Dihybrid cross and chi square

Science, Biology

The paper " Dihybrid Cross and Chi-Square" is an excellent example of a lab report on biology. One of the most fascinating properties of a living cell is its ability to transfer its hereditary properties from one generation to another. G. J. Mendel’s plant-breeding experiments provided proof for such hereditary patterns. Mendel’s experiments with peas helped him define three basic laws of inheritance known as Mendel’s Laws of Inheritance. The first principle deals with the hereditary characters i. e. passing of genes from parents to off-springs. The second principle or principle of Segregation states that during breeding the inheriting factors or alleles segregate into the reproductive cells and unite randomly during fertilization. The third principle also is known as the Law of Independent Assortment states that genes located on different chromosomes will be inherited independently. Thus, it is today established that each trait is controlled by variations of a single gene. These two variants are referred to as alleles- one is derived from each parent. These controlling genes are responsible for variations in both phenotypic and genotypic makeup, where phenotypic makeup refers to the physical appearance of the offspring (e. g. Green pea) and the genotypic makeup refers to the genetic composition (e. g. Gg for green pea). Again, the genotypic makeup depends on the type of allele present. If an individual has two copies of the same allele they are known as homozygous (e. g. RR, rr) while an individual with two different copies of the same allele is referred to as heterozygous (e. g. Rr) (Watson et al, 2004). In some cases, the dominant nature of a gene may be both homozygous and heterozygous. Homozygous dominant refers to the gene which is dominant in its homozygous form while heterogous dominance is the state of a gene when the gene expresses in its

heterozygous form.

A Punnett Square is a representation of the phenotypes and genotypes in a tabular form and gives a much simple representation of possible off-springs from the parental gametes.

Within a population, some phenotypes are more common than others owing to their dominant feature and their success in establishing themselves in the population. In fact, variation occurs in all living organisms including plants. Corn also shows variations in the form of colors. Corn kernels may be yellow or purple.

In this lab, a dihybrid cross is performed between two different corns having different genotype and phenotypes and investigate if they follow Mendel’s principles.

Hypotheses- In the dihybrid study where the heterozygous F1 generation of purple starchy (P/p S/s) is crossed the ratio of the resultant off-springs will be 9: 3: 3: 1 (56% purple & starchy, 19% purple & sweet, 19% yellow & starch and 6% yellow & sweet).

Method

In this laboratory, the dihybrid cross between purple starchy (P/P S/S) and yellow sweet (p/p s/s) was studied. The phenotype of the offsprings was then recorded by working in pairs and marking and counting the grains. The values were recorded in the table below (Table 1).

The Chi-square test is used to compare the observed and the expected data and analyze the extent to which they differ using the probability of p= 0. 1.

Results

The observed and expected values are tabulated. We see that Purple/sweet numbers obtained are a mere 73 whereas its expected value is 257. 63. Also, in the case of yellow/sweet the observed value is 297 which is much higher than the expected value of 85. 88. The ratio of the observed is very much different from the expected ratio of 9: 3: 3: 1. However to analyze the degree to which the ratios differ we employ the chi-square test with a degree of freedom= 3, however the deviation too large to obtain data. From the given table of Chi-square, the value cannot be determined.

Discussion

The chi-square value that we get is extremely high. In fact, the purple-sweet phenotype is observed much below the expected value while yellow-sweet phenotype is extremely high than the expected value and therefore the hypothesis cannot be true.

From the results, it can be said that sweet is recessive but the recessive nature of yellow cannot be determined.

We can reject the hypothesis owing to jumping genes or transposons which cause color disruption in corn. It was owing to these jumping genes that some corns were not completely yellow in color. Transposons do not comply with Mendel’s principles.

Conclusion

This experiment investigates and establishes that existence of transposons

has the potential to change both genotype and phenotype and thus the expected ration of 9: 3: 3: 1 in a dihybrid cross is not always obtained.