

A RECESSIVE SLATE PLUMAGE COLOR OF TURKEYS

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TWO reports have been published dealing with the inheritance of slate color in the plumage of turkeys: one is a brief abstract of a paper presented by Robertson,⁵ who reported that "slate" differs from 'bronze' by a dominant diluter"; the other is a brief note by Taibel,⁶ who obtained seven slate, four lilac and five bronze progeny from a pair of slate turkeys and concluded that slate turkeys are heterozygotes like Blue Andalusian chickens.⁸

Experimental Matings

In 1936 the El Solyo Ranch, Vernalis, California, kindly furnished me with two slate-colored hens which had been hatched out of their Bronze breeding stock, and had barring clearly indicated on the wings. These were mated, one to a Bronze male, the other to a Bourbon Red male. The plumage pattern genes involved in these crosses are: *R* (Bronze), *r* (Bourbon Red), *sl* (slate) and *Sl* (non-slate). The progeny of the Bronze male and slate female all had down and later plumage typical of the Bronze. The F_2 generation comprised the down (and plumage) patterns shown in Table I.

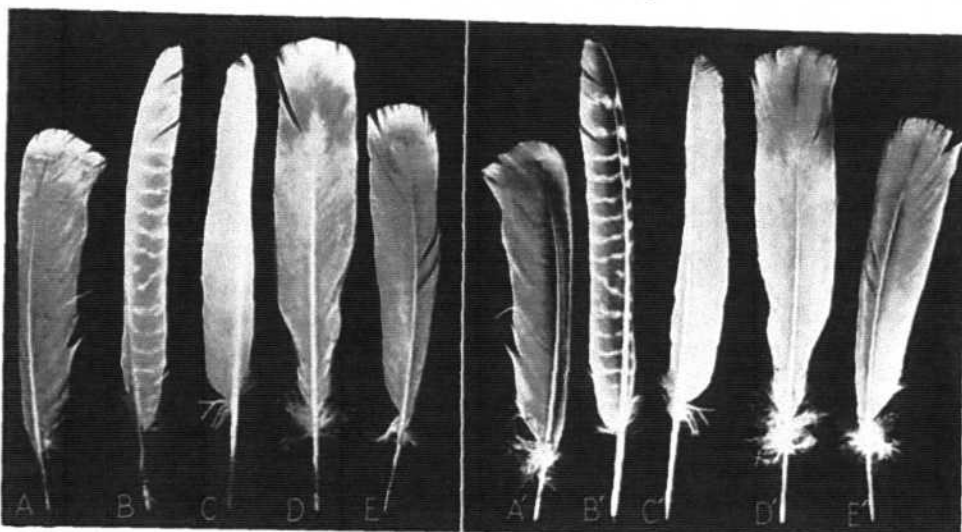
This is clearly a good approximation to a ratio of 3 Bronze to 1 slate expected if slate were a simple autosomal recessive to Bronze. The slate hen mated to a Bourbon Red male produced only a few progeny but these were of two types: Bronze and F_1 pattern, the latter typical of crossbreds obtained when the Bronze and Bourbon Red varieties are crossed.¹ Eggs laid for two weeks after the mating was made were discarded; but since subsequent experience agrees with that of others which indicates that a much longer period of not less than four weeks is desirable, it is almost certain that the

Bronze progeny were out of a previous mating. A hybrid Bronze male was mated to two F_1 females with Bronze and F_1 patterns respectively. The results obtained are shown in Table II.

Subsequent matings of Bourbon Red males with slate females or reciprocal matings have given either all F_1 pattern progeny or F_1 pattern and Bourbon Red pattern. The numbers of each kind obtained from the latter matings are: F_1 pattern, 28 ♂♂, 29 ♀♀; Bourbon Red pattern, 21 ♂♂, 20 ♀♀. Equal numbers are expected in each class while actually there was a deficiency of poults with red down. This may be due to lower viability of the red poults, caused by linkage of detrimental genes with the *r* gene, in the closely inbred Bourbon Reds which were used, or it may simply be the result of random sampling.

The F_1 pattern (*RrSlsl*) progeny out of the matings just described were mated *inter se*. The results are shown in Table III. The F_1 pattern birds gave non-slate progeny which conformed to the expected ratio of 1 Bronze : 2 F_1 pattern : 1 Bourbon Red pattern.¹ The slate progeny comprised birds that had barred flight feathers and penciled tail feathers and also birds with unbarred, nearly white, flight feathers and unpenciled slaty red tail feathers, some of which were white in the middle. The latter looked like birds that Taibel⁶ has called lilac. It should be emphasized that while the lilac colored birds differ in shade or color from other slates, they are, nevertheless, a slate-colored bird distinct from all non-slate birds.

The Bourbon Red pattern birds out of slate mated with Bourbon Red gave only Bourbon Red and lilac (slate) progeny (Table III). The slates here reported have been mated to Black-



FEATHERS OF SLATE AND LILAC TURKEYS

Figure 2

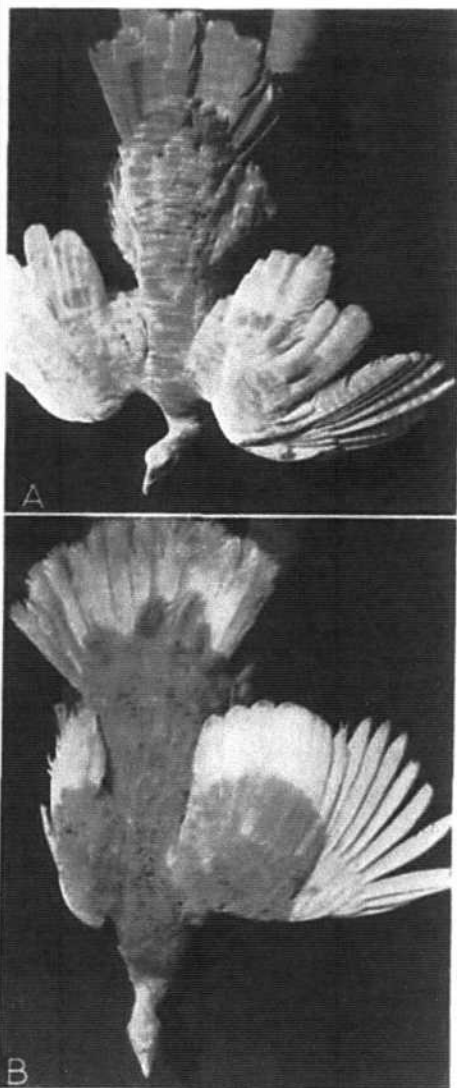
The upper (A-E) and lower (A'-E') surfaces of five feathers are shown. A-A'—tail feather (penciled) from a slate turkey; B—barred primary (outer flight) feather from slate turkey (Figure 3A); C—primary feather from a lilac turkey (Figure 3B); D and E—center and outer tail feathers from a lilac turkey. Note that the outer tail feathers of this lilac turkey have the pigment distributed throughout the feathers whereas a part of the feather from the center of the tail is white. The pigmented parts of the feathers are much more deeply pigmented on the lower surface (A'-E') than on the upper.

winged Bronze² and Narragansett pattern birds and in each case the progeny were non-slates.

Discussion

The evidence presented in this paper leaves no doubt that the gene for slate is in this case recessive to non-slate. The exact shade and the distribution of color, as shown in Figure 3, depends upon the genetic constitution of the individual. Since not enough information is available to consider this a dilution factor, it seems best to use *sl* for this slate gene rather than the *D* of Marsden and Martin⁴ until the claim of Robertson⁵ that there are dominant slates can be confirmed or refuted. The fact that our slates look like those seen at shows and elsewhere does not exclude the possibility that there are dominant and recessive genes determining phenotypically similar plumage patterns in the turkey just as there are such genes for white plumage color in chickens.

There is nothing in our results to support the suggestion of Taibel⁶ that slates do not breed true although obviously slates of the constitution *Rrslsl* will produce a ratio of three slates with barred wings to one lilac. The effect of the *R* and *r* genes on the distribution of pigment is, therefore, the same in these slates as it is in non-slate individuals. The *R* gene is responsible for the production of black pigment, the *r* gene for brown pigment. Birds carrying the *R* gene have barred flight feathers and penciled main tail feathers; while birds homozygous for *r* lack barring and penciling in these sections. In both these effects the *R* gene is dominant to *r*; but since the heterozygotes have lighter colored flight and main tail feathers than birds homozygous for *R*, they are readily distinguished from them at all stages as shown elsewhere.¹ Slates of the constitution *Rrslsl* resemble those homozygous for *R*, but a careful study has not been made to determine whether they can be distinguished by examination.



SLATE AND LILAC TURKEYS

Figure 3

A—Slate turkey with barred flight feathers and penciled tail feathers. B—Lilac, a slate with nearly white flight feathers and some white in the unpenciled tail feathers. The lilac birds are genetically slates, homozygous for the Bourbon Red gene.

Summary

Slate-colored birds were mated to Bronze, Bourbon Red, Black-winged Bronze, and Narragansetts. All the first generation progeny were non-slate regardless of which way the cross was made. Approximately three non-slate

were obtained to each slate in the F_2 generation. It is therefore concluded that slate is a simple autosomal recessive to non-slate.

Slates carrying the Bronze color gene (R) have barred flight feathers and penciled tail feathers; slates (lilac) homozygous for the Bourbon Red gene (r) have nearly white, non-barred flight feathers and non-penciled tail feathers.

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TABLE I.— F_2 generation from a slate female mated to a bronze male.

Sex (and plumage pattern)	Obtained Numbers	Expected Numbers*	Probable Genotypes
Bronze males	70	70	RRSlal, RrSlal
Bronze females	70	70	RRSlal, RrSlal
Slate males	24	20	rrSlal
Slate females	21	24	rrSlal

*Calculated separately for males and for females

TABLE II.— F_2 generation out of slate hen mated to non-slate. The F_1 male used had Bronze plumage (RRSlal). This male and the Bronze female were presumably out of a Bronze male whereas the F_1 pattern (RrSlal) female was out of a Bourbon Red male.

Sex (and plumage pattern)	Out of Bronze pattern hen		Out of F_1 pattern hen		Probable Genotypes
	Obtained Numbers	Expected Numbers	Obtained Numbers	Expected Numbers	
Bronze	14	14.8	11	10	RRSlal, RrSlal
F_1 pattern	—	—	12	12	RrSlal, rrSlal
Slate	5	4.0	9	9	RrSlal, rrSlal

TABLE III.— F_2 generation from slate male \times Bourbon Red female. The parents (F_1 generation) used had the F_1 pattern or Bourbon Red pattern.

Sex pattern of the progeny (F_2 generation)	Parents - F_1 pattern (RrSlal)		Parents - Bourbon Red pattern (rrSlal)		Probable genotypes
	Obtained Number	Expected Number	Obtained Number	Expected Number	
Bronze	11	14.25	—	—	RRSlal, RrSlal
F_1	31	20.50	—	—	RrSlal, rrSlal
Bourbon Red	15	14.25	20	20.25	rrSlal, rrSlal
Slate (or lilac)	21	10.25	—	—	RrSlal, rrSlal
Lilac only	—	—	20	20.75	rrSlal
Total	78	70	115	115	