FOUR SYSTEMS OF BREEDING

Breeding methods are commonly substituted into four general types. These are inbreeding, linebreeding, outbreeding, and crossbreeding. Each system has its place and its purpose and accomplishes certain results when properly used. Considerable difference of opinion exists as to the exact definition of these terms probably due to differences in the breeding methods used on different species. For example, a suitable definition for inbreeding in cattle might not exactly coincide with a definition for inbreeding in corn.

The usual definitions for inbreeding and linebreeding overlap and make difficult any close distinction between the two. This article includes a concise definition for each of these terms inbreeding, linebreeding, outbreeding and crossbreeding-that should prove satisfactory for the field of pigeon genetics.

Inbreeding is the mating of related individuals (usually not more than two generations removed from one another), where neither individual an ancestor of the other. The most distant- related individuals included in this definition would be those having only one grandparent in common. It should be noted that this definition excludes such matings as mother to son, granddaughter to grandfather, etc. The reason for this will be explained in the discussion of line-breeding. The maximum inbreeding that can be achieved in a single mating is by breeding brother to sister. Much easier inbreeding can be obtained by breeding brother to sister through several generations. Slight inbreeding for several generations may have a greater effect than close inbreeding for one generation.

Inbreeding brings out recessive genes in the homozygous condition. Since these genes may be either desirable or undesirable, the effects of inbreeding vary considerably. The results obtained from inbreeding depend upon the recessive genes carried by the original stock.

Inbreeding in its self has no bad effects. This was proven most definitely by Dr. Helen Dean King at the Wister Institute in Philadelphia. She bred rats, brother to sister, for over a hundred generations. The result was that the rats were larger, lived longer and produced larger litters than did the rats with which she began her experiments. The reason for these good results is that careful selection was practiced during the entire experiment. All undesirable animals were destroyed and only the best animals were kept for breeding. If a given strain of pigeons carries an undesirable gene, it must be eliminated or it will continue to crop out in future generations.

Inbreeding accompanied with rigorus progeny test selection is one of the best possible means of breed improvement. Slight inbreeding as practiced by most pigeon breeders serves to maintain stock uniformity and keep the progeny similar to their general ancestry.

Linebreeding is of extreme interest to the pigeon fancy of today. Unfortunately, it has been over-publicized, and as used by most pigeon breeders, it is greatly over-rated. Quite

often linebred squabs are advertised as though there were some magic power about linebreeding that guaranteed good resufts. As with inbreeding the results obtained depend entirely of the quality of the original stock, the skill with which the breeding program was planned and executed, and on the methods and amount of selection.

Much of the factual information on linebreeding has been camouflaged by backyard theories. Literally dozens of linebreeding theories, plans, charts, and schemes have been proposed. Many such plans are represented as a method of recombining the genes that were present in some famous pigeon and thereby duplicating its quality. Some are supposedly to be a general cure-all for the elimination of faults, while other schemes profess to breed champions from common pet stock.

To assure success, a linebreeding program should always be planned to fit the individual case. No scheme that is supposed to fit one breed as well as another or one pigeon as well as another can be of much value. Some of these breeding “theories” have become quite popular. The advocates of these theories are always pointing to this or that good pigeon that was bred according to their theory. Actuallly, the percentage of good pigeons that are bred by most of these theories is no greater than is obtained from plain “hit or miss” breeding. Space will not allow these different theories to be criticized individually but it is hoped that the methods and limitations of linebreeding can be sufficiently well described as to enable the reader to see the fallacies in these different breeding schemes.

Linebreeding is usually considered as a type of inbreeding, but in pigeon breeding the effects and purposes of the two systems are probably different enough to warrant separate definitions that do not overlap. Linebreeding is the breeding of an individual to one of his (or her) ancestors. Linebreeding causes the progeny to resemble one particular individual in their ancestry more closely than the others, and in respect its effects are in direct opposition to those of general inbreeding. The effects of such matings as mother to son, etc., are essentially those of linebreeding and are excluded from the definition of inbreeding for that reason.

The strongest possible linebreeding effect is obtained by breeding a sire to his own daughters for several generations, but not even this will produce youngsters of the exact genetic composition of the original sire. Linebreeding also brings out recessive genes but in a more orderly manner than general inbreeding. Less variation will appear in linebred birds than in inbred pigeons.

With linebreeding the breeder can choose, to some extent, which recessive gene he wishes to bring out and which ones he wishes to hold back. For example, if youngsters are sired by a pigeon with the genetic compostion AAbb, while the dam is aaBB, (these original parents are known as the P1 generation; capital letters represent dominant genes, small letters recessive genes), all of the young will be of the genetic composition AaBb.

This generation is termed the F1 generation. If these youngsters are bred brother to sister, the resufting squabs (called the F2 generation) may vary all the way from AABB to aabb. The difference between the individual squabs may actually be greater than between the

individuals of the P1 generation. If one of the female squabs of the F1 generation (AaBb) is bred back to her sire (AAbb) the resulting squabs will be either A-bb or A-Bb. They will never show the recessive gene (b) carried by their father. From these simple examples, it can be seen that linebreeding permits a better control of the genes than does general inbreeding. In actual practice, a cross may involve several hundred different genes. Obviously, this number of genes cannot be dealt with in the precise manner used in these examples. The geneticist must work by steps, focusing his attention on afew important genes in each mating.

Outbreeding is a mating between individuals that are less closely related than average. A mating should probably be considered as outbreeding when the two individuals show no common ancestor in a four geneneration pedigree. This type of breeding may be used to bring a new character into an inbred line or to increase the amount of variation with the idea of subsequent selection.

Outbreeding is closely related to a phenomenon known as hybred vigor. When across is made between two different inbred strains of animals, the crossbreds often prove to be superior to either of the original strains. Several different explanations for this have been offered but none has been definitely proven. Hybred vigor does not always occur, and at present there is little chance of predicting when it will or will not occur. Since the best outbred animals seldom pass their superior qualities on to their descendants, the value of this method to pigeon breeding is dubious. However, excellent racers have been produced by outcrossing.

Crossbreeding is a mating of one breed to another. This method has little to offer the breeder but useful to the research geneticist in learning more about the genetic compostion of the dffierent breeds.