Mutant Trait Of Drosophila Mel Essay, Research Paper

Mutant Trait of Drosophila melanogaster

The mode of inheritance for the mutant trait giving a dark

dark body phenotype was determined using Drosophila

melanogaster. This phenotype was determined to be result

of the ebony mutant trait. An initial mating was set up

between homozygous mutant males, and homozygous normal

virgin females. The F1 generation was examined and then

allowed to self cross. Then the resulting F2 generation was

examined and the frequency of the mutant phenotype was

noted. This frequency is consistent with that of an autosomal

mode of inheritance. X2 analysis was used and the results

supported the autosomal recessive mode of inheritance.

X2=.0136; P>.95; D.F. = 1.

INTRODUCTION

Drosophila melanogaster is a convenient organism for genetic study because it is small, breeds prolifically, and has a short generation time. Drosophila melanogaster has four chromosomes in each one of its cells. (1) When the genes are not passed on to the next generation in exactly the same form that is present in the parents then this can produce mutant forms of the organism. (1) One type of mutation that has been discovered in Drosophila melanogaster is the ebony mutant. The phenotype of ebony flies includes a difference in body color, compared to the normal, which can vary from shining black to slightly darker than the normal. (2) During the larva period the mutants can be identified by the darkened color of spiracle sheaths. (2)

This mutation is recessive and the gene is located on chromosome 3. (1) Looking at this information it can be determined that the ebony mutant is an autosomal recessive trait. The term autosomal means that the mutant gene is located on one of the three chromosomes besides the sex chromosomes. If the gene was located on the sex chromosome then the type of inheritance would be sex-linked. Recessive inheritance occurs when both matching genes must be abnormal to produce the recessive phenotype, compared to dominant inheritance, when only one copy of the of the abnormal gene is needed to produce the dominant phenotype. (3) In recessive inheritance, when only one copy of the abnormal gene is present these individuals are known as carriers. Carriers have completely normal phenotypes. (3) The following punnet squares will show the ratios of normal to mutant offspring following the autosomal recessive mode of inheritance. A=normal allele (dominant) a=mutant allele (recessive)

A A

a A a A a

a A a A a

This is a cross between a homozygous normal and a homozygous mutant organism. All of the offspring will have normal phenotypes, but they will also all be carriers.

A a

A A A A a

a A a a a

This is a cross between to heterozygous dominant organisms (carriers). The phenotypic ratios are as follows: 75% of the offspring will have normal phenotypes, and 25% will have the mutant phenotype. The genotypic ratios are as follows: 25% will be homozygous dominant (AA), 50% will be heterozygous (Aa) carriers, and 25% will be homozygous recessive (aa).

Another aspect that needs to be considered is that this trait follows the complete dominance theory. In complete dominance the recessive allele makes no contribution to the phenotype in a heterozygous individual. (4) The dominant allele completely masks the phenotype of the recessive allele. Therefore, carriers, who contain one dominant and one recessive allele, will appear identical to an individual who is homozygous dominant.

METHODS AND MATERIALS

The purpose of this experiment was to determine the mode of inheritance for a mutant trait present in Drosophila melanogaster. To do this homozygous mutant males were mated with normal virgin females. Before the mating was set up, a vial of normal male and female flies was examined. The purpose of these flies was to provide a comparison for the mutant flies, so that the mutant trait could be discovered. The flies were anesthetized using Fly Nap. After looking at the normal flies the mutant flies were anesthetized and examined. After the mutant trait was identified, the mutant flies were separated into groups of males and females. Nine of the mutant males were added to a vial containing virgin normal females. The vial contained rehydrated banana meal with a small amount of yeast on top. The vials used were clear, plastic and about 150 ml in volume, and were corked with foam rubber. The vials were kept in an incubator that was about 24.1 degrees Celsius at all times except when they were under examination. A week later the vial that contained the mutant males and normal virgin females were removed from the incubator and the parents were removed. The larva were then placed back into the incubator. Two weeks after the initial cross was set up the F1 generation had hatched. These flies were anesthetized and examined under the stereomicroscope, and the frequency of the mutant trait was noted. This generation was then returned to the vial and then to the incubator so that they could mate and produce the F2 generation. The same procedure was then repeated for this mating. After the F2 generation emerged they were examined and the frequency of the mutant phenotype was noted.

RESULTS AND CONCLUSION

The mutant trait in this experiment was determined to be dark bodies, also known as the ebony mutant, which was determined to have an autosomal recessive mode of inheritance. The expected results for an autosomal recessive cross is to have an F1 generation that is 100% normal, and the F2 generation should be 75% normal and 25% mutant. The sex of the flies is not relevant in an autosomal mode of inheritance. Our results from this experiment gave an F1 generation that was 100% normal, and our F2 generation which consisted of 98 flies, had 74 normal flies and 24 mutant flies. Both groups contained males and females. This yielded X2=.0136; P>.95; D.F. = 1 which supported the hypothesis of autosomal recessive inheritance.

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