XXIII. A PRELIMINARY REPORT ON THE GENETICS OF A RED SPOTTED SEX LIMITED MUTATION BRUCHUS

Clarence Lee Furrow.

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This report is concerned with the genetic behavior of a 'sex limited' mutation which occurred in a stock of culture of *Bruchus*, the four-spotted cowpea weevil.

In the wild or normal stock tan is the common body color. The female of the wild type carries four black spots, two on each elytrum. The male is less conspicuous than the female, as he is much smaller in size and does not have spotted elytra; however, the factors for body color and elytra pattern are carried by the male even though they are not manifested somatically.

During the year of 1917, while investigating a stock culture of

Bruchus pure for tan, Dr. J. K. Breitenbecher observed a female with red body color. This mutant female was mated with a normal tan male by him and inbred until a mass culture pure for red was obtained. In this race of insects the female has the usual four black spots of the wild type, and the red body color of the mutation, while the male is a tan phenotype but a red genotype.

On September 22, 1921, a female was found in a mass culture pure for red body color which had four red spots instead of the four black spots. This mutant female with red body color and red spotted elytra was mated with a male that was pure for red. After several matings for homologous mutants, a culture was obtained that was pure for both red body and red spots.

It is of special interest to note that this character is sex limited, that is, manifested only in the female. The male of this strain is pure for the same factors, but every male appears tan in body color and has no elytra pattern visible. This kind of sexual dimorphism is known as 'sex limited,' and is often called a secondary sex character. As a result of this we have two different types of insects produced.

The factor symbol for red spots may be represented by (SS) and that of black spots by (ss). Then by crossing a female pure for red spots (SS) with a male pure for the same (SS) the resulting offspring will every one be pure for red spots (SS).

Experiments

One female pure for red spots was mated with a spotless male, pure for black spots. The resulting female offspring were all red spotted. Sufficient data has been obtained to show that the normal black spots is a Mendelian recessive to the red spotted mutation; in other words the mutation is a complete dominant to the black spots of the tan wild type.

A mutant female, pure for red spots was bred to a male pure for red spots. No black spotted females were obtained, but ten red spotted females and nineteen tan males carrying (SS) were observed.

When a red spotted female (SS) is mated with a non-spotted male (ss) carrying black spots, their female offspring were all red spotted (Ss), but the males were all non-spotted.

By crossing the F_1 males and females from the above experiment (both of which were heterozygous (Ss) for red and black spots) the following F_2 offspring were obtained: twenty-nine red spotted females whose genetic constitution may be represented as (SS, Ss, and sS) nine black spotted females (ss) and twenty-two non-spotted tan males (SS, Ss, sS, and ss).

Since the red spotted character is dominant to the black for the

females, one fourth will be pure for red spots, one-half will be heterozygous for red and black, but will appear as red spots, and one-fourth will be homozygous for black spots. This is confirmed by the experimental results of the cross. All the males from this mating were non-spotted in appearance, but each bear the same gentic factors of the gametes as manifested for the above females.

A heterozygous female (Ss) was mated with a homozygous black male (ss). This is really a back cross of a female manifesting red spots, and whose gametes carry both red and black spots with the F_1 male that was pure for black spots. The offspring from this cross were ten red spotted females (Ss), eleven black spotted females (ss) and twenty tan non-spotted males (Ss and ss). This result conforms to the theoretical expectation of such a cross, in that we have obtained the 1:1:2, sex limited ratio.

The reciprocal cross demonstrates a similar inheritance. A homozygous black spotted female (ss) was mated with a heterozygous non-spotted tan male (Ss). Six black spotted females (ss), four red spotted females (Ss), and eight non-spotted tan males (Ss and ss) were the offspring from this cross. Here again the sex limited results may be interpreted as a 1:1:2, ratio. Obviously the results of this cross show one-half of the females are red spotted and heterozygous, and one-half are black spotted and homozygous, and the offspring obtained while small in number, are in line with the theoretical expectation.

The data presented in this paper are not sufficient to permit any final conclusions, however, a fundamental genetic behavior which is in keeping with sex limited inheritance, is demonstrated. More data are being accumulated, and all of it confirms so far the above interpretation.

Conclusion

These experiments show that red spotting is due to a mutation; that is a complete dominant to the black spots in the tan wild type; and that the particular kind of sexual dimorphism exhibited here is in accordance with the behavior of the 'sex limited' type of inheritance.