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CANALISATION AND THRESHOLD EFFECT OF THE EXTRA SCUTELLAR PHENOTYPE IN *DROSOPHILA MELANOGASTER*

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Payne (1918), Rendel (1959) and Fraser (1963) observed that the number of scutellar bristles in *Drosophila* is controlled by a polygenic system. Rendel (1959) and Fraser (1963) further consider that development is canalised at four bristles so that the infrequent wildtype flies with more or less than four bristles are caused by segregation of the scutellar genes producing combinations with a summed action of more or less than four bristles. Fraser (1963) described such variation as due to " genetic leakage " of the canalised genotype. During the analysis of the genetic variability in the natural population of *D. melanogaster* from Kulu Valley such a leakage has been found in the progenies of thirteen females out of a small sample of thirty-nine females inseminated in nature.

Selection for higher number of scutellar bristles yielded some very interesting results. It was carried on for nine generations (table 1) after which the individuals became sterile. During the first seven generations, ten females with the highest number of bristles and inseminated by unknown males were selected and mass cultured in each generation. In the subsequent generations the selection was extended to both the parents through pair mating. From the numbers of offspring of the pairs in the eighth and ninth generation it became evident that the sterility did not suddenly develop at the ninth generation. In the eighth generation three out of a total of nine crosses yielded comparatively low numbers of progeny and still lower fertility was shown by as many as four out of a similar set of nine crosses in the ninth generation.

A glance at table 1 reveals that though the selection raised the bristle number up to eight in the second generation, it failed to produce individuals

with nine bristles until the ninth generation. This would mean that the large number of genes, which it must be assumed were accumulated from the second to the eighth generation, were insufficient to produce the ninth bristle and produce only the eighth. Such an assumption is further supported by the fact that the frequency of individuals with eight bristles increases in the successive generations of selection. It, thus, seems that there exists a " secondary canalisation zone " of bristle development at eight where a wide range of summed genetic values all lead to the expression

TABLE 1

Frequency distribution of the number of scutellar bristles, average number of bristles per individual and percentage of the flies carrying the extra bristles, through nine generations of selection

Generation	Frequency of individuals with bristles												Total	Average no. of bristles per fly	Per cent. of flies showing effect
	4		5		6		7		8		9				
	F	M	F	M	F	M	F	M	F	M	F	M			
1st .	21	11	10	5	2	5	1	...	...	...	...	...	55	4·582	41·818
2nd .	56	118	77	41	64	12	17	1	3	...	...	...	389	4·868	55·269
3rd .	23	45	26	15	31	15	5	1	...	...	...	...	161	4·938	57·766
4th .	67	182	128	105	159	41	39	6	4	...	...	...	731	5·072	65·938
5th .	39	62	48	42	44	21	17	2	9	...	...	...	284	5·102	64·436
6th .	66	88	75	40	64	37	36	7	14	...	...	...	427	5·105	63·937
7th .	16	105	55	134	123	68	62	14	22	1	...	...	600	5·485	79·833
8th .	16	65	54	123	135	121	141	35	39	3	...	...	732	5·892	88·934
9th .	33	114	78	105	97	36	53	8	4	1	1	...	530	5·466	72·264

F = females M = males

of eight bristles. In terms of polygenes, it may be concluded that although a number of genes are needed to pass the canalisation of the scutellar bristles at four, a still higher number are required to give a threshold effect to produce more than eight bristles.

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