

ANIMAL GENETICS & BREEDING

UNIT - III

The Principles of Animal Breeding Theory

Inbreeding

Dr Anil Meel

Department of Animal Genetics & Breeding
MJF Veterinary college

Inbreeding

- Inbreeding means mating between individuals that are related to each other by ancestry .
- It's very common in small population.
- It is totally opposite to out breeding.
- It creates lot of genetic disorder like haemophilia, cysic fibrosis, sickle cell anemia an.d so on

Inbreeding:

Example :

- (i) Selfing
- (ii) Full - sib mating
- (iii) Half-sib mating
- (iv) Parent-offspring mating
- (v) Mating of cousin brother - sister, etc.

❖ Classification of Inbreeding :

1. Close breeding:

Mating of more closely related individuals.

Example:

- (i) Selfing - the closest form of inbreeding
- (ii) Parent - offspring mating
- (iii) Full-sib mating

2. **Line breeding:** It is a form of inbreeding in which an attempt is made to increase the frequency of superior genes of an outstanding ancestor among the inbreds of future generations.

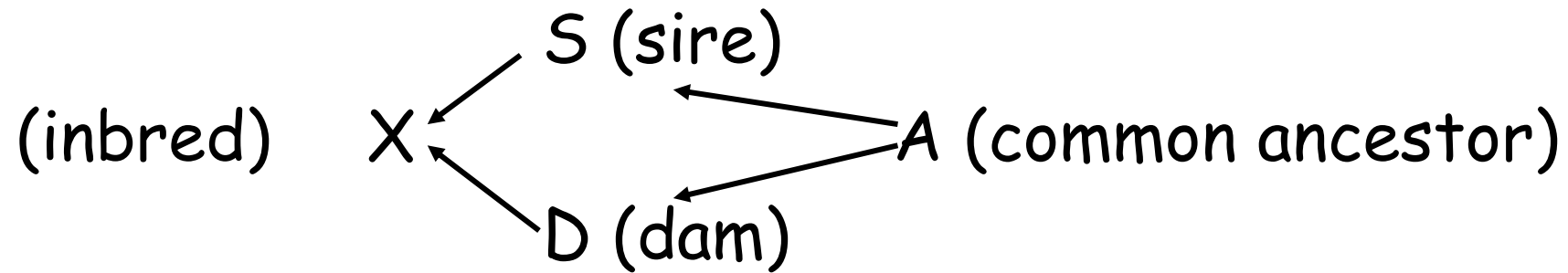
Example : (i) **Half-sib mating**

(ii) Mating of a sire continuously with its daughter, grand daughter, grate grand daughter, and so on, so that superior genes of sire persist among the progeny.

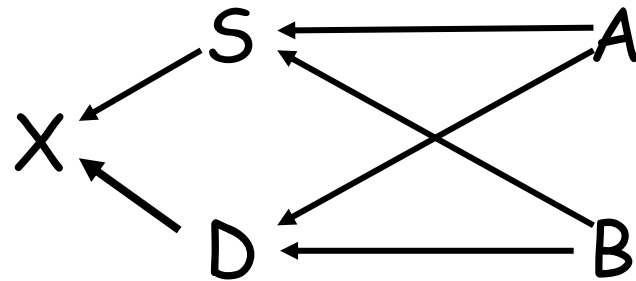


Pedigree diagram of different types of inbreeding :

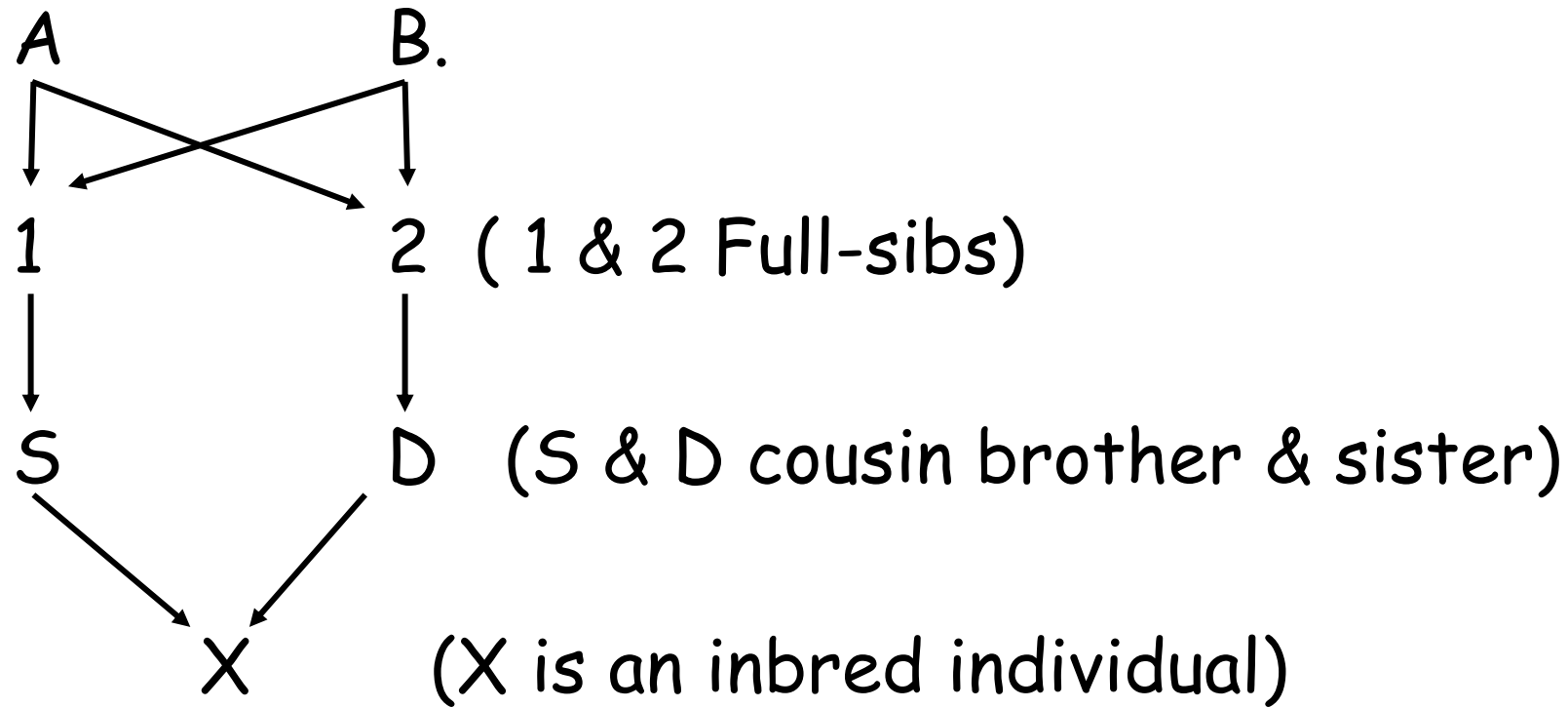
(i) Half-sib mating :-



(ii) Full-sib mating:-



(iii) Mating of cousin brother and sister:



❖ Genetic consequences of inbreeding:

1. Increases homozygosity in the population at the cost of heterozygosity.
2. It does change the gene frequency in the population.
3. All pairs of genes that segregate independently are made homozygous at the same rate.
4. The rate of inbreeding in case of animals is much slower than the plants.

❖ Genetic effect of inbreeding can be illustrated with the following example considering a pair of alleles D & d :

Assumption:

1. Dealing with self fertilized plant.
2. There is no selection for or against the dominant or recessive gene.
3. Parent generation contains 1600 individuals and are heterozygous for the same pair of genes.

Illustration:

<i>Generation</i>	<i>Genotypes</i>			<i>% homozygotes</i>	<i>Gene frequency</i>	
	DD	Dd	Dd		D	d
0	0	1600	0	0	0.5	0.5
1	400	800	400	50.0	0.5	0.5
2	400 + 200	400	600	75.0	0.5	0.5
3	700	200	700	87.50	0.5	0.5

❖ General consequences of inbreeding :

1. Inbreeding increases homozygosity.
2. It does not change the gene frequency.
3. Inbreeding results into expression of hidden recessive genes in the population by making them homozygous.
4. Inbreeding fixes characters in an inbred population.

5. Inbreeding causes inbreeding depression.

Decreasing in mean phenotypic value of the characters associated with fitness, reproduction and physiological efficiency due to inbreeding is known as inbreeding depression.

6. Inbreeding increases prepotency.

Prepotency is the ability of an individual to stamp of its characteristics to its progeny so that progeny resemble the parents.

❖ Use of inbreeding :

1. To determine the genetic worth of an individual.
2. It is practiced for selection against a recessive gene.
3. It is used to form different families of lab animals.
4. Inbreeding combined with selection over period of time results into development of new breeds.
5. It is used for production of prepotent animals.
6. The most important use of inbreeding is the production of inbred lines.

❖ Disadvantage:

1. Inbreeding increases the frequency of undesirable traits in the population.
2. It exposes lethal and sublethal genes by making them homozygous.
3. The traits related to fitness (survivability, reproduction and physiological efficiency) and vigour are reduced in farm and laboratory animals.

THANK YOU