30 AN EXERCISE TO ILLUSTRATE THE CONCEPT OF GENETIC DRIFT

30.1 INTRODUCTION

In randomly mating large populations, according to Hardy-Weiberg principle (refer to unit 20 of LSE-03 course—Behaviour of genes in populations), the frequency of any given pair of alleles tend to remain constant in the absence of selection and mutations. If selection and mutations do occur then the frequencies do change and such changes are usually small and slow. In unit 13 of the LSE-07 course, we have discussed the behaviour of genes in **small populations,** and the concept of **genetic drift** was illustrated with a small population of mice living as four or five extended families in the rice barn of a farmer. (You may read this section of unit 13 before you commence doing this exercise). In small populations due to sampling error there will be random changes in the frequencies of genes in the population. Such changes or drift in gene frequencies may eliminate well adapted traits from the population and fix the less adapted ones. We mentioned in the previous exercise that under the influence of natural selection neither the fixation (100%) nor elimination (0%) of a trait occurs. Under the influence of the genetic drift, a trait may become fixed (100%) or even eliminated (0%) from the population. In this exercise we shall illustrate the concept of genetic drift with a simple exercise.

Objectives

At the end of this exercise you should be able to:

- distinguish the specific role of natural selection and genetic drift in the evolutionary process

30.2 MATERIALS REQUIRED

plastic beads (big sized ones) of green, red, blue and black colours—500 each.

two plastic bowls.

30.3 PROCEDURE

As in the previous exercise, let us assume the green colour is favoured by selection and black colour is opposed by it.

1. From a population of 2000 beads (500 of each colour) kept well mixed in a plastic bowl, just pick out 10 beads with your finger tips. This should be done at random without looking into the bowl. Let us say that the 10 beads belong to the four colours in the following way:

Green	4
Red	1
Blue	3
Black	2

2. Record these results in your note book. Now, with the above frequencies make a population of 100 heads.

The distribution will be

Green	40
Red	10
Blue	30
Black	20
	100

3. Out of these 100 beads, once again pick up ten beads with your finger tips. Suppose you get the following.

Green	0
Red	2
Blue	3
Black	5
	10

Record your results.

4. Now there are just there colours left. Once again make a total of 100 heads based on new frequencies. This would mean no greens, 20 reds, 30 blues and 50 blacks to make a hundred. Out of these hundred pick up 10 beads. Suppose, you get the following distribution.

Red	0
Blue	4
Black	6

Record Your results.

5. Now with the new frequencies, make up a population with 40 blues and 60 blacks. Pick out ten beads out of these hundred and you may get the following figures

Blue	3
Black	7

Record your results.

6. Repeat the experiment after they were made upto 100 beads with 30 blues and 70 blacks. Supposing we get the following:

Blue	0
Black	10

Record your results.

7. Put your results on a graph sheet

30.4 INFERENCE

You may observe here that the green colour favoured by the selection process is eliminated from the population by the third generation. On the contrary the black colour which is normally opposed by the selection gets fixed in the population by about sixth generation.

SAQ

1. Why does this happen?

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2. Do you think that the effects of genetic drift are quite opposite to the ones produced by natural selection? Why?

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3. Can genetic drift be a significant factor in the evolutionary process?

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