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A POSSIBLE BASIS OF INHERITANCE OF DDT RESISTANCE IN PHTHORIMAEA OPERCULELLA (ZELL.)

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SUMMARY

There was no significant departure from segregations which could be expected if a single autosomal gene were operating.

Concurrent with studies on the occurrence of insecticide resistance in *Phthorimaea operculella* (Zell.) in Queensland (Champ and Shepherd 1965*a*, 1965*b*), a preliminary examination was made of the inheritance of the DDT resistance found locally in this species.

Single-pair crossings and backcrossings of resistant and susceptible strains were made. First generation females from reciprocal crosses gave mortality responses of the order of 90% when dosed with 2 μg of DDT, the discriminating dose for susceptibles: all were killed at 5 μg. As the resistance allele had poor penetrance and a pure resistant strain giving no response at the susceptible discriminating dose could not be isolated, this dose only was used. Observed responses are given in Table 1.

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TABLE 1

SEGREGATION OF F1, F2, AND BACKCROSS PROGENIES IN DDT RESISTANCE INHERITANCE STUDIES ASSUMING A SINGLE GENE OPERATING
Expected progenies calculated for no penetrance of resistance allele in heterozygotes

—	Resistant × Susceptible					Susceptible × Resistant					Sub-totals and Totals				
	Expected		Observed		χ^2	Expected		Observed		χ^2	Expected		Observed		χ^2
	Susceptible	Resistant	Susceptible	Resistant		Susceptible	Resistant	Susceptible	Resistant		Susceptible	Resistant	Susceptible	Resistant	
F1 ..	34	0	32	2	—	99	0	90	9	—	133	0	122	11	—
F2 ..	92·25	30·75	86	37	1·694	222·75	74·25	235	62	2·695	315	105	321	99	0·457

	D.F.	χ^2
Heterogeneity between direction of mating	1	4·388
Deviation	1	0·457
Total	2	4·845

F1×R ..	85·5	85·5	77	94	1·690	151·5	151·5	166	137	2·776	237	237	243	231	0·304
R×F1 ..	88	88	83	93	0·568	167	167	160	174	0·587	255	255	243	267	1·129
Sub-total	173·5	173·5	160	187	2·101	318·5	318·5	326	311	0·353	492	492	486	498	0·146

	D.F.	χ^2
Heterogeneity between backcross direction and within direction of F1 mating	2	5·621
Heterogeneity between direction of F1 mating	1	2·454
Deviation	1	0·146
Total	4	8·221

F1×S ..	94	0	71	23	—	161	0	153	8	—	255	0	224	31	—
S×F1 ..	256	0	244	12	—	463	0	430	33	—	719	0	674	45	—
Sub-total	350	0	315	35	—	624	0	583	41	—	974	0	898	76	—

Male responses were heterogeneous and though established are not presented because of their unreliability. There was no indication in the data obtained that sex linkage of factors was implicated.

The results did not show any significant departure from segregations which could be expected if a single gene were operating. Within the groups comprising the resistant backcrosses, 2 groups of 17 observed gave aberrant segregations—all but 2 individuals of one group containing 31 individuals and all but 1 of another group of 19 were resistant. Both groups were derived from the same first generation cross. The segregations were similar to those expected from resistant individuals, indicating that another allele affecting resistance was present but at a low frequency.

REFERENCES

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