{11}	Male	23.17 ± 0.3055	16.33 ± 0.5774	14.03 ± 0.9018	0.0	0.0
	Female	24.90 ± 0.4583	21.60 ± 0.4592	15.00 ± 1.6371	0.0	0.0
F_{14}	Male	23.60 ± 0.5568	16.03 ± 0.5033	13.30 ± 0.9166	0.0	0.0
	Female	24.53 ± 0.4923	16.90 ± 0.3464	13.17 ± 0.3055	0.0	0.0

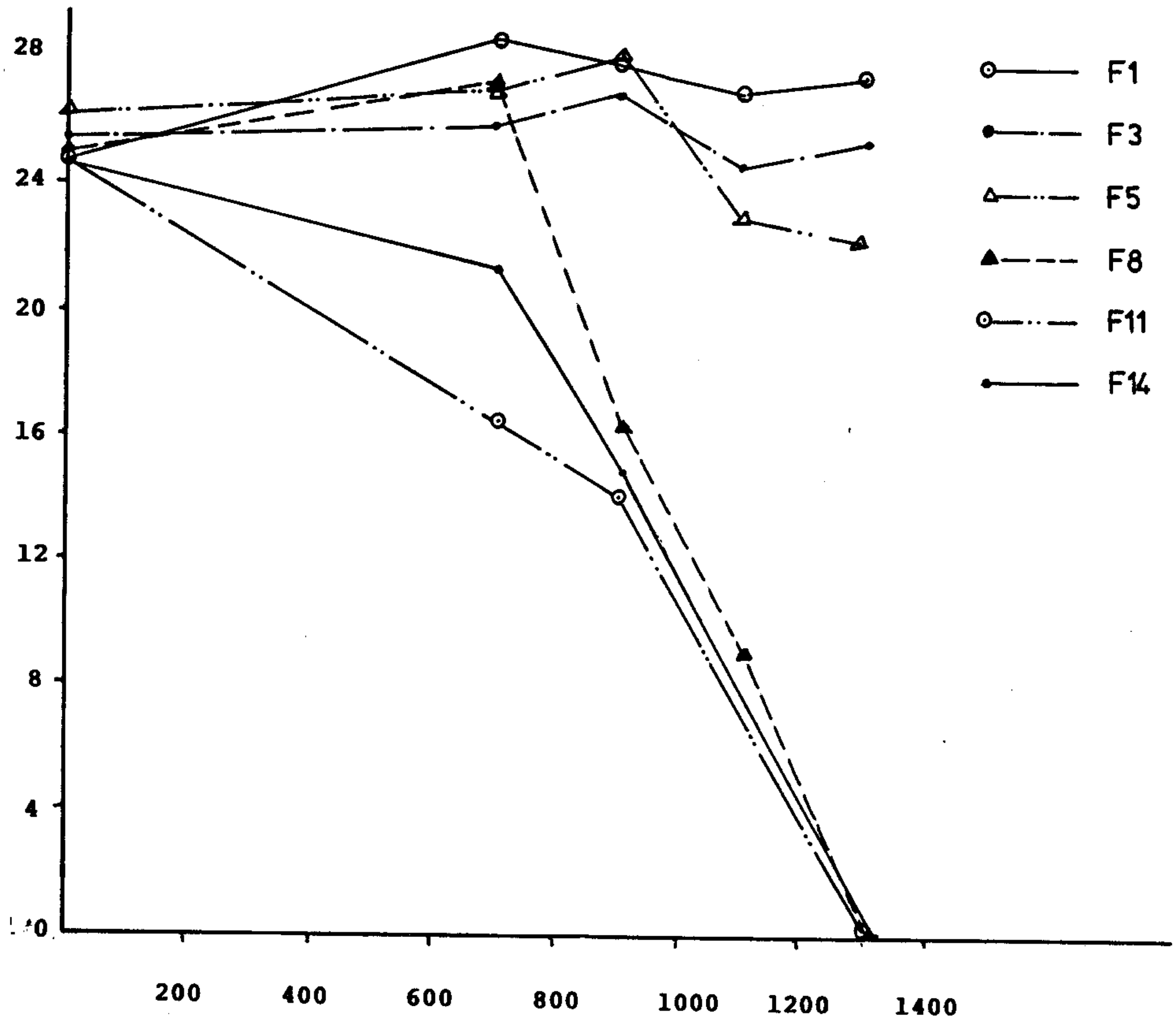

Fig (3): Effects of chronic irradiation on longevity of *Musca domestica* L. females sequentially irradiated in ancestor generations

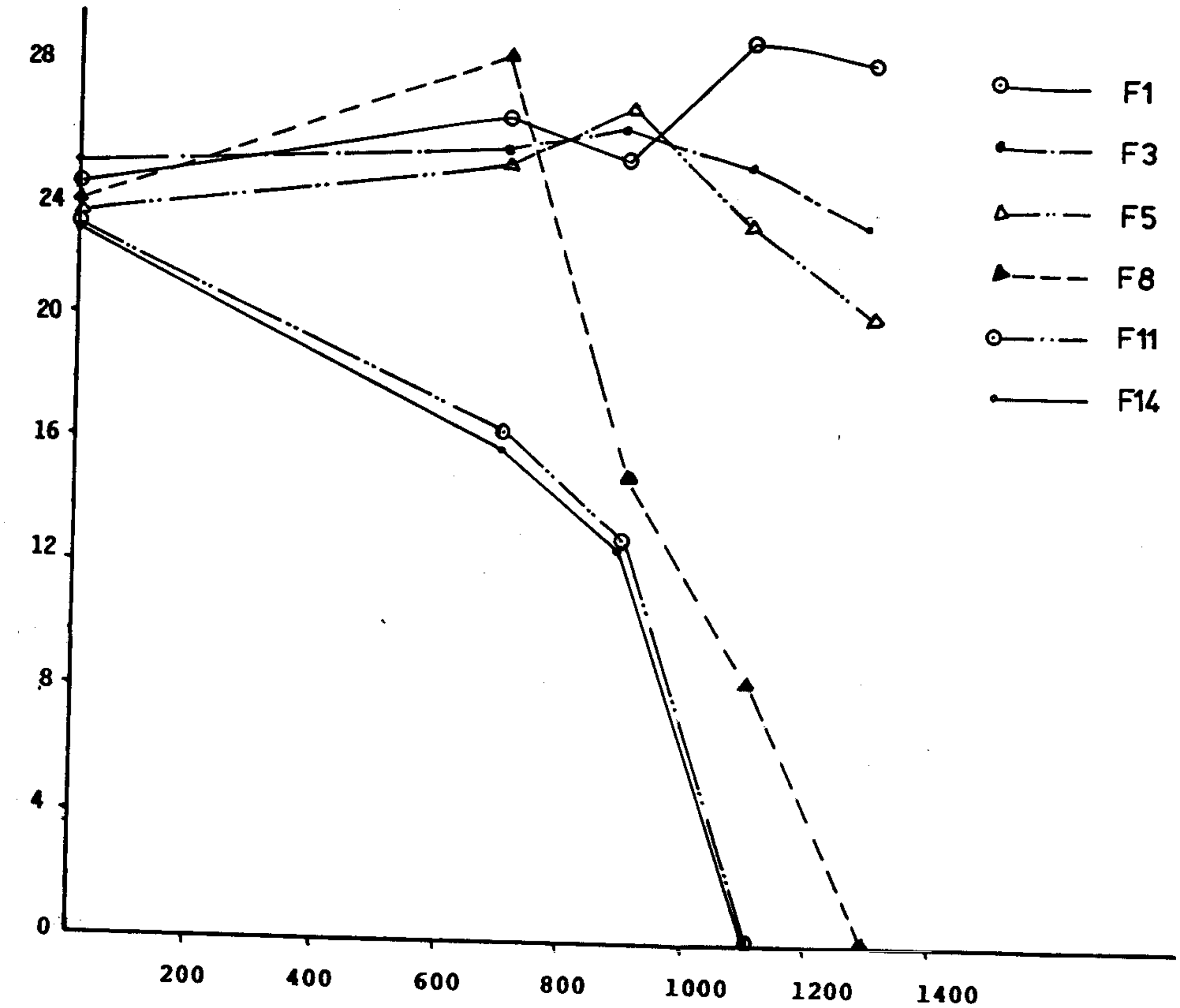

Fig (4): Effects of chronic irradiation on longevity of _Musca domestica_ L. males sequentially irradiated in ancestor generations.

Table (3): Average percentage of survival rates of *Musca domestica* L. adults produced from successively irradiated pupae in the first generation with substerilizing doses of 700, 900, 1100 and 1300 rad in each generation.

Days after emergence	Sex	Doses-Rads				
		Control	700	900	1100	1300
		Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
17	Male	100.0 ± 0.0000	100.0 ± 0.0000	92.0 ± 0.1561	75.2 ± 0.6570	84.1 ± 0.230
	Female	95.0 ± 0.6210	95.0 ± 1.2300	92.3 ± 0.7310	88.3 ± 1.2530	88.0 ± 0.000
18	Male	100.0 ± 0.0000	88.0 ± 1.0200	78.2 ± 0.5634	70.0 ± 0.5310	68.3 ± 0.157
	Female	90.0 ± 0.5300	78.1 ± 1.3100	87.2 ± 0.9725	81.2 ± 1.3720	82.1 ± 0.000
19	Male	100.0 ± 0.0000	65.4 ± 0.3030	62.3 ± 1.2631	65.8 ± 1.2670	55.1 ± 0.153
	Female	77.5 ± 1.5300	65.1 ± 0.1560	65.1 ± 0.9754	51.9 ± 0.1034	52.4 ± 0.000
20	Male	100.0 ± 0.0000	58.1 ± 0.1150	56.3 ± 1.5700	47.2 ± 0.5173	35.4 ± 1.620
	Female	63.4 ± 0.3210	60.5 ± 0.1300	42.2 ± 0.8764	48.2 ± 0.4721	48.5 ± 0.000
21	Male	92.4 ± 1.2320	47.5 ± 0.2360	48.2 ± 0.2100	25.7 ± 0.5620	22.1 ± 1.324
	Female	37.1 ± 0.3160	32.5 ± 1.5600	36.7 ± 1.0000	21.4 ± 0.1532	22.5 ± 0.000
22	Male	86.6 ± 0.0050	37.5 ± 0.5621	32.1 ± 0.0000	27.3 ± 0.3450	0.0 ± 0.000
	Female	36.0 ± 0.9530	18.3 ± 0.0000	22.1 ± 0.6573	0.0	0.0
23	Male	70.3 ± 0.0201	18.3 ± 0.6210	29.8 ± 1.5000	0.0	0.0
	Female	0.0	15.3 ± 1.5600	15.0 ± 0.2172	0.0	0.0
24	Male	59.2 ± 0.0000	18.3 ± 0.2610	29.0 ± 0.5000	0.0	0.0
	Female	0.0	0.0	0.0	0.0	0.0

Table (4): Average percentage of survival rates of _Musca domestica_ L. adults produced from successively irradiated pupae for three generation with substerilizing doses of 0, 700, 900, 1100 and 1300 rad.

Days after emergence	Sex	Doses-Rads				
		Control	700	900	1100	1300
		Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
14	Male	92.1 ± 0.5673	75.1 ± 0.563	68.2 ± 0.5710	72.0 ± 1.5720	62.1 ± 0.3100
	Female	100.0 ± 0.0000	92.5 ± 0.156	73.2 ± 0.7630	72.5 ± 0.2760	65.1 ± 2.1530
16	Male	88.0 ± 1.2430	65.0 ± 0.727	56.8 ± 1.2302	62.5 ± 0.3740	51.1 ± 0.5160
	Female	90.0 ± 1.2300	85.1 ± 2.345	67.1 ± 0.5620	66.0 ± 0.3456	60.0 ± 1.3720
18	Male	84.3 ± 0.2570	62.1 ± 0.153	55.0 ± 1.2720	54.1 ± 0.9860	42.3 ± 1.6531
	Female	88.1 ± 0.9720	70.0 ± 1.273	62.5 ± 0.2130	61.1 ± 1.3570	52.0 ± 0.1560
20	Male	74.5 ± 0.4210	57.5 ± 1.241	50.2 ± 0.2574	45.1 ± 0.7812	40.1 ± 0.2670
	Female	84.3 ± 1.5670	65.1 ± 0.572	55.0 ± 1.3520	52.0 ± 1.5630	42.1 ± 1.5670
22	Male	58.0 ± 1.3150	52.3 ± 0.562	38.1 ± 1.5732	35.1 ± 0.6531	32.5 ± 1.5320
	Female	80.0 ± 0.2350	61.5 ± 1.362	54.0 ± 1.7560	45.0 ± 0.2172	40.3 ± 0.5370
24	Male	47.5 ± 2.5700	41.2 ± 1.572	20.0 ± 0.5714	20.1 ± 0.4231	35.0 ± 0.2710
	Female	71.2 ± 1.5630	57.8 ± 1.347	50.2 ± 1.4621	35.0 ± 1.3721	34.0 ± 1.2730
26	Male	46.0 ± 1.5630	32.1 ± 0.351	16.1 ± 0.2372	10.1 ± 0.5631	15.5 ± 0.5145
	Female	65.0 ± 1.3510	52.1 ± 0.561	40.0 ± 1.5631	31.0 ± 1.5321	25.0 ± 0.2760
28	Male	37.5 ± 0.2731	19.0 ± 0.172	0.0 ± 0.2571	8.2 ± 0.2172	5.0 ± 1.2731
	Female	45.0 ± 0.2730	41.1 ± 0.789	31.0 ± 0.2150	10.0 ± 1.5720	15.0 ± 1.3574

Table (5): Average percentage of survival rates of *Musca domestica* L. adults produced from successively irradiated pupae for five generation with substerilizing doses of 0, 700, 900, 1100 and 1300 rad.

Days after emergence	Sex	Doses-Rads				
		Control	700	900	1100	1300
		Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
17	Male	98.0 ± 0.3120	95.0 ± 1.563	91.1 ± 0.1560	84.2 ± 1.3520	80.2 ± 1.5720
	Female	98.1 ± 0.1560	98.0 ± 0.470	95.0 ± 1.3470	89.0 ± 0.4710	86.0 ± 1.4720
18	Male	97.1 ± 0.2172	92.0 ± 0.210	86.2 ± 1.5600	77.1 ± 0.2530	74.4 ± 0.5630
	Female	97.0 ± 1.3560	97.0 ± 0.250	92.0 ± 0.1710	85.0 ± 1.2720	85.0 ± 1.3420
19	Male	92.5 ± 0.6740	87.1 ± 0.245	77.1 ± 0.1570	68.5 ± 0.5710	60.6 ± 0.9720
	Female	92.0 ± 0.5530	85.0 ± 0.572	86.0 ± 1.3570	82.0 ± 0.3210	64.0 ± 0.8910
20	Male	95.5 ± 0.1769	64.2 ± 0.675	65.3 ± 0.5720	51.6 ± 1.2570	45.3 ± 0.1563
	Female	84.0 ± 0.2572	77.0 ± 0.272	75.0 ± 0.2730	80.0 ± 0.4320	53.2 ± 0.6721
21	Male	65.3 ± 0.3570	48.1 ± 0.253	55.5 ± 0.2371	45.1 ± 0.9780	37.0 ± 0.3521
	Female	65.0 ± 0.1620	69.0 ± 0.152	70.0 ± 1.3210	65.2 ± 1.0760	42.0 ± 0.2193
22	Male	58.2 ± 0.2530	40.5 ± 1.572	45.3 ± 0.3452	31.2 ± 0.0371	30.8 ± 0.7821
	Female	56.0 ± 1.4772	50.0 ± 1.347	55.0 ± 1.4721	45.3 ± 1.6231	33.0 ± 0.3541
23	Male	48.1 ± 1.5310	20.5 ± 1.560	40.0 ± 0.5721	30.4 ± 0.5341	0.0
	Female	41.0 ± 1.5610	0.0	45.0 ± 1.4321	32.1 ± 0.2141	31.0 ± 0.1721
24	Male	30.0 ± 0.2740	12.0 ± 1.374	20.0 ± 0.3511	0.0 ± 0.2431	0.0
	Female	29.5 ± 0.1530	0.0	40.0 ± 0.2141	31.1 ± 0.3156	30.0 ± 1.2730

Table (6): Average percentage of survival rates of _Musca domestica_ L. adults produced from successively irradiated pupae for eight generation with substerilizing doses of 0, 700, 900 and 1100 rad.

Days after emergence	Sex	Doses-Rads			
		Control	700	900	1100
		Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
17	Male	99.0 ± 0.5630	84.0 ± 1.2730	80.0 ± 1.5620	65.0 ± 0.7210
	Female	95.2 ± 1.2710	78.0 ± 1.5610	70.0 ± 0.2750	72.0 ± 0.3540
18	Male	97.3 ± 2.5710	82.0 ± 0.7890	75.0 ± 0.9831	53.0 ± 1.5621
	Female	94.1 ± 1.5310	75.0 ± 0.5310	65.0 ± 1.5670	68.0 ± 0.7213
19	Male	75.0 ± 0.9780	75.0 ± 1.0720	61.0 ± 0.2740	48.0 ± 0.3471
	Female	79.6 ± 0.4321	72.0 ± 0.2510	62.0 ± 1.5340	65.0 ± 0.1562
20	Male	42.5 ± 1.5631	65.0 ± 1.6710	22.0 ± 0.2563	38.0 ± 0.2571
	Female	57.1 ± 0.2531	58.0 ± 0.5630	54.0 ± 0.1721	61.0 ± 0.4721
21	Male	22.0 ± 1.2721	35.0 ± 0.1561	20.0 ± 1.3521	25.0 ± 0.3217
	Female	17.0 ± 0.5310	45.0 ± 0.3723	45.0 ± 1.2560	32.0 ± 0.4721
22	Male	10.2 ± 0.5620	30.0 ± 0.1532	20.0 ± 0.3472	20.0 ± 0.1562
	Female	0.0	23.0 ± 0.1721	32.0 ± 0.2572	22.0 ± 0.1362
23	Male	0.0	20.0 ± 0.5621	0.0	0.0
	Female	0.0	0.0	12.0 ± 0.7320	0.0
24	Male	0.0	0.0	0.0	0.0
	Female	0.0	0.0	0.0	0.0

Table (7): Average percentage of survival rates of *Musca domestica* L. adults produced from successively irradiated pupae for eleven generations with substerilizing doses of 0, 700 and 900 rad.

Days after emergence	Sex	Doses - Rads		
		Control	700	900
		Mean ± S.D.	Mean ± S.D.	Mean ± S.D
16	Male	100.0 ± 0.1235	94.0 ± 0.2531	75 ± 1.2350
	Female	100.0 ± 0.0000	85.5 ± 1.2714	70 ± 0.2730
17	Male	98.0 ± 0.2356	93.4 ± 0.1627	72 ± 1.3520
	Female	90.0 ± 0.1237	84.3 ± 1.3274	78 ± 0.5721
18	Male	98.0 ± 0.3256	98.5 ± 0.1752	68 ± 1.3521
	Female	53.2 ± 0.4671	83.1 ± 1.2735	76 ± 0.4723
19	Male	78.0 ± 0.4631	63.2 ± 0.1521	65 ± 1.7536
	Female	44.3 ± 0.2461	80.1 ± 1.6231	75 ± 0.8271
20	Male	33.0 ± 0.1562	35.6 ± 0.7321	45 ± 1.2691
	Female	17.1 ± 1.3521	75.5 ± 1.3542	32 ± 0.1531
21	Male	5.0 ± 1.2567	20.3 ± 0.2431	35 ± 0.2532
	Female	0.0 ± 0.5372	50.1 ± 1.5612	16 ± 1.7563
22	Male	0.0	13.0 ± 0.271	5 ± 0.1523
	Female	0.0	37.0 ± 1.6531	0.0
23	Male	0.0	0.0	0.0
	Female	0.0	0.0	0.0

Table (8): Average percentage of survival rates of *Musca domestica* L. adults produced from successively irradiated pupae for fourteen generations with substerilizing doses of 0, 700 and 900 rad.

Days after emergence	Sex	Doses - Rads: Control	Doses - Rads: 700	Doses - Rads: 900
		Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
16	Male	93.1 ± 0.2352	65.1 ± 1.3720	46.7 ± 1.3521
	Female	92.0 ± 1.3715	66.0 ± 0.1560	40.1 ± 0.5271
17	Male	92.3 ± 1.5671	61.2 ± 1.3710	40.5 ± 1.3521
	Female	90.1 ± 0.9721	63.0 ± 0.2530	32.3 ± 0.1462
18	Male	90.5 ± 1.6731	60.0 ± 0.2710	35.2 ± 1.3514
	Female	86.3 ± 0.1561	60.1 ± .3560	27.1 ± 0.5271
19	Male	88.0 ± 0.3514	55.3 ± 0.1621	28.3 ± 1.5621
	Female	73.2 ± 0.2541	45.5 ± 1.1651	21.9 ± 0.2781
20	Male	74.2 ± 1.2736	45.5 ± 0.1672	15.1 ± 1.5321
	Female	65.7 ± 0.2761	35.7 ± 0.1725	15.0 ± 0.6680
21	Male	65.4 ± 1.3251	36.6 ± 1.5165	10.0 ± 1.2673
	Female	50.6 ± 2.472	10.3 ± 0.1927	13.0 ± 0.5721
22	Male	48.1 ± 0.1563	12.7 ± 1.2735	0.0
	Female	38.0 ± 1.2720	0.0	0.0
23	Male	36.5 ± 0.5310	0.0	0.0
	Female	20.3 ± 0.1720	0.0	0.0

Figs. (5 - 16): Effects of chronic irradiation on percentage survival rate of _Musca_ _domestica_ L. sequentially irradiated in ancestor generations.

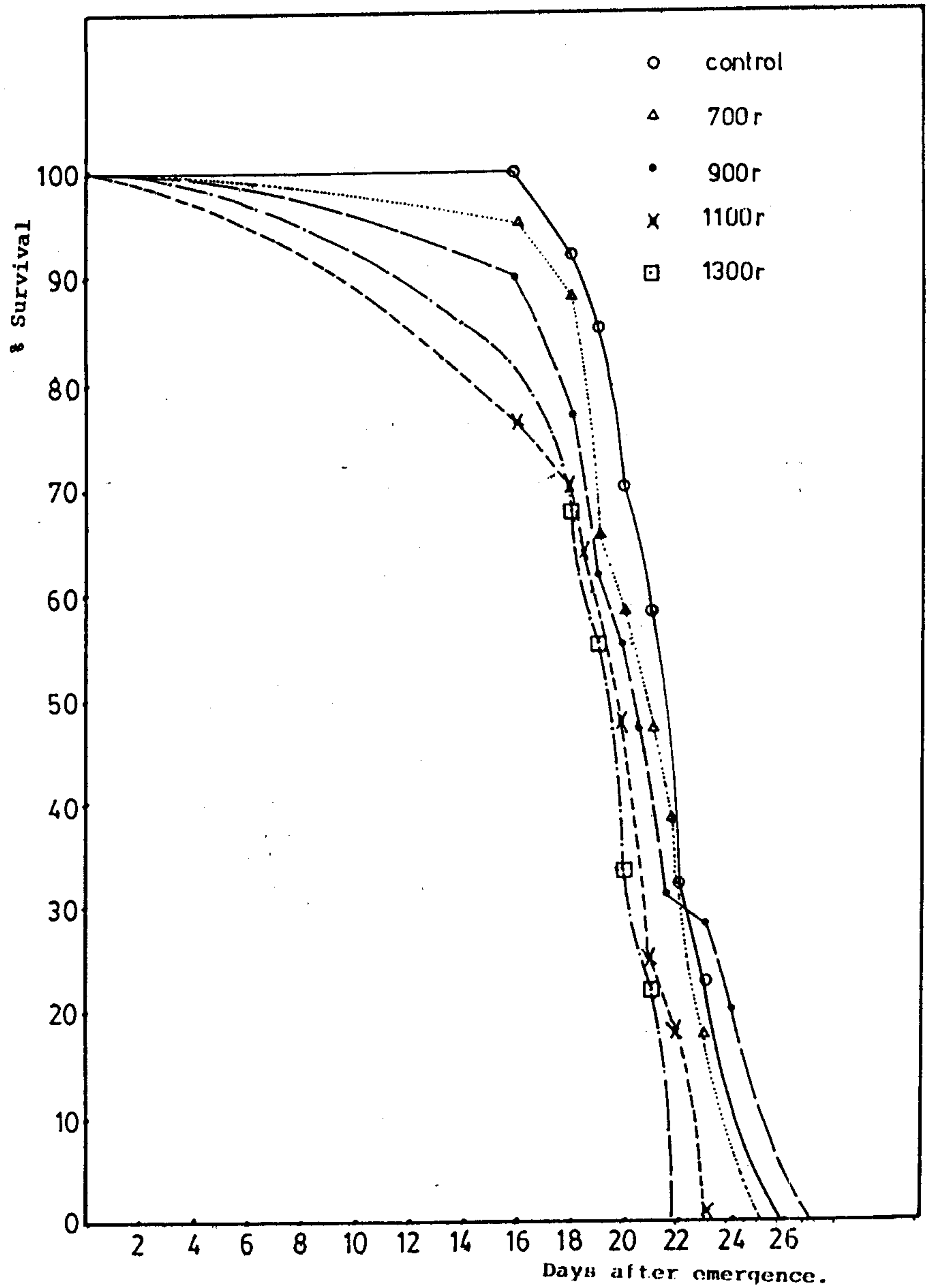

Fig (5): F_1 Males

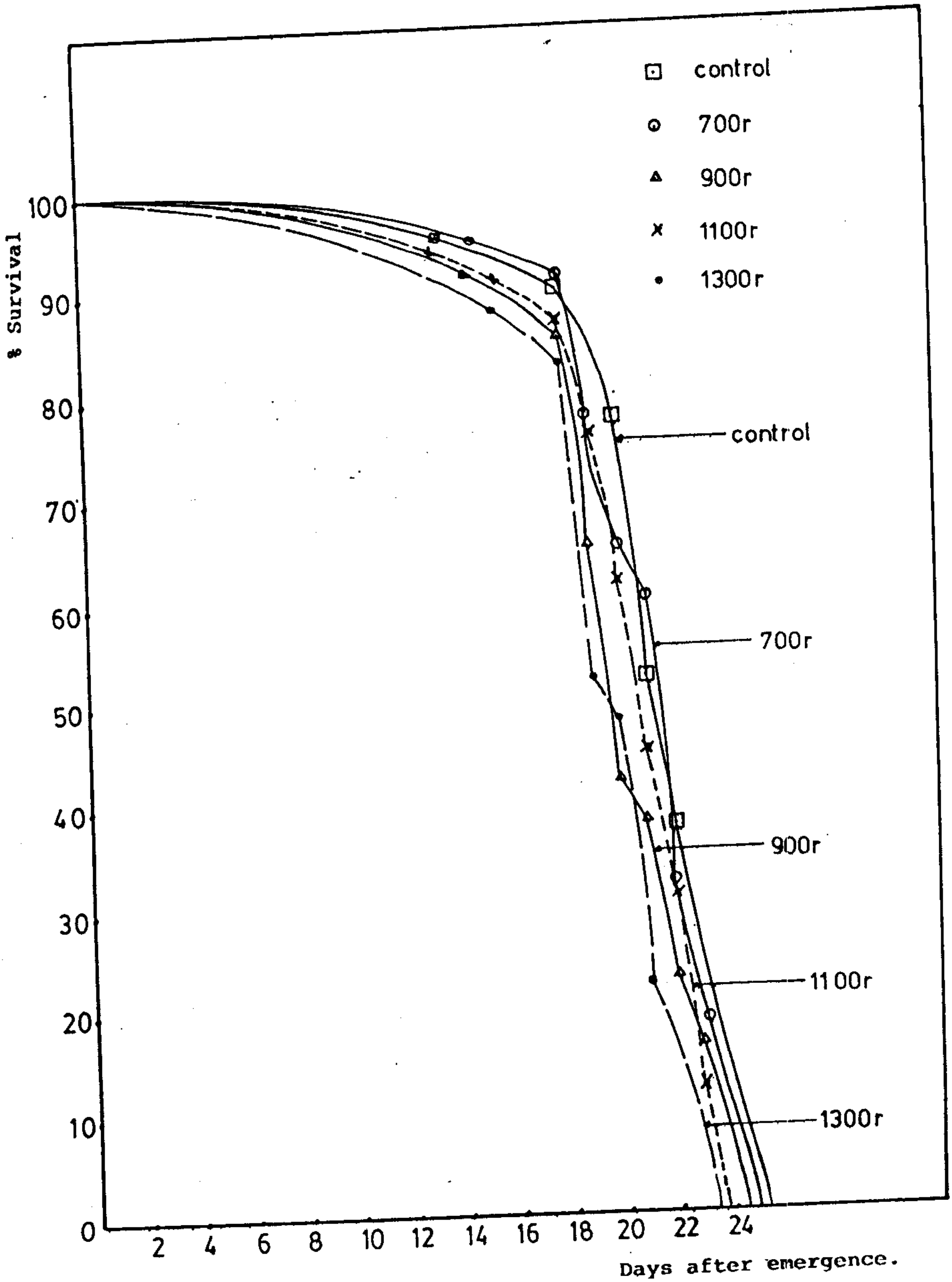

Fig (6): F_1 Females

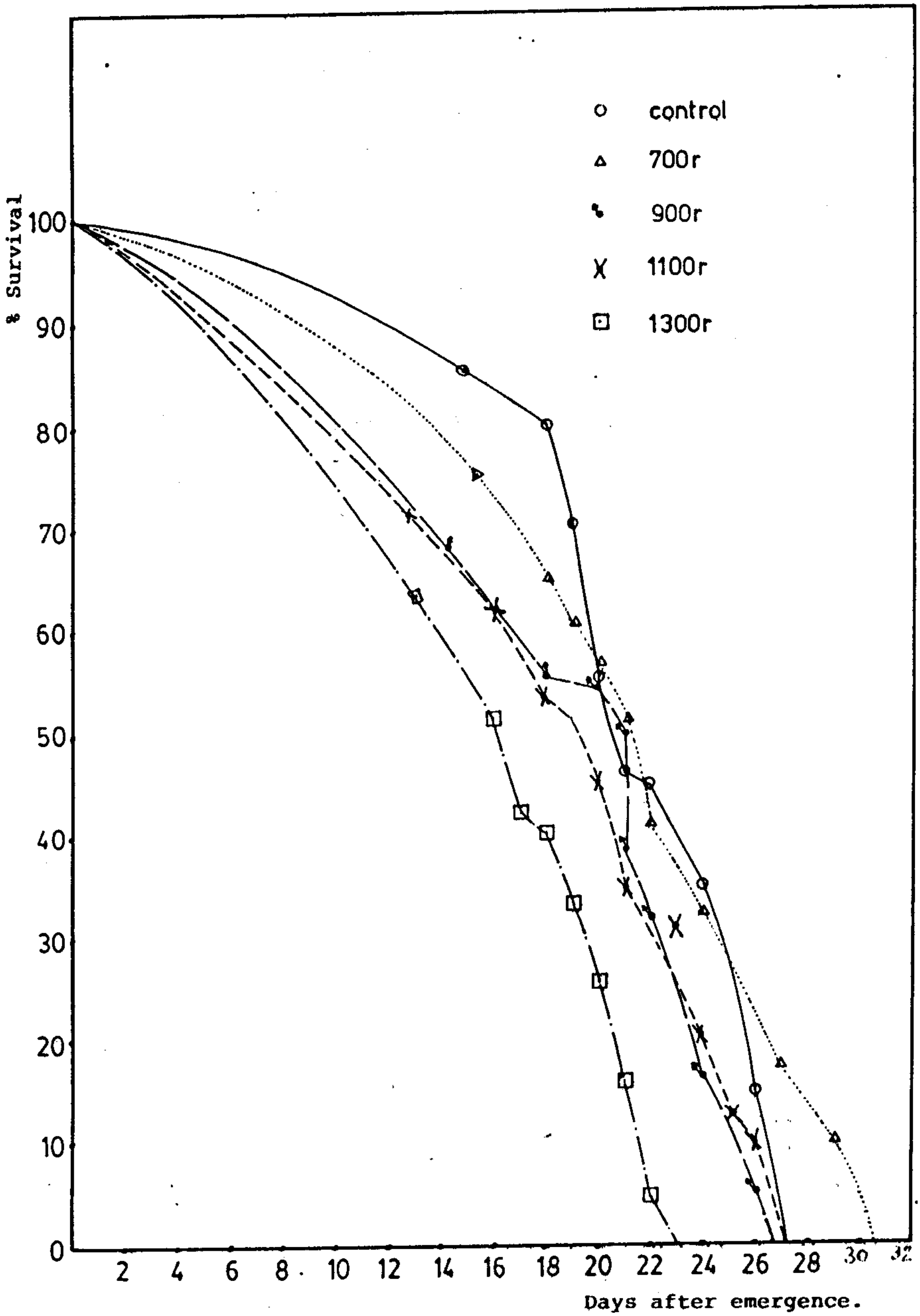

Fig (7): F_3 Males

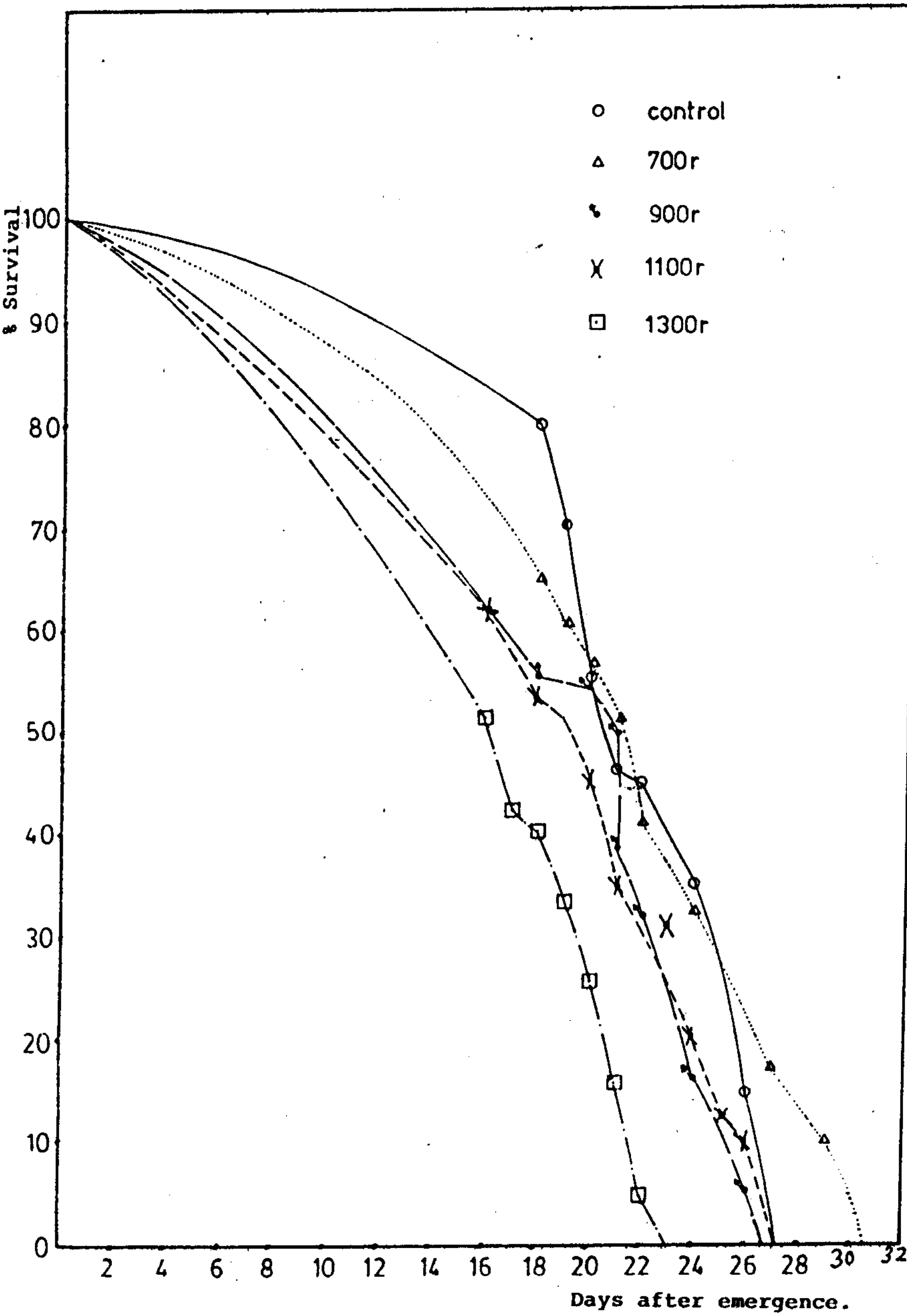

Fig (8): F_3 Females

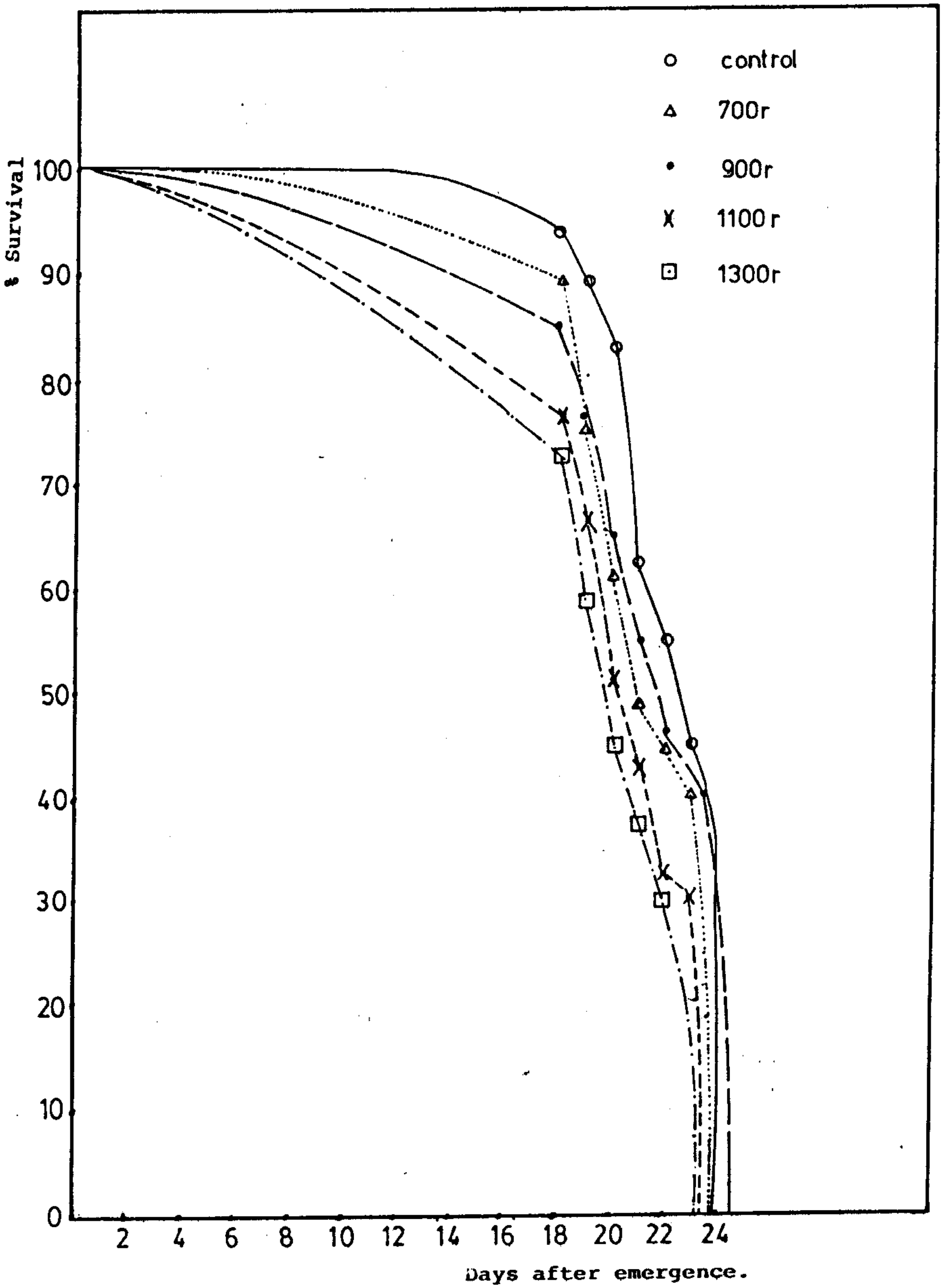

Fig (9): F_5 Males

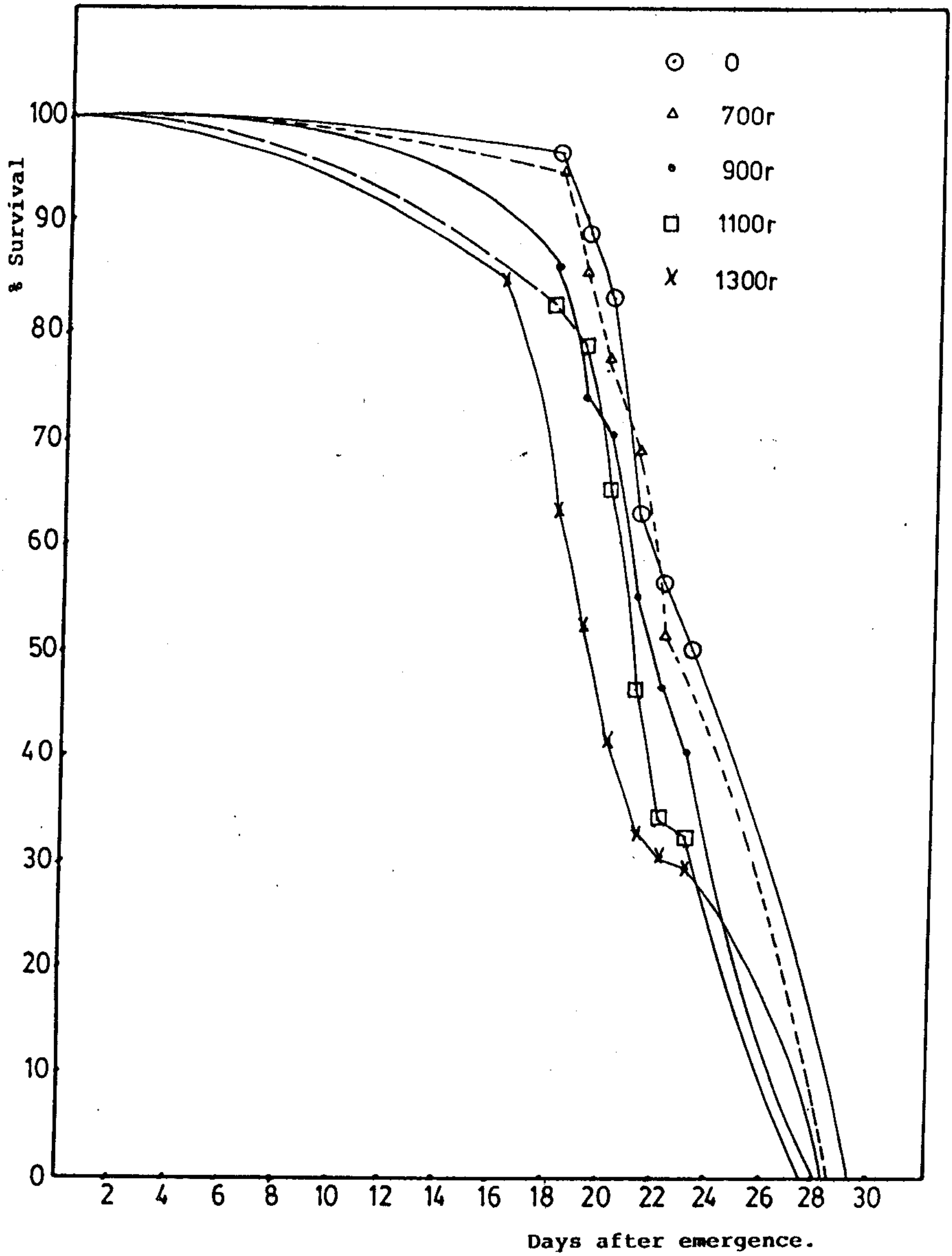

Fig (10): F_5 Females

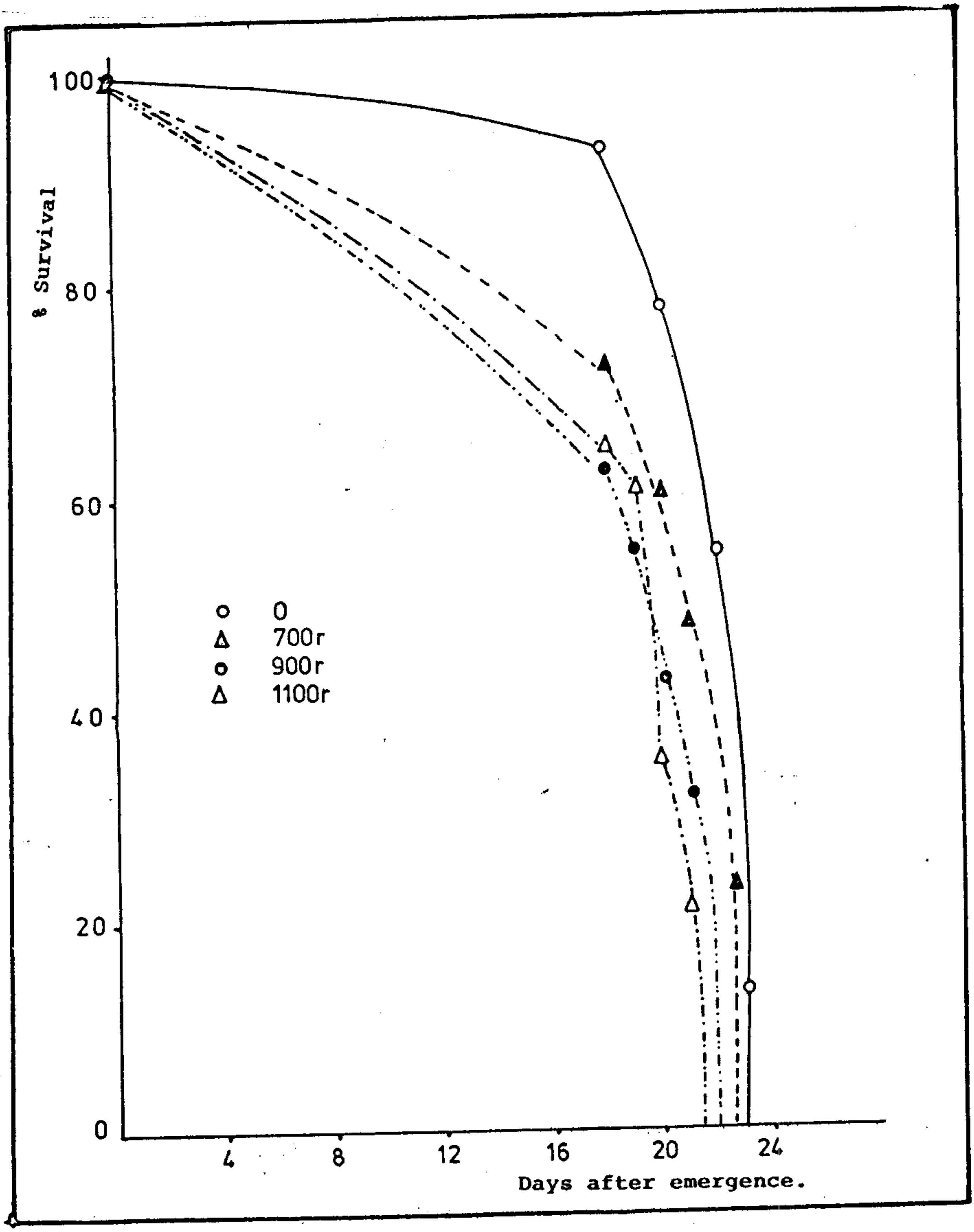

Fig (12): F_8 Females

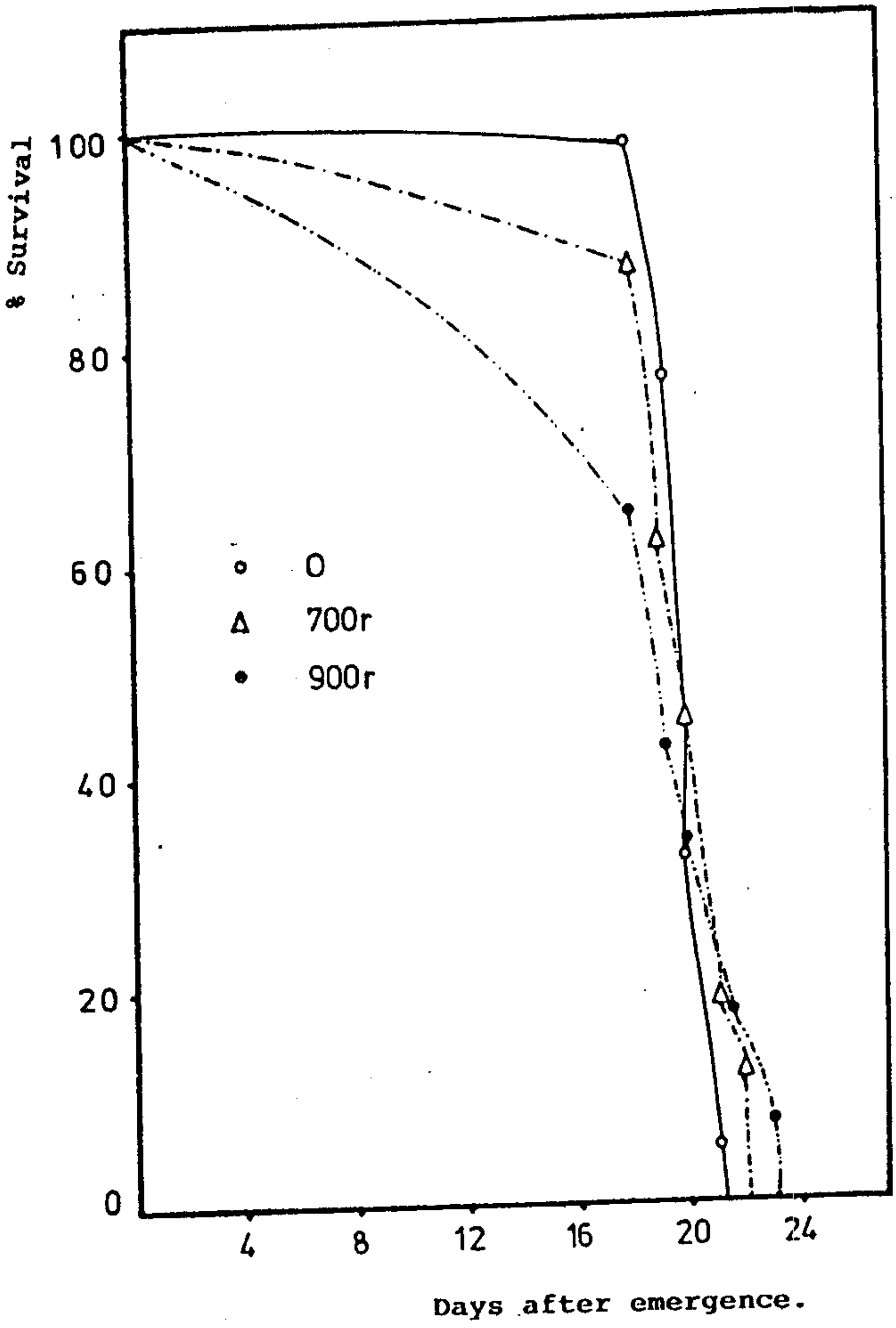

Fig (13): F11 Males

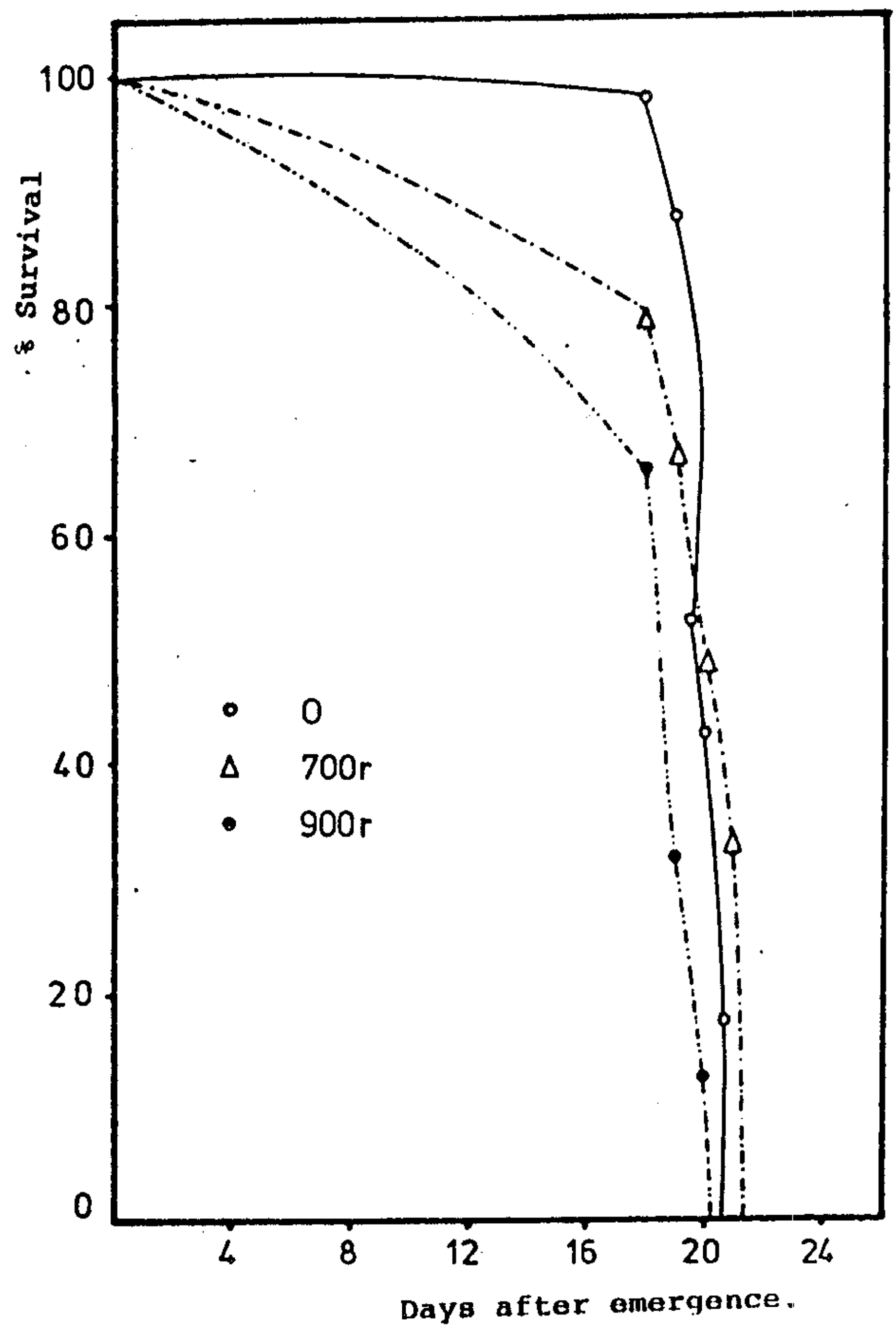

Fig (14): F_{11} Females

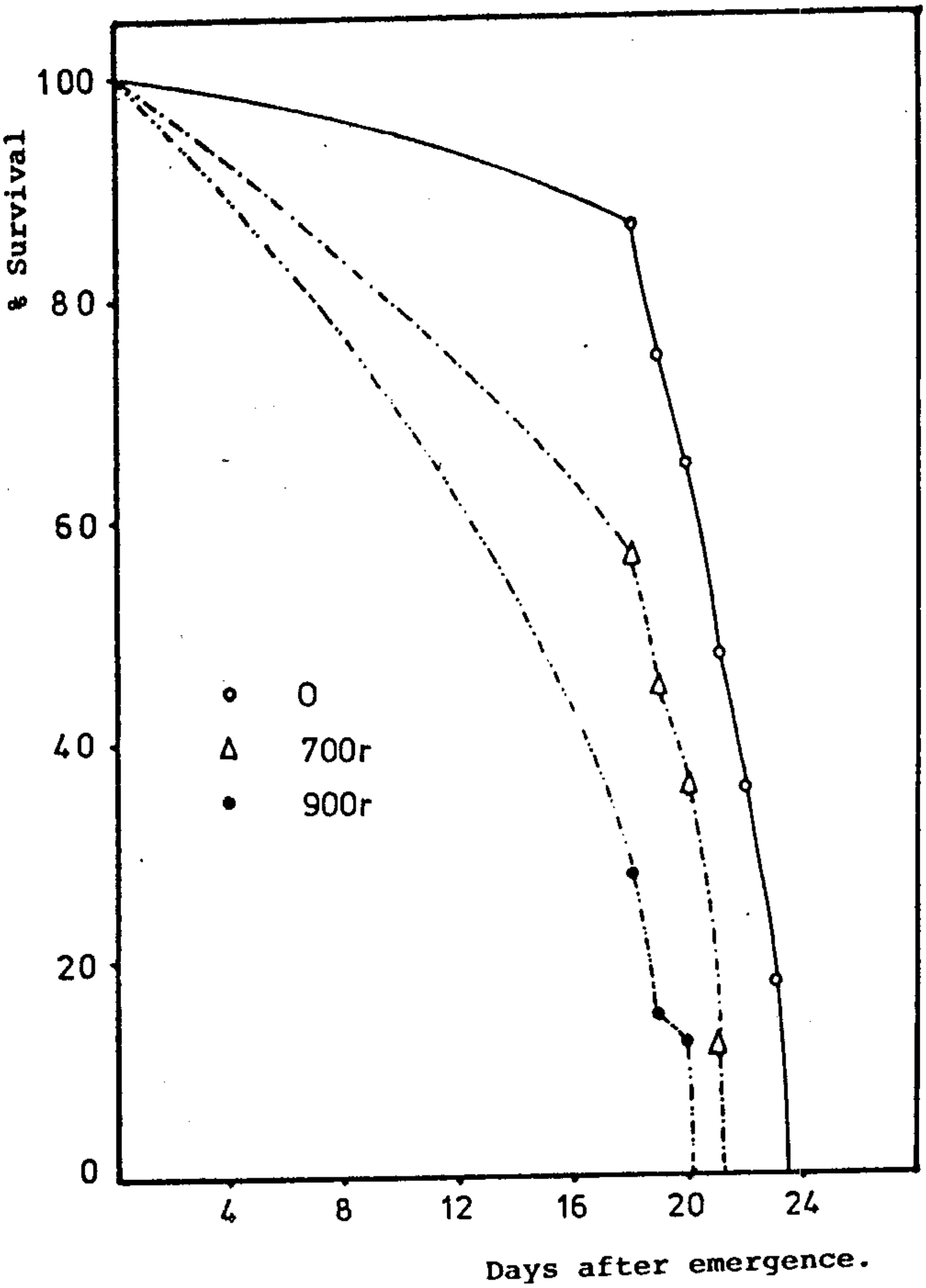

Fig (15): F14 Males

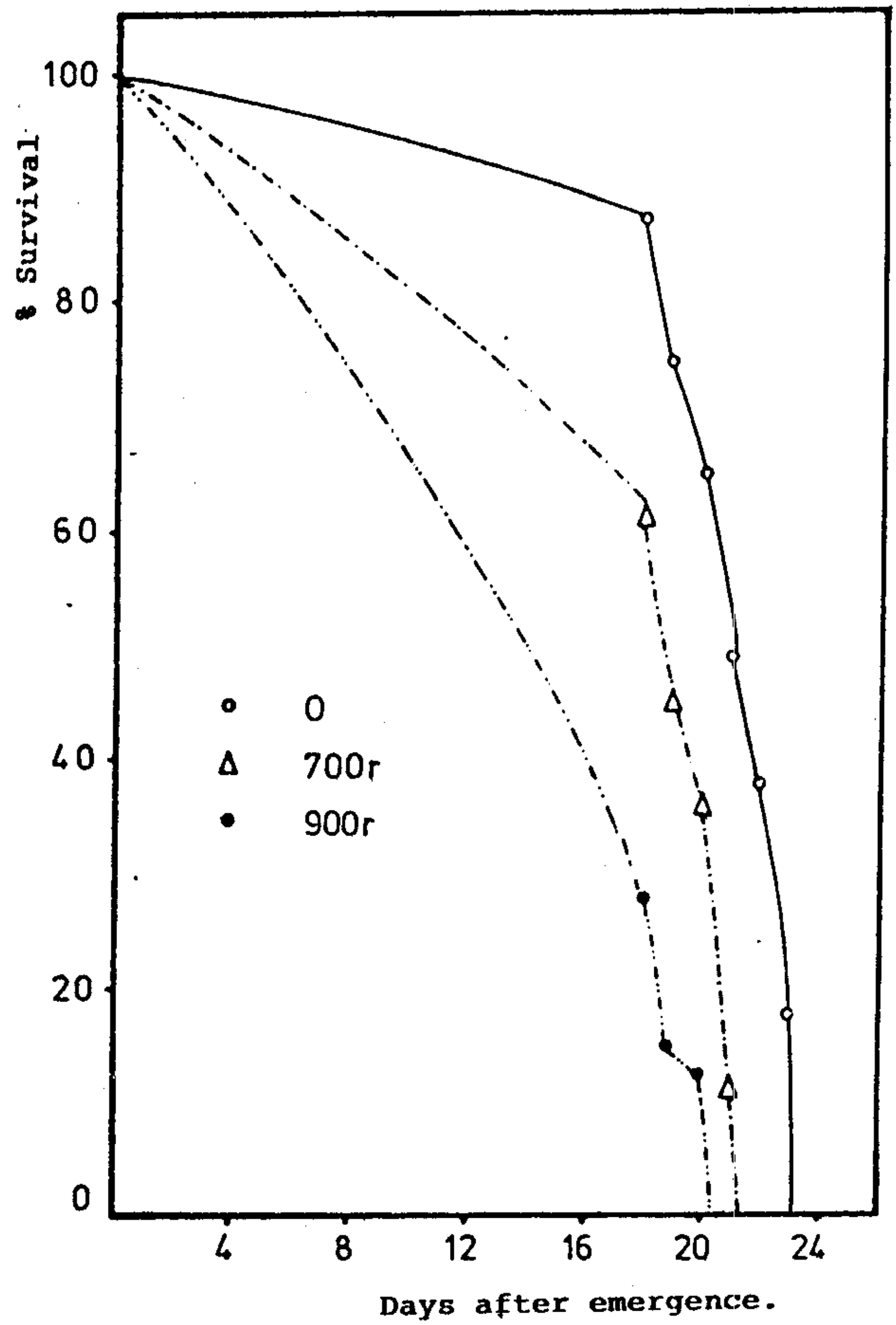

Fig (16): F_{14} Females

Results in this table and figures indicate the following:

a- Adult longevity was highly affected by chronic irradiation. It is evident from these data that adult females derived from irradiated pupae of selected population and reared in the usual way, die at significantly faster rate and have a shorter life span than females derived from non irradiated population.

b- There was a difference in mortality rates between irradiated and non irradiated populations; however, this differences was comparatively small.

In all, the longevity experiments have continued to be maintained essentially unchanged with each successive generation. Statistical analysis of the data in table (2) indicate that:

* Both males and females from F_1 population treated with 700, 900, 1100 and 1300 rad survived significantly longer than those of check population ($P<0.01$, 0.02).
* Both sexes of F_3 population exposed to 700, 900, 1100 and 1300 rad treatment showed insignificant difference in adult life span than their corresponding check populations ($P<0.02$, 0.05).

* Survival rates of the irradited males and females from F_5 population showed no significant effect at all tested doses except at 1300 rad population, where the longevity of both treated sexes was significantly shorter than the check population ($P<0.02$).
* The longevity of both sexes of F_8 population increased more than the check group at a lower dose of 700, 900 and 1100 rad. This increase as significant ($P<0.02$, 0.05) while life span of males and females derived from 900 and 1100 rad populations showed a significant reduction than control ones ($P<0.05$).
* Longevity test for F_{11} population indicate a remarkable significant reduction on the adult life span of both sexes as compared to their corresponding check population for 700 and 900 rad treatments ($P<0.02$, 0.05).
* The longevity of both males and females of F_{14} population showed significant decrease from check group ($P<0.02$, 0.05).
* Tables (3,4,5,6,7 and 8) and Figures (5 to 16) indicate the effect of chronic exposure of gamma radiation on the survival rates.

- Survival rates of both sexes were highly affected by chronic irradiation through successive generations.

* There was a significant increase in the mortality rates of both sexes ($P<0.02$, 0.05).
* There was a difference in mortality rates between irradiated and nonirradiated populations, however, this difference was comparatively small

3- **Fecundity:**

The effect of gamma irradiation on the fecundity of adult females was tested. The obtained results are tabulated in table (9) as well as graphically illustrated in fig. (17).

Results in table (9) indicate the following:

a- Fecundity was affected by the exposure to gamma radiation.

b- The effect of **gamma** irradiation was extended to different **generations.**

c- There is a correlation between the radiation dose and their response of fecundity.

Table (9): Rate of egg laying of sequently irradiated populations of <u>Musca domestical</u> L. females (expressed as No. of eggs /o/day).

Generation	Control	Doses - Rads			
		700	900	1100	1300
Number	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
F_1	5.77 ± 0.3512	6.93 ± 0.3014	6.31 ± 0.4011	6.81 ± 0.1181	2.47 ± 0.0764
F_3	5.83 ± 0.1732	4.64 ± o.5943	6.43 ± 0.2805	5.59 ± 0.2618	3.88 ± 0.2883
F_5	5.43 ± 0.2060	4.64 ± 0.1931	6.21 ± 0.2252	6.13 ± 0.4512	2.29 ± 0.2205
F_8	5.83 ± 0.2042	4.32 ± 0.200	3.80 ± 0.1562	3.3. ± 0.1732	0.0
F_{11}	5.53 ± 0.2082	3.47 ± 0.252	2.70 ± 0.5292	0.0	0.0
F_{14}	6.33 ± 0.1578	3.20 ± 0.360	2.60 ± 0.1000	0.0	0.0

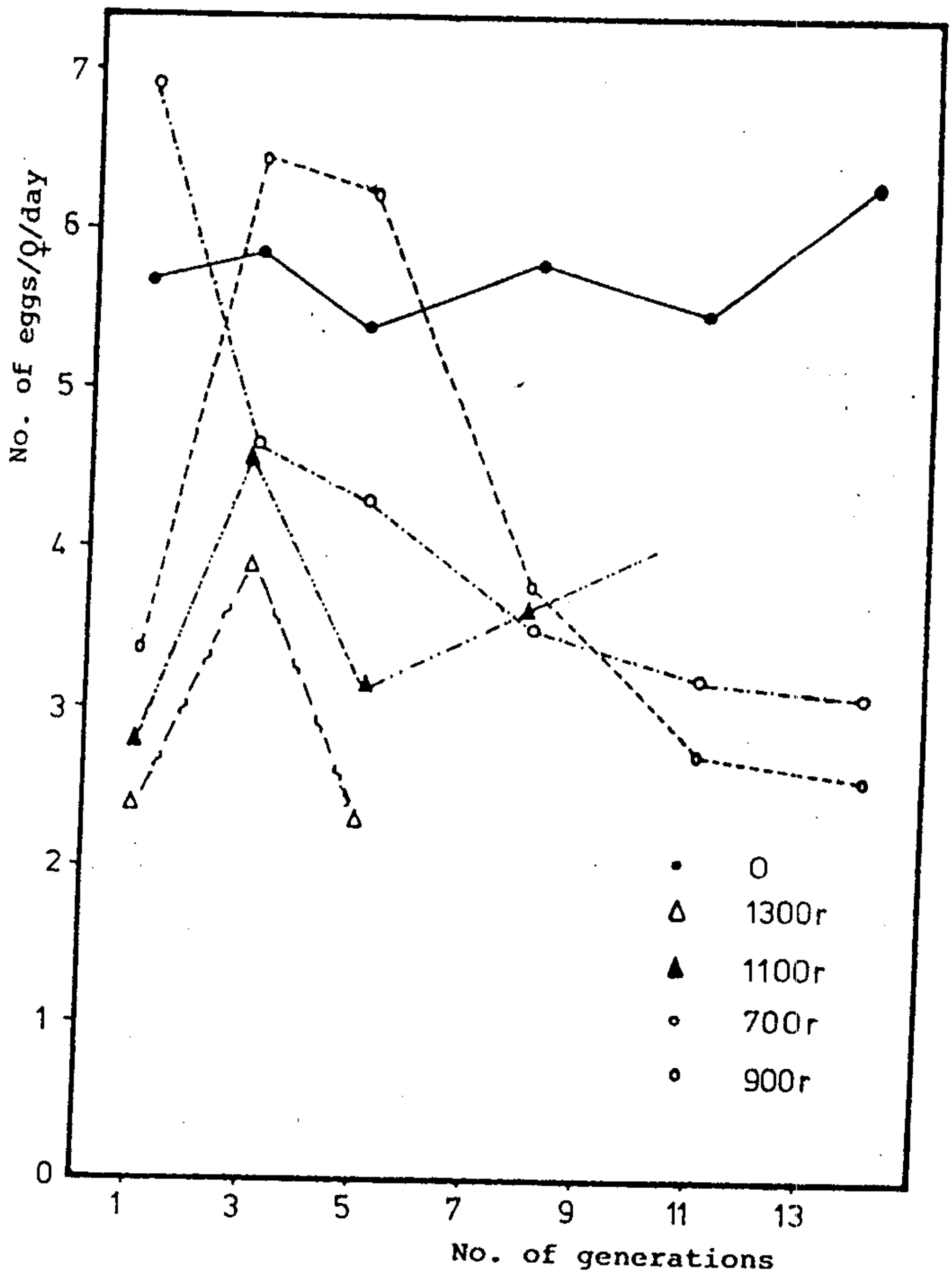

Fig. (17): Effects of chronic irradiation on rate of egg laying of Musca domestica L. females sequentially irradiated in ancestor generations.

These results can be explained as follow:

* Treatment with 700 rad in the first generation stimulated egg production. This observation was also true for 900 and 1100 rad traetments, but 1300 rad treatment decreased the number of eggs laid by irradiated females.
* Treatment with 700 and 900 rad slightly affect the fecundity throughout the first seven generations, i.e. females were continued fecund till F_7.
* Maximum stimulation of rate of egg production was shown in F_1 population treated with 700 rad, followed by complete sterility of F_{10} females.
* Sterility in the irradiated females appeared among females of the F_{11} population when treated with 1100 rad.
* A significant decrease in the fecundity of 1300 rad population was observed at the first six generations only, followed by complete sterility of the 7th generation.
* It appears that the radiation selected population of *M. domestica* L. developes no resistance to chronic irradiation.
* The results proved that chronic irradiation affect vittilogensis and protein synthesis in female

reproductive system, i.e. the females fail to develop mature occytes due to the effect of chronic irradiation.

4- **Fertility:**

The effect of gamma irradiation on fertility of adult M. domestica L. was investigated. The results of fertility experiment are tabulated in table (10).

Results in table (10) indicate that:

1- Fertility of deposited eggs by females produced from populations irradiated for successive generations was adversly affected by chronic irradiation.

2- There was a highly significant reduction in egg hatchability with the increase of dose through successive generations ($P<0.02$, 0.05) i.e. the fertility was affected as the number of generations of selection was increased and when the dose level increased.

3- Fertility of irradiated populations was less than their corresponding controls in the non irradiated populations.

Table (10): Fertility of sequantly irradiated populations of <u>Musca domestica</u> L. (expressed as % hatch).

Generation	Control	Doses - Rads			
		700	900	1100	1300
Number	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
F_1	88.11 ± 0.1905	26.09 ± 0.6565	22.38 ± 0.7974	21.057 ± 1.34	10.05 ± 0.5021
F_3	88.32 ± 1.2322	25.01 ± 0.9250	20.09 ± 1,0785	17.400 ± 0.5624	7.230 ± 0.3610
F_5	87.13 ± 0.4371	24.83 ± 0.2427	19.70 ± 0.7646	14.500 ± 0.9644	5.630 ± 0.2722
F_8	88.12 ± 0.3863	22.40 ± 0.7000	16.64 ± 1.6170	13.110 ± 0.4000	0.0
F_{11}	88.30 ± 0.2082	18.23 ± 1.2055	13.60 ±1.2055	0.0	0.0
F_{14}	87.30 ± 1.0144	15.20 ± 1.0149	10.23 ± 0.9018	0.0	0.0

B- Meansurments of radiosensitivity of *M. domestica* L. exposed to substerilizing doses of gamma radiation for five and eleven generation:

The following experiment was carried out to study the possibility of developing radioresistance in selected populations of *M. domestica* L., irradiated in ancestral generations (five and eleven generations) and then exposed to additional acute doses of 3000 or 4500 rad.

Average percentage of adult emergence and sex ratio were calculated. Adult mortality, number of eggs laid per female per day and egg hatchability were also calculated. Statistical analysis for results took place. Evidence of difference between selected and control strain was estimated.

1- Effect of two additional acute doses of 3000 or 4500 rad on adult emergence, sex ratio, adult longevity, fecundity and fertility of F_6 population

a- Adult emergence and sex ratio:

The effect of acute exposure of gamma radiation on the adult emergence and sex ratio was tested. The results obtained are tabulated in table (11) and graphically illustrated in (figs. 18 and 19).

Table (11): Effect of the acute dose of 3,000 and 4,500 rad on percentage of adult emergence, sex ratio and longevity of the adults of the irradiated selected population (F_6) of *Musca domestica* L.

Treatment during 1st-5th generation rads	Treatment in the 6th generation rads	Adult emergence: No. of pupae	Adult emergence: No. of emerged adults	Adult emergence: Average % of adult emergence ± S.D.	Average % sex ratio: % of Males ± S.D.	Average % sex ratio: % of Females ± S.D.	♂ : ♀	Average adult longevity ± S.D.: Males	Average adult longevity ± S.D.: Females
Control	Control	200	176	88.00±0.000	44.0±0.00	44.0±0.00	1:1	19.43±1.3051	20.53±0.5859
Control "exposed"	3000	214	130	60.75±0.7636	25.42±4.041	35.33±1.235	1:1.389	26.17±0.9504	26.97±1.2583
	4500	207	96	46.38±2.0817	23.38±1.547	22.92±0.976	1:0.98	25.3±0.2560	26.30±1.3540
700	3000	202	84	41.58±2.8870	21.25±1.5276	20.33±0.1532	1:0.957	24.77±1.6450	23.43±1.2662
	4500	198	71	35.86±2.5170	17.86±1.5275	17.99±1.259	1:1.007	23.00±1.2730	23.50±1.5700
900	3000	222	81	36.49±2.8870	18.49±1.534	18.00±1.921	1:0.973	23.87±1.7954	23.93±1.4190
	4500	223	33	14.8±3.0550	7.47±1.527	7.33±0.976	1:0.981	23.2±1.573	24.4±2.56
1100	3000	210	31	14.76±3.0550	7.1±1.00	7.66±0.537	1:1.079	9.00±1.5670	10.72±2.577
	4500	207	0.0	0.0	0.0	0.0		0.0	0.0

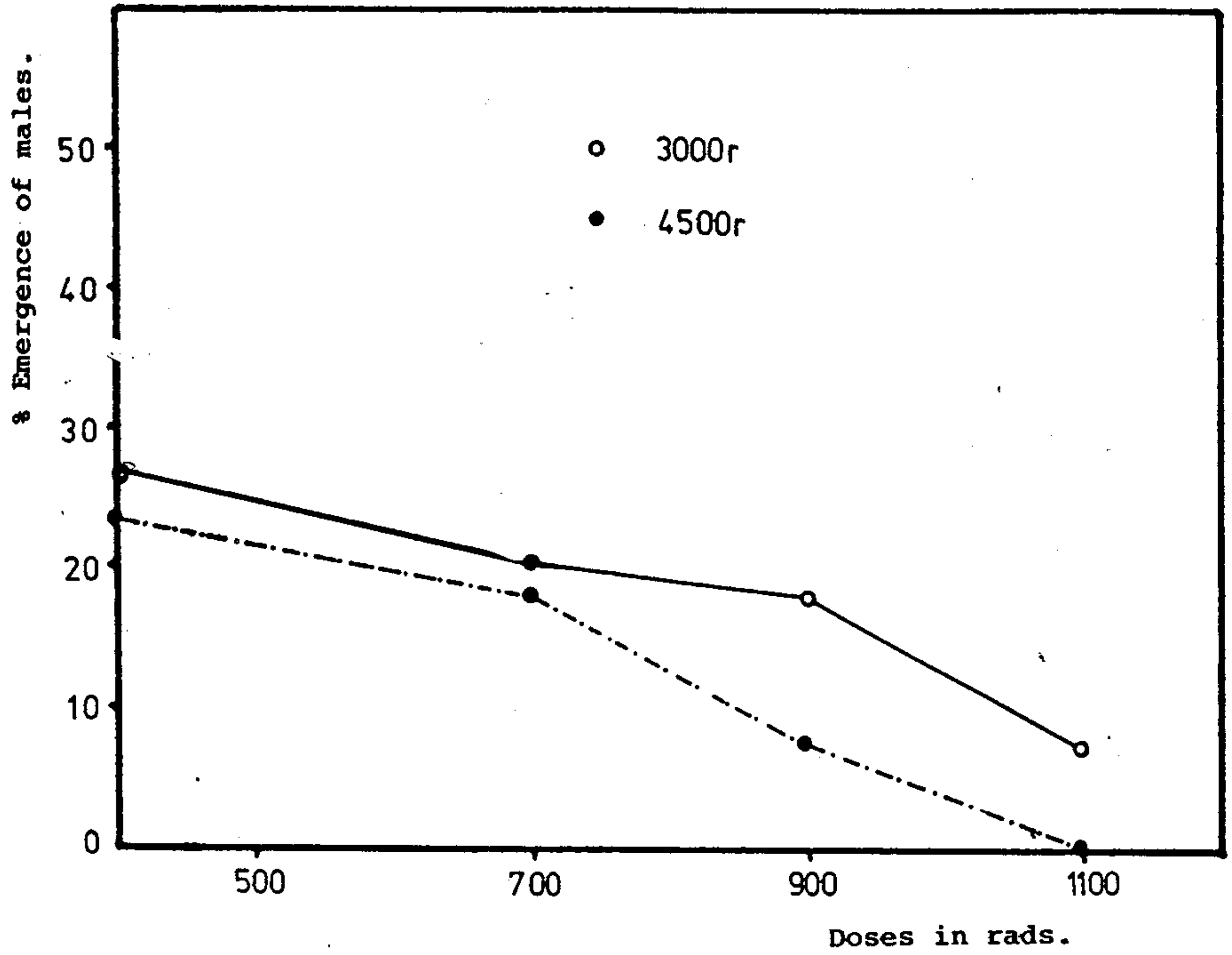

Fig (18): *Effects of exposing* F_6 *to (3,000 and 4,500 r) on percentage emergence of males of* ***Musca domestica*** *L. sequentially irradiated in 5 ancestor generations.*

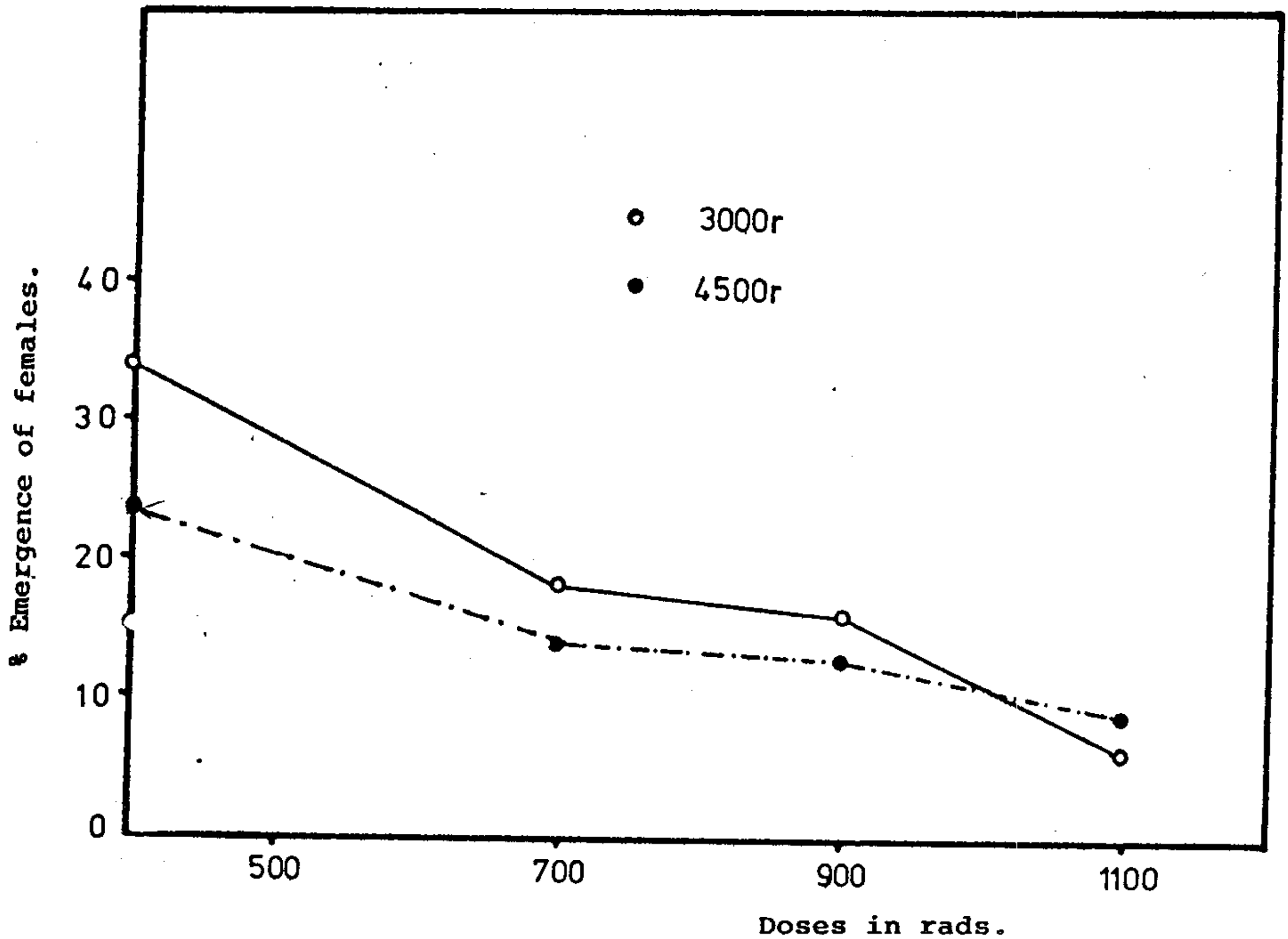

Fig (19): *Effects of exposing F_6 to (3,000 and 4,500 r) on percentage emergence of females of Musca domestica L. sequentially irradiated in 5 ancestor generations.*

Results in table (11) show that:

* Laboratory observations gave the conclusion that adult emergence was severely affected by acute additional dose.
* Results tabulated in table (11) indicated that irradiation of pupae derived from populations previously irradiated and exposed to an additional acute dose of 3000 or 4500 rad had no effect on sex ratio of all populations.
* Table (11) indicated that all populaitons recieved 3000 or 4500 showed a significant decrease in percentage of adult emergence as compared with controls ($P<0.02$, 0.05).
* Also control exposed "o" population showed a significant decrease in percentage of adult emergence ($P<0.02$, 0.05) when exposed to the acute doses.
* In case of 700, 900 and 1100 rad populations, results indicate a large devition in percent of adult emergence than their corresponding controls ($P<0.02$, 0.05).

b- Adult longevity:

Effect of acute dose of 3000 and 4500 rad on adult life span of irradiated selected population of *M. domestica* L. was observed and calculated. Results obtained were tabulated in table (11) and grophically illustrated in (Figs. 20 and 21). The average survival rates were graphically illustrated in tables (12 and 13) and (Figs. 22, 23, 24 and 25).

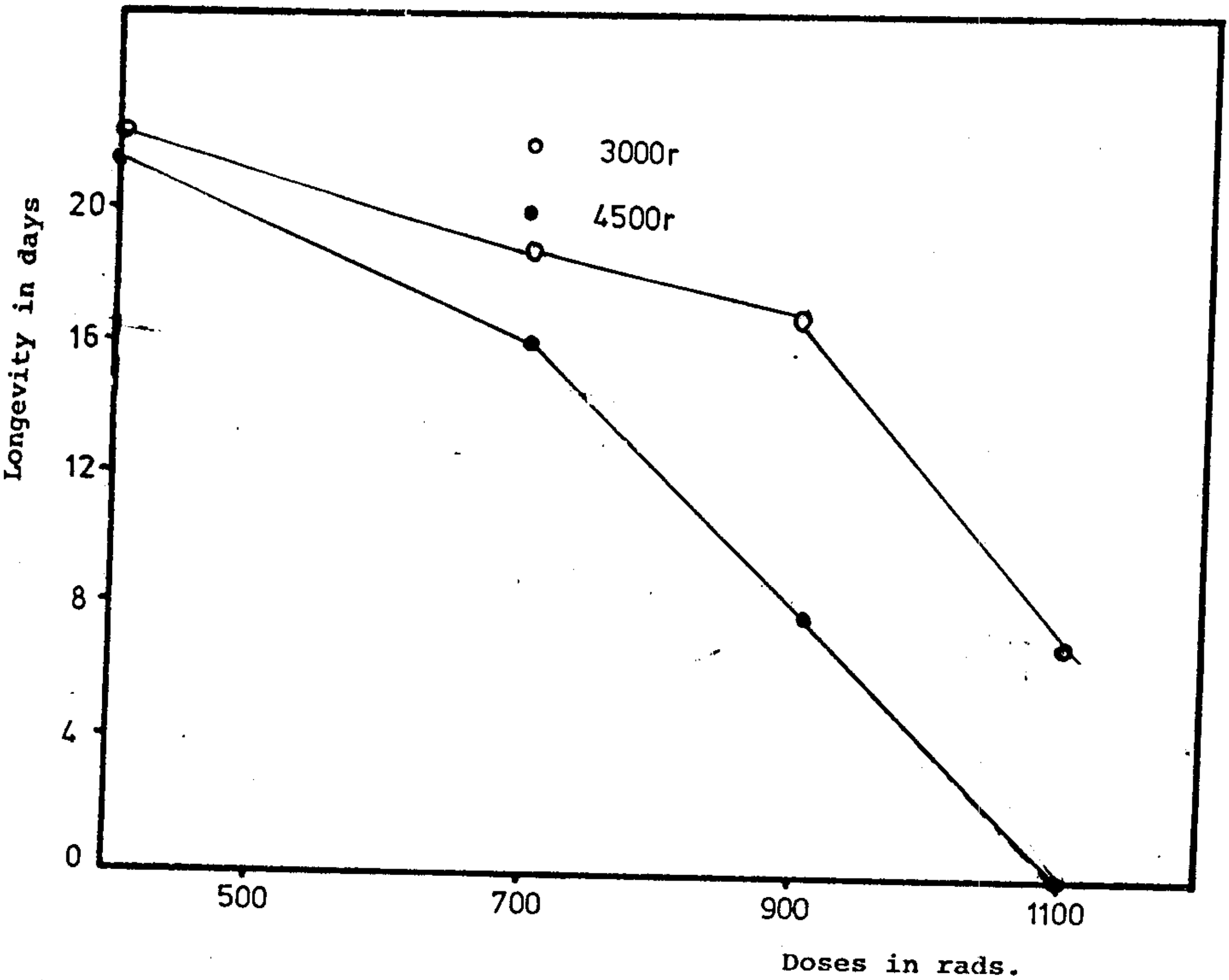

Fig (20): Effects of exposing F_6 to (3,000 r and 4,500 r) on longevity of males of <u>Musca domestica</u> L. sequentially irradiated in 5 ancestor generations.

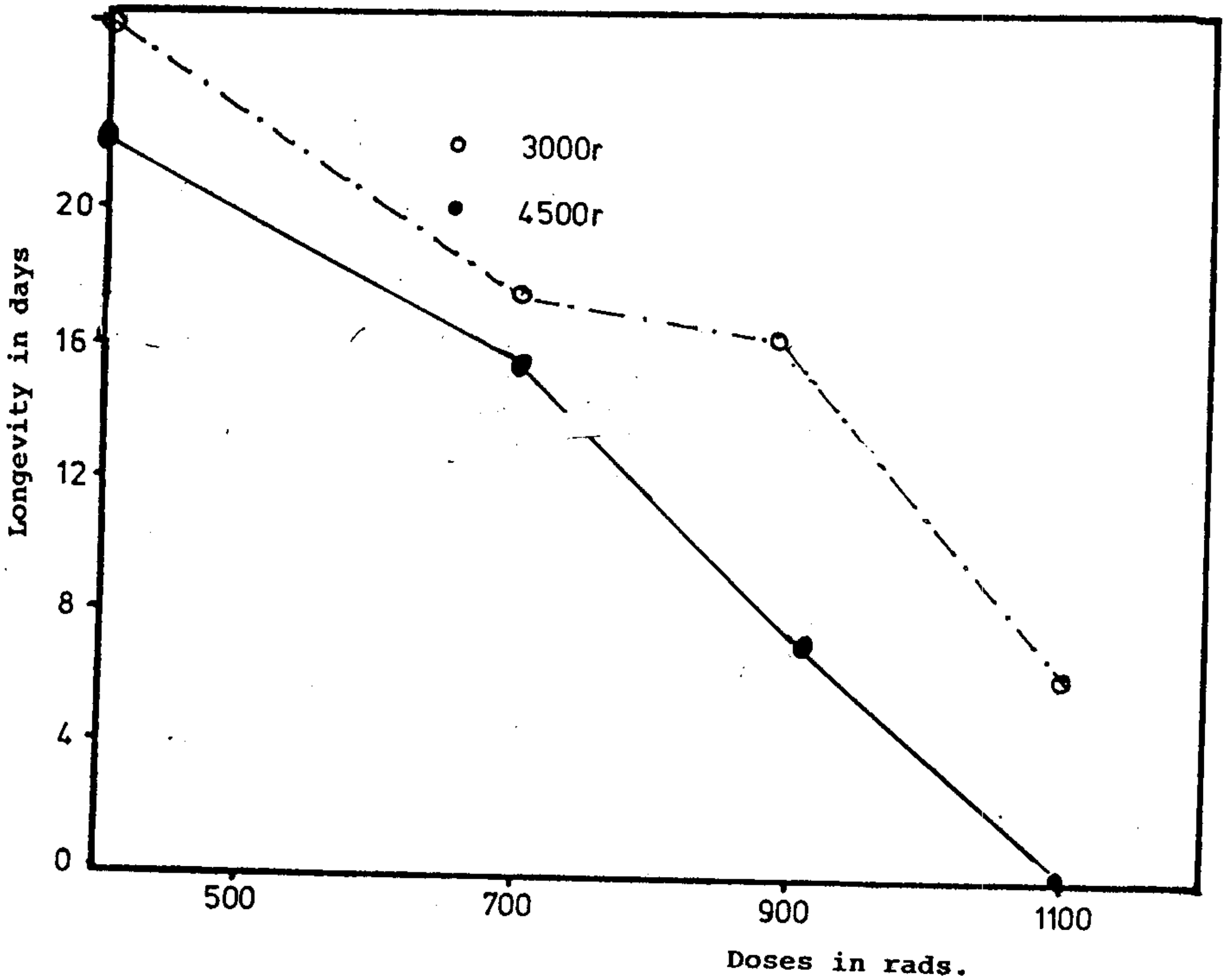

Fig (21): Effects of exposing F_6 to (3,000 and 4,500 r) on longevity of females of Musca domestica L. sequentially irradiated in 5 ancestor generations.

Table (12): **Effect of exposing F_6 to 4500 rad on the percentage survival rate of *M. domestica* L. sequentially irradiated in 5 ancestor generations.**

Days after emergence	Sex	Doses - Rads				
		Control	Control exposed	700	900	1100
		Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
12	Male	72 ± 1.3567	90 ± 1.3561	78 ± 1.6521	63 ± 1.5312	42 ± 1.5671
	Female	71 ± 0.9821	88 ± 0.7823	76 ± 0.1721	64 ± 0.1571	40 ± 0.3621
13	Male	45 ± 0.6723	71 ± 1.4571	53 ± 1.3541	55 ± 0.8213	33 ± 0.7821
	Female	45 ± 1.3672	70 ± 0.3456	54 ± 0.2731	56 ± 0.2718	35 ± 1.5813
14	Male	15 ± 0.5861	38 ± 1.3721	26 ± 0.1672	23 ± 1.5371	18 ± 0.1365
	Female	14 ± 1.6731	37 ± 0.2471	25 ± 0.3241	24.5 ± 0.4712	17 ± 1.0123
15	Male	0.0 ± 0.5671	18 ± 0.3561	10 ± 1.6587	5 ± 0.1352	5 ± 0.5671
	Female	0.0	16 ± 1.5362	10 ± 0.1562	6.5 ± 0.0321	5 ± 1.3512
16	Male	0.0	0.0	0.0	0.0	0.0
	Female	0.0	0.0	0.0	0.0	0.0

Table (13): Effect of exposing F_6 to 4500 rad on the percentage survival rate of *M. domestica* L. sequentially irradiated in 5 ancestor generations.

Days after emergence	Sex	Doses - Rads				
		Control	Control exposed	700	900	1100
		Mean ± S.D	Mean ± S.D	Mean ± S.D	Mean ± S.D	Mean ± S.D
12	Male	98 ± 1.532	100 ± 1.3541	84 ± 1.3560	72 ± 1.5621	66 ± 0.5621
	Female	88 ± 0.563	75 ± 0.2760	85 ± 0.2730	78 ± 0.7531	65 ± 0.3712
13	Male	67 ± 0.567	85 ± 1.3572	75 ± 1.5671	55 ± 1.3720	53 ± 0.5631
	Female	60 ± 0.678	82 ± 0.2782	70 ± 0.6215	55 ± 0.5631	54 ± 1.6731
14	Male	50 ± 1.356	80 ± 1.8631	65 ± 0.1561	42 ± 1.2561	10 ± 0.1561
	Female	40 ± 0.278	60 ± 0.7891	48 ± 1.3721	50 ± 0.2731	54 ± 0.1341
15	Male	33 ± 0.573	65 ± 1.2304	50 ± 0.5672	25 ± 1.5621	55 ± 0.2731
	Female	25 ± 1.452	53 ± 0.5671	40 ± 0.3721	38 ± 0.7531	42 ± 0.5731
16	Male	10 ± 0.371	40 ± 1.7283	31 ± 0.1562	0.0	0.0
	Female	0.0	18 ± 0.1562	0.0	0.0	0.0

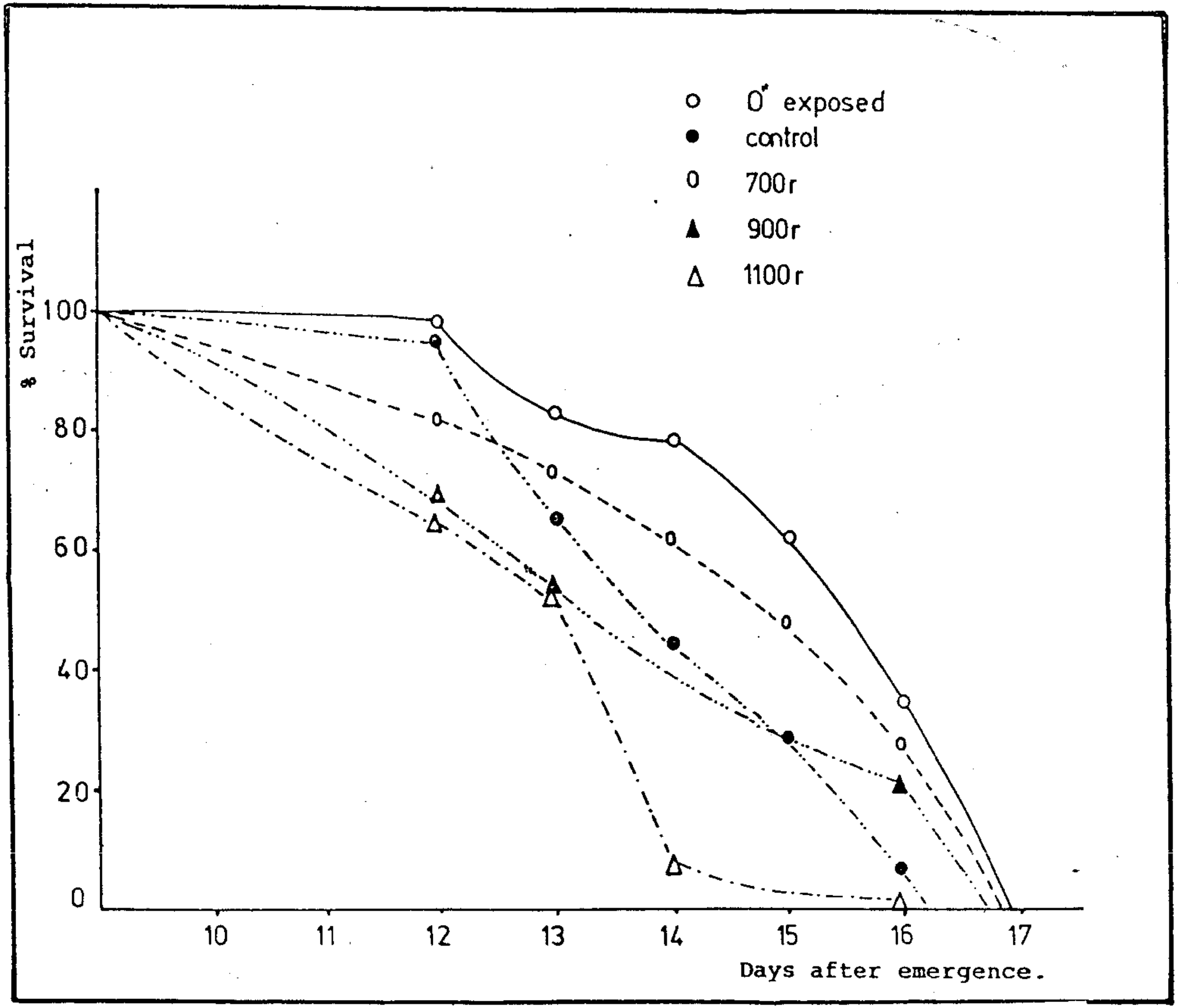

Fig. (22): Effects of exposing F_6 to 3,000 (r) on the percentage survival rate of Musca domestica L. males sequentially irradiated in 5 ancestor generations.

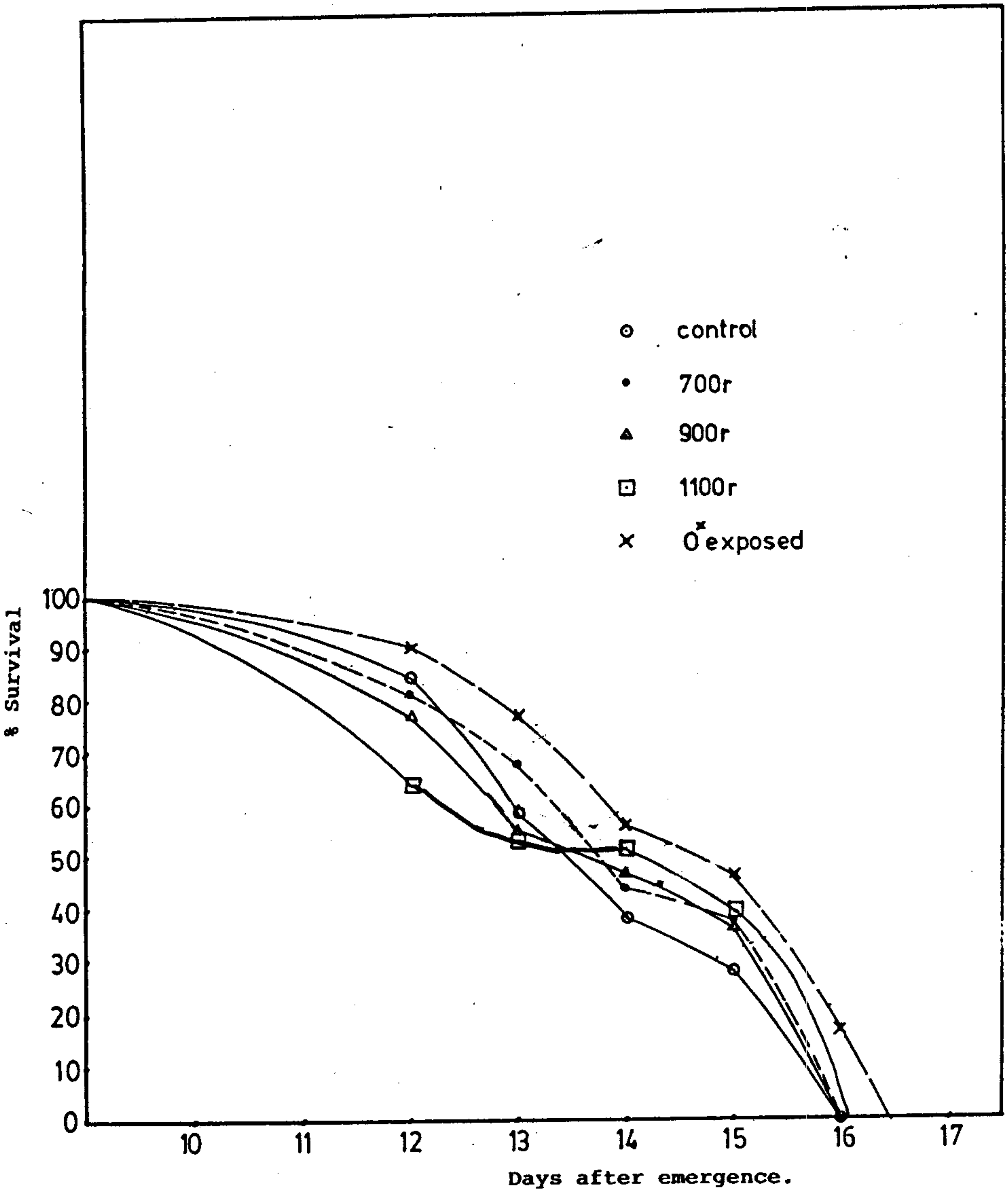

Fig (23): Effects of exposing F_6 to 3,000 (r) on the percentage survival rate of <u>Musca</u> L. females sequentially irradiated in 5 ancestor generations.

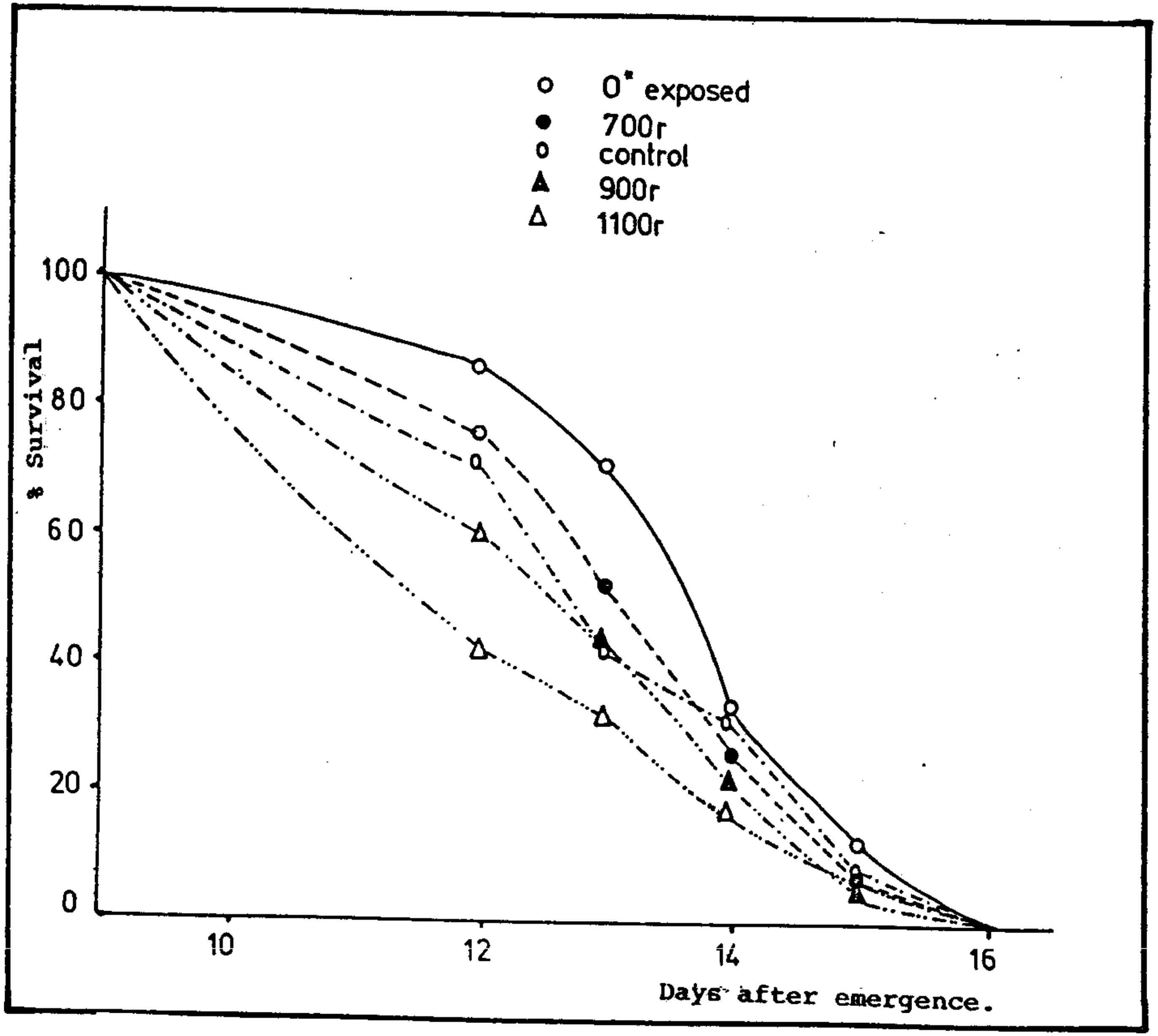

Fig (24): Effects of exposing F_6 to 4,500 (r) on the percentage survival rate of Musca domestica L. males sequenticlly irradiated in 5 ancestor generations.

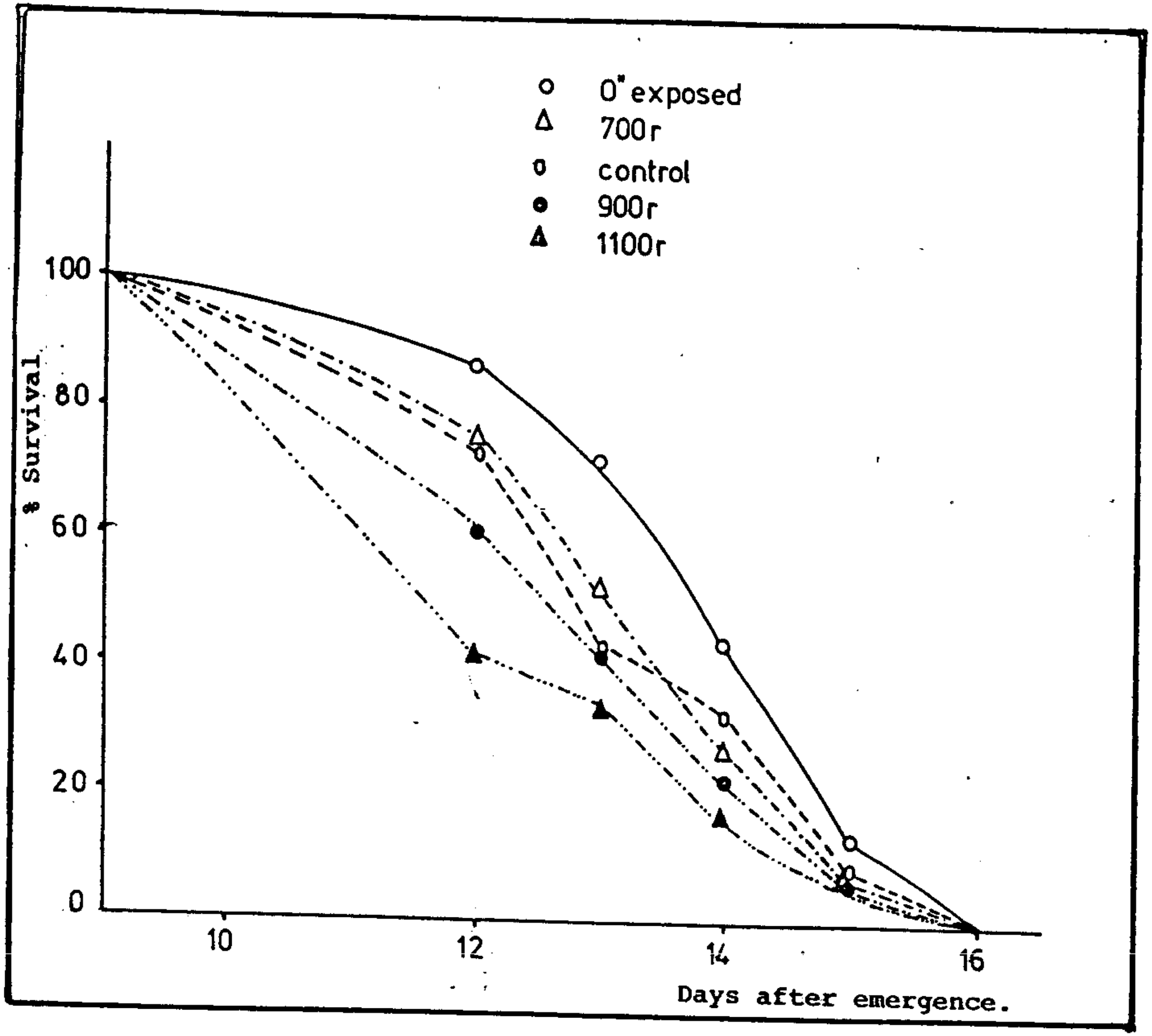

Fig (25): Effects of exposing F_6 to 4,500 (r) on the percentage survival rate of <u>Musca</u> <u>domestica</u> L. females sequentially irradiated in 5 ancestor generations.

Data obtained in table (11) indicate the following:

1- Adult longevity has been affected by acute exposure to gamma radiation (3000 or 4500 rad).

2- Populations of M. domestica L. treated in ancestor generations and exposed to 3000 rad in F_6 as acute dose showed clear shortening effect on the life span of the emerging adults.

3- There was a correlation between the radiation substerilizing dose and the response of adult longevity.

4- The results indicated that there might be a relationship between egg laying and female longevity, while laboratory observations showed that the higher the longevity of females, the lower the number of eggs laid, and females which lived longer laid no eggs.

* Radiation had a certain effect on ovarian development by damaging the ovarian nurse cells of the female as a result of reducing pupal fat body histolysis.

* Table (11) indicated that population of "o" exposed recieved 3000 rad as acute dose showed a maximum increase in adult longevity (26.97 ± 0.2583 and 26.17 ± 0.9504 days) for both male and female, respectively.

* In 700 and 900 rad populations when exposed to 3000 rad as acute dose showed an observable significant increase of adult longevity of both male and female (P<0.02 , 0.05)), comparable with the untreated flies.
* 1100 rad populations recieved 3000 rad as acute dose showed distincit decrease in adult longevity (9.0 ± 1.567 and 16.72 ± 0.2577 days) for both male and female respectively.
* When all populations recieved 4500 rad as acute dose a high significant increase in males and females longevity was also observed (P<0.02 , 0.05).

C- Fecundity and fertility:

The effect of acute dose of 3000 or 4500 rad on the fecundity and fertility of F_6 population of irradiated selected popultion of M. domestica L. was tested. Results were tabulated in table (14) and graphically illustrated in (Figs. 26 and 27).

Table (14): Effect of acute dose of 3000, 4500 rad on adult rate of egg laying and fertility of irradiated selected population (F_6) of Musca domestica L.

Treatment during 8 generations rads	Treatment in the 6.th generation rads	Average No. of eggs/♀/ day	No. of eggs tested	No. of eggs hatched	Aver. % hatch
Control	control	6.30±0.3570	63	54	85.77±0.3215
Control	3000	7.11±0.2816	59	21	35.40±0.2730
exposed "o"	4500	6.11±1.3540	81	14	17.20±1.3560
700	3000	5.50±0.2646	72	11	15.80±1.1015
	4500	3.40±1.3560	83	7	8.40±0.2570
900	3000	3.10±0.4328	69	4	5.80±1.0000
	4500	2.40±0.5730	80	2	2.50±0.2730
1100	3000	1.11±0.1386	0.0	0.0	0.0
	4500	0.0	0.0	0.0	0.0

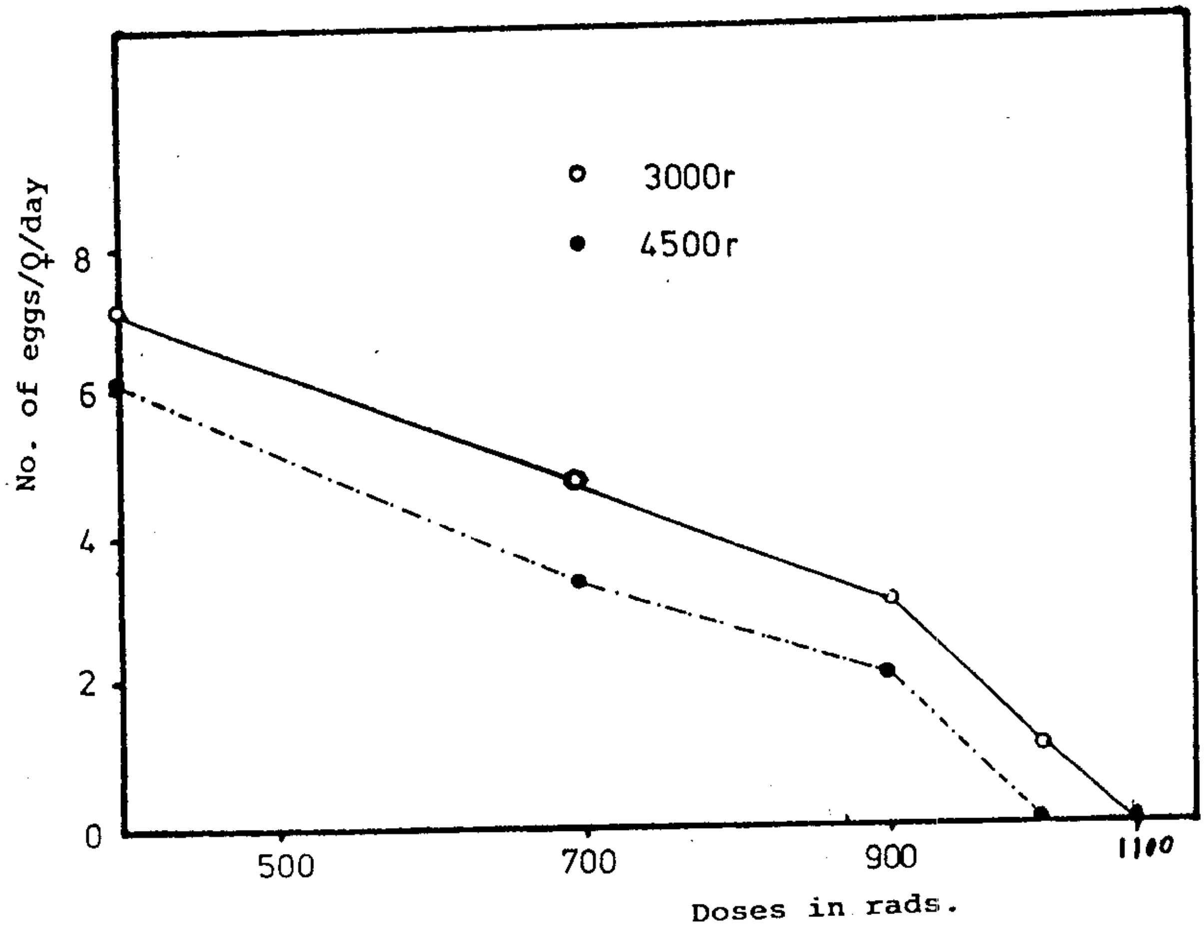

Fig. (26): Effects of exposing F_6 to (3,000 and 4,500 r) on the rate of egg laying of females of <u>Musca domestica</u> L. sequentially irradiated in 5 ancestor generations.

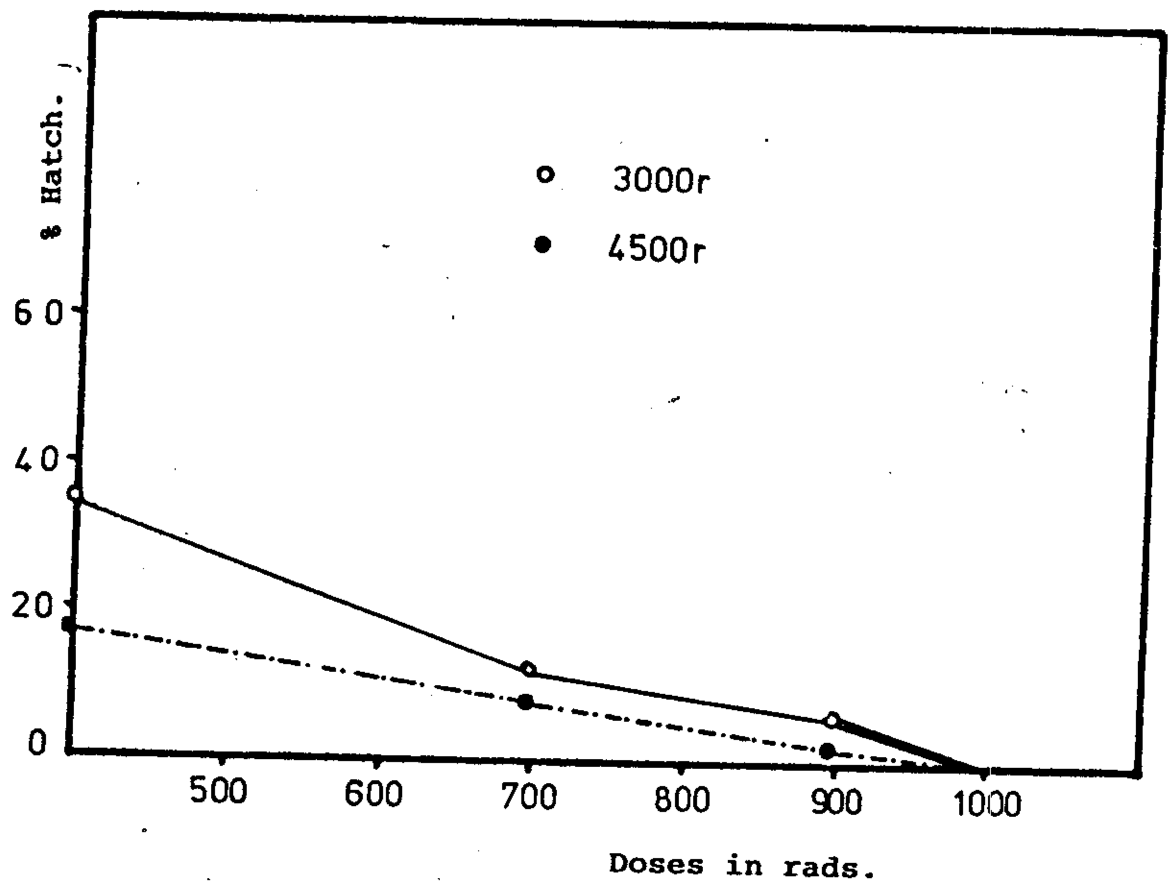

Fig (27): *Effects of exposing F_6 to (3,000 and 4,500 r) on the fertility of Musca domestica L. sequentially irradiated in 5 ancestor generations.*

Results in table (14) illustrated the following:

* **Fecundity** has been affected by acute exposure of gamma radiation.
* Acute dose 3000 rad when applied to the control group stimulated the egg production.
* Populations which treated successively with chronic irradiation doses and then offered an acute dose showed a negative response of fecundity and fertility.

Data in table (14) and fig. (27) indicated the following:

* There was a significant reduction in the number of eggs laid by females emerged from pupae successively irradiated with 700, 900 and 1100 rad for 5 generations and 3000 or 4500 rad as acute doses in the sixth generation.
* On the other hand, the number of eggs laid by females emerging from pupae "o" exposed and then offered 3000 rad was higher than their corresponding controls i.e. it was 7.11 ± 0.2816, 6.11 ± 1.3540 for the "o" exposed to 3000 or 4500 rad respectively while it was 6.3 ± 0.357 for control group.

Also table (14) and fig. (28) indicated that:

* **Fertility** was also affected by acute doses of 3000 and 4500 rad. Fertility of the irradiated selected populations was reduced. A remarkable decrease in the average of percentage hatch was observed, i.e the average percentage hatch was 85.77±0.3215%, 35.4±6.273%, 17.2±1.356% for control unexposed and control "o" exposed to 3000 or 4500 rad, respectively. Females treated previously with 1100 rad and 4500 rad as acute doses showed complete sterility.

2- Effect of two additional acute doses of 3000 or 4500 rad on adult emergence, sex ratio, adult longevity, fecundity and fertility of the F_{12} population

a- Adult emergence and sex ratio:

Effect of acute gamma exposure on the adult emergence and sex ratio of F_{12} population when treated previously for successive eleven generations to 700 and 900 rad was investigated. Data obtained was tabulated in table (15).

Table (15): Effect of the acute dose of 3,000 and 4,500 rad on percentage of adult emergence, sex ratio and longevity of the irradiated selected population (F_{12}) of <u>Musca domestica</u> L. (in days).

Treatment during 1st-11th generation rads	Treatment in the 12th generation rads	Average Adult emergence $\pm$ S.D.			Average sex ratio			Average adult longevity $\pm$ S.D.	
		No. of pupae	No. of emerged adults	Average % of adult emergence $\pm$ S.D.	% Males	% Females	sex ratio	Males	Females
Control	Control	196	161	82.14 ± 1.2503	41.8 ± 1.365	40.34 ± 0.02	1:0.967	22.27 ± 0.7572	24.77 ± 0.5770
Control "exposed"	3000	214	71	33.18 ± 1.4978	16.33 ± 0.4163	16.85 ± 0.9844	1:1.032	26.60 ± 1.3923	28.90 ± 0.2824
	4500	198	63	31.82 ± 0.557	15.7 ± 0.5508	16.12 ± 0.3215	1:1.028	26.50 ± 0.2520	28.50 ± 0.5510
700	3000	209	32	15.3 ± 1.2014	7.7 ± 0.3606	7.55 ± 0.8505	1:0.981	27.17 ± 0.9074	27.03 ± 1.5948
	4500	213	26	12.20 ± 1.4177	6.40 ± 0.3606	5.8 ± 1.0580	1:0.906	26.6 ± 0.4163	28.8 ± 0.3512
900	3000	231	21	9.10 ± 0.5568	4.46 ± 0.4163	4.63 ± 0.1528	1:0.963	18.40 ± 0.6032	26.77 ± 0.5773
	4500	205	12	5.85 ± 0.6807	2.7 ± 0.4510	3.15 ± 0.2310	1:1.167	23.86 ± 0.3215	25.20 ± 0.1000

Results in table (15) indicated the following:

* All population showed highly significant ($P<0.02$, 0.05) reduction in adult emergence than their corresponding controls.
* Exposure of pupae resulting from adults successively treated for eleven generations to 700 and 900 rad and then exposed to an additional acute dose of 3000 or 4500 rad showed no significant ($P<0.02$, 0.05) effect on the sex ratio when compared with controls. No difference in sex ratio was also shown in "o" exposed when compared with 700 and 900 rad populations.

b- Adult longevity:

The effect of acute exposure of gamma radiation on the adult life span of F_{12} population (treated previously with 700 and 900 rad and offered an acute dose of 3000 or 4500 rad) was tested. The obtained results were tabulated in table (15).

Tabulated results in table (15) indicated the following:

* Both males and females from the irradiated selected populations (exposed to an acute dose of 3000 or 4500 rad) survived significantly longer than their corresponding control ones, i.e males and females from the irradiated selected populations die at significant slower rate than males and females of the non irradiated population.

Data obtained in table (15) showed that:

* The control population lived significantly shorter than the "o" irradiated populations. Male survival periods of "o" exposed and 700 rad populations when offered 3000 rad was 28.6 ± 1.3923 and 27.17 ± 0.9074 days, respectively while it was 16.4 ± 0.6032 days for 900 rad population.
* The mean survival periods for control population was 22.27 ± 0.7572 days.
* At 4500 rad tratment, the same conclusion was observed i.e. the mean survival periods were 26.50 ± 0.252, 28.60 ± 4163 and 23.86 ± 0.3215 days for "o" exposed, 700 and 900 rad populations, respectively ($P<0.01$, 0.02).
* Female populations for all treatment ("o" exposed, 700 and 900 rad) when offered 3000 or 4500 rad,

lived significantly longer than the females of normal populations ($P<0.02$, 0.05).

C- Fecundity and fertility:

The effect of acute dose of 3000 or 4500 rad on the fecundity and fertility of F_{12} population was tested. Data were tabulated in table (16).

Table (16): Effect of dose of 3000, 4500 rad on adult rate of egg laying and fertility of irradiated selected population (F_{12}) of *Musca domestica* L.

Treatment during 11 generations rads	Treatment in the 12th generation rads	Average No. of eggs/♀/day	No. of eggs tested	No. of eggs hatched	Aver. % hatch ± S.D.
Control	Control	5.47±0.2401	50	42	84.00±1.0967
Control	3000	6.80±0.6557	63	8	12.70±0.5132
exposed "o"	4500	6.10±0.2646	82	0.0	0.0
700	3000	4.47±0.5508	67	31	4.63±0.2517
	4500	3.30±0.1000	72	0.0	0.0
900	3000	2.53±0.3214	53	0.0	0.0
	4500	0.0	0.0	0.0	0.0

Results represented in table (16) indicated the following:

* Data showed a high significant reduction in the average number of eggs laid by females ($P<0.02$, 0.05).
* It was also apparent that the fecundity of the females of 900 rad population reached its minimum value (2.53 ± 6.3214 eggs/♀/day) as compared with control (5.47 ± 0.2401 eggs/♀/day).
* Statistical analysis showed a high reduction in the average percentage of egg hatch. This reduction was correlated with the dose received in ancestor generations and, on the other hand, with the acute dose of 4500 rad being the sterilizing dose of *M. domestica* L. .
* Exposure of F_{12} population irradiated in ancestor generations to 900 rad and offered 3000 or 4500 rad showed complete sterility.
* In an attempt to evaluate the effect of acute exposure, results concluded that exposure of selected population to an additional acute dose of 3000 or 4500 rad could not increase the radio-resistance in fecundity and fertility as number of generations of the selection increased.

C- The effect of acute dose of gamma irradiation on sexual competitiveness of *M. domestica* L.:

A major problem in using irradiation to sterilize insects for sterile insect release programmes is that irradiation may debilitate the insects to an extent, that they no longer compete with native insects for mates. Thus, irradiated insects that are to be used in such programmes must be tested for sexual competitiveness.

I- Mating competitiveness of irradiated males mated with normal females:

Objective:

The present experiments were planned to clear out the following aspects:

The effect of acute sterilizing doses of gamma radiation on the competitiveness value of *M. domestica* L. males resulting from previously exposed potential strain to substerilizing doses for several generations.

a- Mating competitiveness of F_7 males:

The effect of acute exposure of gamma radiation on the mating competitiveness of F_7 males was investigated. The obtained results are tabulated in table (17).

Table (17): Sexual competitiveness of *Musca domestica* L. males treated successively with substerilizing doses of gamma radiation for 6 generations and subjected to acute gamma exposures of 3000 , 4500 rad in 7th. generation.

Treatment during paternal 6th. generation (rads)	Treatment in 7th. generation (rads)	Competition ratio	Average % hatch after						Competitiveness values after		
			1st. week		2nd. week		3rd. week		1st. week	2nd. week	3rd. week
		I♂:N♂:N♀	Obser.	Exp.	Obser.	Exp.	Observ.	Exp.			
control	---	0 : 1 : 1	80.10	---	81.20	---	80.90	---			
Treated Control "0"	3000	1 : 0 : 1	18.10	49.10	19.40	50.30	18.80	49.85			
		1 : 1 : 1	52.10	66.10	55.10	68.15	54.80	67.65	0.82	0.64	0.71
	4500	1 : 0 : 1	13.30	46.70	13.63	47.30	13.00	46.95			
		1 : 1 : 1	40.40	64.75	56.90	69.10	48.00	64.45	1.00	1.56	1.41
700	3000	1 : 0 : 1	15.20	47.65	15.90	48.55	15.70	48.30			
		1 : 1 : 1	49.10	64.60	58.00	69.60	51.80	66.35	0.91	0.54	0.81
	4500	1 : 0 : 1	12.10	46.10	11.10	46.15	12.00	46.45			
		1 : 1 : 1	45.80	62.95	46.10	64.35	49.00	64.95	1.02	1.00	0.86
900	3000	1 : 0 : 1	21.50	51.30	20.60	50.90	21.00	50.95			
		1 : 1 : 1	54.20	67.20	52.10	66.65	53.80	67.35	0.79	0.92	0.83
	4500	1 : 0 : 1	18.00	49.10	19.00	50.10	17.80	49.35			
		1 : 1 : 1	47.70	63.90	49.30	65.25	48.00	64.35	1.10	1.22	1.10
1100	3000	1 : 0 : 1	14.20	47.15	13.30	47.25	13.90	47.40			
		1 : 1 : 1	53.10	66.60	48.30	64.75	53.70	67.30	0.69	0.94	0.68
	4500	1 : 0 : 1	9.40	44.75	8.40	44.80	9.00	44.95			
		1 : 1 : 1	55.20	67.65	45.10	63.25	52.90	66.90	0.54	0.98	0.64

On the analysis of the obtained data, the following may be pointed out

1- 3000 rad treatment:

In the seventh generation the four selected irradiated populations were less competitive than the control ones ($P<0.01$) during the three weeks of the experiments; and these differences were significant.

Males of the 700, 900 and 1100 rad populations were apparently less competitive than males of the control population during the three weeks and these differences were significant. The difference in hatchability was significant at ($P<0.02$, 0.05).

Competitiveness values of 1100 rad male populaiton were less during the first week and high during the second week than those of "o" population (treated control). Statistical analysis showed a significant difference at ($P<0.05$) and ($P<0.02$) respectively.

From results represented in table (17) it was clear that:

When mating competitiveness of males of the four populations ("o" exposed, 700, 900 and 1100 rad) was assessed by the percentage egg hatch and the ratio used was 1:1:1 (I♂:N♂:N♀). The competitiveness value during the first week was 0.82, 0.91, 0.79 and 0.96, while it was 0.64, 0.54, 0.92 and 0.94 during the second week, but during the third week it was 0.71, 0.81, 0.83 and 0.68.

Data obtained in table (17) showed that when normal males were allowed to mate with normal females (0:1:1), the average percentage egg hatch was 80.1, 81.2 and 80.9 during the first, second and third week, respectively; while when treated males mated with normal female in the absence of normal males (1:0:1) the average of percentage hatching was 18.1, 15.2, 21.5 and 14.2 during the first week and 19.4, 15.9, 20.6 and 13.3 during the second week, while it was 18.8, 15.7, 21.0 and 13.9 during the third weeks for the treated control "o", 700, 900 and 1100 rad populations, respectively.

Results in table (17) indicated that during the first week the populations of M. domestica L. pupae previously treated for six generations with 700 rad when exposed to an acute dose of 3000 rad produced males that were less significantly (P<0.01) comptetitive than the "o" population ones.

Also at 1:1:1 ratio and for all doses the observed egg hatch of the competitive population was lower than expected, according to these results it may be assumed that competitiveness of males of M. domestica L. was affected by irradiation.

2- **4500 rad treatment:**

Males of the four selected irradiated populations when exposed to an acute dose of 4500 rad during the seventh generation showed different competitiveness values. Males of 700 and 900 rad populations showed competitiveness values higher than males obtained from "o" populations. Statistical analysis showed a significant difference ($P<0.01$) in egg hatchability during the three weeks of the experiment.

While the males of 1100 rad populations showed competitiveness values less than those obtained from the "o" populaiton (control exposed). These differences were significant during the three weeks of the experiment.

From these results it appears that exposing *M. domestica* L. males to an acute dose of 4500 rad had no effect on the viability of the sperms. So that irradiated males were able to compete with normal ones, but when treated males (exposed to 4500 rad) mated with normal females at all substerilizing dose the percentage of hatching decreased, however it was less than 30% compared with control (81.1%).

Results tabulated in table (17) indicated that:

The mating competitiveness of males of the four populations were 0.85, 1.02, 1.1 and 0.54 for the tested doses "o" exposed, 700, 900 and 1100 rad. during the first week and 0.58, 1.00, 1.2 and 0.98 during the second week, while it was 0.91, 0.86, 1.1 and 0.64 during the third week, respectively.

It has been also found that when normal males were allowed to mate with normal females (0:1:1) the average percentage egg hatch was 80.1, 81.2 and 80.9 during the first, second and third week, respectively. On the other hand at the ratio (1:0:1) the average percentage egg hatch was 13.3, 12.1, 18.0 and 8.4 during the second week while it was 13.0, 12.0, 17.8 and 9.0 during the third week for the treated control "o", 700, 900 and 1100 rad populations exposed to an acute dose of 4500 rad. At 1:1:1 for all doses the observed egg hatch of competing population was higher than expected.

The percentage of egg hatch at 4500 rad was much lower than that at 3000 rad at 1:0:1, while at 1:1:1 ratio there was a significant difference between the two acute doses although the percentage of egg hatch after exposure to 3000 rad was still higher.

b- Mating competitiveness of radiosterilized F_{13} males:

The mating competitiveness of males treated successively with 0, 700 and 900 rad of gamma radiation for twelve generations and offered an acute dose of 3000 or 4500 rad in the thirteen generation was studied. Obtained results were tabulated in table (18).

Table [18]: Sexual competitiveness of *Musca domestica* L. males treated successively with substerilizing doses of gamma radiation for 12 generation and subjected to acute gamma exposures of 3000 , 4500 rad in 13th. generation.

Treatment during paternal 12th. generation (rads)	Treatment in 13th. generation (rads)	Competition ratio	Average % hatch after						Competitiveness values after		
			1st. week		2nd. week		3rd. week				
		I♂:N♂:N♀	Obser.	Exp.	Obser.	Exp.	Observ.	Exp.	1st. week	2nd. week	3rd. week
control	---	0 : 1 : 1	82.20	---	81.00	---	83.00	---			
Treated Control "0"	3000	1 : 0 : 1	9.60	45.90	9.20	45.10	10.40	46.70			
		1 : 1 : 1	45.10	63.65	44.20	62.60	54.20	68.60	1.05	1.05	0.66
	4500	1 : 0 : 1	9.00	45.60	9.30	45.15	9.70	46.35			
		1 : 1 : 1	48.20	65.20	48.80	64.90	48.10	65.55	0.87	0.97	0.91
700	3000	1 : 0 : 1	8.10	45.15	9.20	45.10	8.90	45.95			
		1 : 1 : 1	43.20	62.70	41.50	61.25	42.00	62.50	1.10	1.20	1.20
	4500	1 : 0 : 1	5.20	43.70	6.40	43.70	6.70	44.85			
		1 : 1 : 1	44.10	63.15	46.40	63.70	45.10	64.05	0.98	0.87	0.98
900	3000	1 : 0 : 1	7.20	43.70	7.80	44.40	6.70	44.85			
		1 : 1 : 1	38.00	60.10	35.40	58.20	53.20	68.10	0.93	0.86	0.64
	4500	1 : 0 : 1	3.40	42.80	3.50	42.25	3.70	43.35			
		1 : 1 : 1	46.00	65.35	48.20	64.60	52.10	67.55	0.75	0.72	0.64

1- 3000 rad treatment:

Table (18) showed that, only "0", 700 and 900 rad populations could perpetuate to the thirteen generation. The competitiveness values for "0", 700 and 900 rad populations were 1.05, 1.1 and 0.93 during the first week and 1.05, 1.2 and 0.86 during the second week; while it was 0.66, 1.2 and 0.64 during the thirds week. Such values were assessed by the percentage of egg hatching observed at 1:1:1 ratio. It appears taht males of the 700 rad population were more competitive than males of "0" population according to the number of egg hatching during the three weeks.

It has also been found that at 0:1:1 ratio the average percentage of egg hatch was 82.2, 81.0 and 83.0% during the first, second and third week; respectively. While at 1:0:1 ratio the average percentage of egg hatch was 9.6, 9.2 and 10.4%, and 8.1, 9.2 and 8.9% during the first, second and third week for the "0" treated control and 700 rad population, respectively.

For 900 rad populations, it was 7.2, 7. and 9.7 during the first, second and third week, respectively. However, all these differences are statistically significant.

2- **4500 rad treatment:**

Mating competitiveness of males of the three populations "0", 700 and 900 rad offered an acute dose of 4500 rad in the thirteenth generation as assessed by the percentage egg hatch recorded for 1:1:1 ratios. The assessed competitiveness values were 0.87, 0.98 and 0.75 during the first week, 0.97, 0.87 and 0.72 during the second week, while it was 1.06, 1.0 and 0.71 during the third week.

Results represented in table (18) indicated that:

At 0:1:1 ratio the average percentage of egg hatch was 82.2, 81.0 and 83.0 during the first, second and third week, respectively. On the other hand, at 1:0:1 ratio there was a graet reduction in the average of percentage hatching (0.9, 5.2 and 3.4) during the first week and (9.3, 6.4 and 3.5) during the second week. While it was (9.7, 6.7 and 3.7) during the third week.

At 1:1:1 ratio for tested doses ("0" treated control, 700 and 900 rad) the observed egg hatching of the competing population was lower than expected ones.

Results obtained in table (18) indicated that competitiveness values increased by increasing the dose level ("0", 700 and 900 rad) for both 3000 and 4500 rad.

Emerging males from irradiated pupae at "0" and 700 rad populations were much more competitive than 900 rad male population. These differences were significant when the males were exposed to a dose of 3000 rad ($P<0.05$).

Results represented in table (18) showed that, at 1:0:1 ratio large numbers of eggs were laid by the normal females although the males used were irradiated with 3000 or sterilized by 4500 rad. However, in spite of this high egg production of the normal females mated with irradiated males, the percentage of egg hatchability was very low as compared with the controls. Statistical analysis showed that this reduction in egg hatchability was highly significant, while at 1:1:1 ratio females laid a smaller number of eggs than that laid by controls. Percentage of egg hatchability was slightly higher at 1:0:1 ratio, but less than control at 0:1:1 ratio.

II- Matting competitiveness of irradiated females mated with normal males:

The objective of the experiments was to extend the radiosensitivity to control the house fly *M. domestica* L. through exposing the 2-days old female pupae to acute dose of gamma radiation. The experiment aimed at the determination of the effect of substerilizing doses of gamma radiation on the mating competitiveness of the female population of the house fly. We are currently trying to adapt the sterile female technique to control the population of the house fly.

a- The effect of acute doses of gamma radiation on the mating competitiveness of F_7 females:

The effect of acute exposure of gamma radiation on the mating comptitiveness of F_7 females was tested. The obtained results were tabulated in tables (19, 20 and 21).

Table (19): Sexual competitiveness of <u>Musca domestica</u> L. females treated successively with substerilizing doses of gamma radiation for 6-generations and subjected to acute gamma exposure of 3000, 4500 rad in 7<u>th</u> generation. (First week).

Treatment during 6- generations (Rads)	Treatment during 7<u>th</u> gernation (Rads)	Ratio 1♀:N♀:N♂	Average No. of eggs/ ♀ /week	Average egg % infertility	Fraction of infertile eggs	Exp. % infertility	Corrected exp.% infert- ility	C.V.
0		0:1:1	45	19.9	0.2			
Treated 0	3000	1:0:1	16.8	77.7	0.78	48.8	35.76	
		1:1:1	24.5	54.9	0.55	--	33.74	1.54
	4500	1:0:1	12.8	81.7	0.82	50.8	23.74	
		1:1:1	24.5	54.8	0.55	--	--	1.62
700	3000	0:1:1	21.7	81.3	0.81	50.6	39.85	
		1:1:1	33.6	55.9	0.58	--	--	1.40
	4500	1:0:1	22.4	84.7	0.85	52.3	41.60	
		1:1:1	37.1	57.8	0.58	--	--	1.39
900	3000	0:1:1	17.5	87.7	0.88	83.8	39.40	
		1:1:1	21.7	56.0	0.56	--	--	1.42
	4500	0:1:1	11.9	89.7	0.90	54.8	34.64	
		1:1:1	25.9	58.0	0.58	--	--	1.40
1100	3000	0:1:1	13.3	91.3	0.91	55.6	36.20	
		1:1:1	31.5	54.0	0.54	--	--	1.49
	4500	0:1:1	9.1	93.0	0.94	56.8	32.45	
		1:1:1	22.3	57.0	0.57	--	--	1.76

Table (20): Sexual Competitiveness of *Musca domestica* L. females treated successively with substerilizing doses of gamma radiation for 6-generations and subjected to acute gamma exposure of 3000 , 4500 rad in 7th generation. (second week).

Treatment during 6- generations (Rads)	Treatment during 7th gernation (Rads)	Ratio 10:N♀:N♂	Average No. of eggs/ ♀ /week	Average egg % infertility	Fraction of infertile eggs	Exp. % infertility	Corrected exp.% infert-ility	C.V.
0		0:1:1	41.3	18.8	0.19			
Treated 0	3000	1:0:1	18.0	78.5	0.79	48.7	37.22	
		1:1:1	26.0	58.0	0.58	--	--	1.56
	4500	1:0:1	14.0	82.4	0.82	50.6	35.00	
		1:1:1	27.0	60.0	0.60	--	--	1.70
700	3000	0:1:1	23.1	80.9	0.81	49.9	41.23	
		1:1:1	39.2	52.5	0.53	--	--	1.27
	4500	1:0:1	25.9	84.0	0.84	51.4	41.10	
		1:1:1	39.2	52.0	0.52	--	--	1.18
900	3000	0:1:1	20.3	86.9	0.87	52.9	41.40	
		1:1:1	25.9	54.1	0.54	--	--	1.31
	4500	0:1:1	16.8	88.9	0.89	53.9	39.20	
		1:1:1	29.4	51.5	0.52	--	--	1.30
1100	3000	0:1:1	14.7	91.6	0.92	55.2	45.5	
		1:1:1	32.9	53.3	0.53	--	--	1.27
	4500	0:1:1	13.3	94.1	0.94	56.2	45.63	
		1:1:1	31.5	56.1	0.56	--	--	1.23

Table (21): Sexual competitiveness of *Musca domestica* L. females treated successively with substerilizing doses of gamma radiation for 6-generations and subjected to acute gamma exposure of 3000 , 4500 rad in 7th generation (third week).

Treatment during 6- generations (Rads)	Treatment during 7th gernation (Rads)	Ratio 1♀:N♀:N♂	Average No. of eggs/ ♀ /week	Average egg % infertility	Fraction of infertile eggs	Exp. % infertility	Corrected exp. % infert-ility	C.V.
0		0:1:1	44.1	19.1	0.19			
Treated 0	3000	1:0:1	17.5	79.8	0.80	49.5	36.33	
		1:1:1	25.9	55.1	0.55	--	--	
	4500	1:0:1	16.1	84.6	0.85	51.9	36.65	1.52
		1:1:1	26.6	58.8	0.59	--	--	1.60
700	3000	0:1:1	18.9	82.9	0.83	51.0	38.16	
		1:1:1	33.6	60.0	0.60	--	--	
	4500	1:0:1	25.2	84.4	0.84	51.8	42.60	1.57
		1:1:1	36.4	63.0	0.63	--	--	1.49
900	3000	0:1:1	17.5	86.5	0.87	52.8	38.00	
		1:1:1	26.6	60.5	0.61	--	--	
	4500	0:1:1	16.1	89.6	0.90	54.4	38.00	1.59
		1:1:1	33.6	64.2	0.64	--	--	1.69
1100	3000	0:1:1	13.3	92.2	0.92	55.7	35.90	
		1:1:1	33.6	62.7	0.63	--	--	
	4500	0:1:1	11.9	93.7	0.94	56.4	34.90	1.75
		1:1:1	30.8	60.7	0.71	--	--	1.75

Data in tables (19, 20 and 21) derived the following:

The irradiated females were fully competitive than normal ones. The house fly, M. domestica L. responded differently when irradiated as females. Fecundity of females (irradiated for 6-successive generations by substerilizing doses of 700, 900 and 1100 rad and exposed to 3000 and 4500 rad as acute doses) declined as the dose increased. Also, within treatments of either 3000 or 4500 rad, the fecundity was affected by the competition between irradiated and nonirradiated females. At any of the tested doses, when irradiated and nonirradiated females were paired together with nonirradiated males the egg production was generally lower than the control group.

The results in table (19, 20 and 21) indicated that 19.9% of the eggs in the control treatment, were infertile. Irradiation of females increased the infertility as the dose increased. During first week, at the tested doses ("0" exposed, 700, 900 and 1100 rad) the competition increased by increasing the dose of exposure and this observation was true for the acute dose exposure (3000 or 4500 rad). During second week; the reverse was true as the competitiveness values of females decreased by increasing the dose. Third week observations showed that competitiveness values of irradiated females increased by increasing the dose of exposure.

At all doses through the three weeks, the observed egg hatch was higher than the expected ones. During the first week, the competitiveness values at 3000 rad for "0" exposed, 700, 900 and 1100 rad were 1.54, 1.4, 1.42 and 1.49, respectively; for the second week, they were 1.56, 1.27, 1.31 and 1.27 for the tested doses, respectively. Also for the third week they were 1.52, 1.57, 1.59 and 1.75, respectively, for the same doses.

For 4500 rad exposure, the competitiveness values showed an increase in "0" exposed group and 1100 rad group (1.62 and 1.76, respectively), while it was 1.39 and 1.4 for 700 and 900 rad populations, respectively.

In general, females irradiated with high doses were more competitive than those irradiated with low doses, but the difference was slight.

b- The effect acute doses of gamma radiation on mating competitiveness of F_{13} females:

Results in tables (22, 23 and 24) indicated that, during the three weeks of the experiments, in "0" exposed population competitiveness values were increased than the other tested populations of 700 and 900 rad in both acute doses of 3000 or 4500 rad.

Table (22): Sexual competitiveness of Musca domestica L. females treated successively with substerilizing doses of gamma radiation for 12-generations and subjected to acute gamma exposure of 3000 , 4500 rad in 13th generation. (first week).

Treatment during 12- generations (Rads)	Treatment during 13th gernation (Rads)	Ratio 1♀:N♀:N♂	Average No. of eggs/ ♀ /week	Average egg % infertility	Fraction of infertile eggs	Exp. % infertility	Corrected exp.% infert-ility	C.V.
0		0:1:1	40.6	20.7	0.21			
Treated 0	3000	1:0:1	7.5	77.2	0.77	48.95	29.35	
		1:1:1	24.2	53.8	0.54	--	--	
	4500	1:0:1	7.9	80.8	0.81	50.75	29.77	1.80
		1:1:1	23.8	52.2	0.52	--	--	1.75
700	3000	0:1:1	12.5	89.7	0.90	52.20	36.47	
		1:1:1	25.3	47.7	0.48	--	--	
	4500	1:0:1	15.1	91.3	0.91	56.00	38.98	1.30
		1:1:1	32.3	52.5	0.53	--	--	1.35
900	3000	0:1:1	14.7	92.8	0.93	56.75	39.41	
		1:1:1	30.7	46.9	0.47	--	--	
	4500	0:1:1	8.3	95.7	0.96	58.20	32.90	1.19
		1:1:1	28.2	49.9	0.50	--	--	1.52

Table (23): Sexual competitiveness of <u>Musca domestica</u> L. females treated successively with substerilizing doses of gamma radiation for 12-generations and subjected to acute gamma exposure of 3000 , 4500 rad in 13<u>th</u> generation. (Second week).

Treatment during 12- generations (Rads)	Treatment during 13<u>th</u> gernation (Rads)	Ratio 1♀:N♀:N♂	Average No. of eggs/ ♀ /week	Average egg % infertility	Fraction of infertile eggs	Exp. % infertility	Corrected exp. % infert-ility	C.V.
0		0:1:1	39.9	19.7	0.2			
Treated 0	3000	1:0:1	9.8	77.9	0.78	48.80	31.13	
		1:1:1	27.3	52.9	0.53	--	--	1.70
	4500	1:0:1	11.9	79.9	0.80	49.90	33.78	
		1:1:1	24.5	52.1	0.52	--	--	1.54
700	3000	0:1:1	15.4	90.3	0.90	55.00	39.50	
		1:1:1	34.3	51.5	0.52	--	--	1.30
	4500	1:0:1	16.8	92.1	0.92	55.90	41.30	
		1:1:1	34.3	47.6	0.48	--	--	1.15
900	3000	0:1:1	11.6	92.6	0.93	56.15	36.44	
		1:1:1	30.8	48.7	0.49	--	--	1.34
	4500	0:1:1	14.7	95.9	0.96	87.80	40.46	
		1:1:1	31.5	47.7	0.48	--	--	1.18

Table (24): Sexual Competitiveness of *Musca domestica* L. females treated successively with substerilizing doses of gamma radiation for 12-generations and subjected to acute gamma exposure of 3000 , 4500 rad in 13th generation. (Third week).

Treatment during 12- generations (Rads)	Treatment during 13th gernation (Rads)	Ratio 1♀:N♀:N♂	Average No. of eggs/ ♀ /week	Average egg % infertility	Fraction of infertile eggs	Exp. % infertility	Corrected exp. % infert-ility	C.V.
0		0:1:1	42.7	18.5	0.19			
Treated 0	3000	1:0:1	9.1	78.5	0.79	48.5	30.54	
		1:1:1	30.1	53.7	0.54	--	--	1.75
	4500	1:0:1	14.7	80.5	0.81	49.5	35.36	
		1:1:1	29.4	53.8	0.54	--	--	1.50
700	3000	0:1:1	13.3	90.8	0.91	54.65	36.63	
		1:1:1	32.9	47.9	0.48	--	--	1.31
	4500	1:0:1	12.6	92.5	0.93	55.50	36.63	
		1:1:1	30.1	50.6	0.51	--	--	1.38
900	3000	0:1:1	11.2	93.1	0.93	55.80	43.18	
		1:1:1	31.5	45.9	0.46	--	--	1.38
	4500	0:1:1	14.0	96.8	0.97	57.65	39.00	
		1:1:1	30.1	45.0	0.45	--	--	1.15

In all treatments the expected egg hatch was higher than the observed egg hatch. Also egg production decreased by increasing the dose of exposure. Irradiated females were more effective than irradiated males in reducing the total number of progeny in the following generations. Moreover, irradiated females were found more effective in reducing the percentage egg hatch upon which judgments about relative competitiveness are usually based.