RURAL AND SUBURBAN

THE PRINCIPLES OF PLANT BREEDING

Hybridization involves a knowledge of the parts of the flower and of their particular functions. It is based on the fact of the sexuality of plants. When ripe pollen from the stamens of a flower belonging to one variety of species is placed on the mature stigmas of a flower belonging to another variety, the pollen grains send down slender tubes through the styles into the ovary, where they enter the ovules and come into contact with the egg-cells. A male germ cell then passes out of the tube and fuses with the nucleus of the egg-cell. This process is known as fertilization of the egg-cell by the male germ cell. The fertilized egg-cell soon divides into many cells and becomes an embryo. The plant that develops from this embryo is a hybrid, and the process of formation is called hybridization.

The principles of hybridization of plants were unknown before the eighteenth century. The development of our knowledge of hybridization is largely due to Kolreuter (1760), Knight (18—) and Darwin. Later additions were contributed by Gaertner, Naudin, Focke, Vilmorin, Mendel and others. To Darwin we owe the phrase: "Nature abhors perpetual self-fertilization," which does not hold true in the case of many vigorous plants such as tobacco, wheat and barley. Dr. East says Darwin's phrase should probably be changed to read: "Nature resists any sudden change in long established conditions."

It is well known that many plants have special adaptations in their flowers, whereby self-fertilization is prevented; that the highly colored flowers are usually cross-fertilized by insects; that the more inconspicuous flowers are cross-pollinated by wind, etc., etc. Darwin proved by numerous experiments that the products of crosses were usually more vigorous than the parents of the hybrid. It has also been observed that "in general the closer the botanical relations of two plants, the more easily they will cross. Crosses between varieties are generally very easy to make; those between Linnaen species have been made in quite a number of instances, while crosses between genera and families are rare." Moreover, it has been observed that hybrids arising from parents not closely related are much more likely to be sterile than are those from parents nearly related.

While a host of facts regarding hybridization had been accumulated, no general principle had been established until Mendel published a report in 1865. The experiments embodied in the report were made between 1855 and 1865, and were published in the transactions of an obscure society in Brunn, Austria. This publication lay unnoticed until 1900.

If one turns to the works on plant breeding published before 1900 he will realize how vague at that time were our notions of the laws regarding hybrids. No person seemed to be able to predict with any degree of certainty the result of crossing varieties of plants. In fact, contradictory results are often reported by different plant breeders. "The facts were wonderful enough, but they showed no signs of falling into orderly arrangement." Mendel's results were formulated in two laws:

1. The Law of Dominance, which may be expressed thus: "If two contrasting characters which have previously bred true are crossed, one only, the dominant character, appears in the hybrid." (East); and

2. The Law of Inheritance, which may be stated as follows: "In succeeding generations, self-fertilized plants grown from seeds of the cross reproduce both characters in the proportion of three of the dominant character to one of the recessive character. Furthermore, the recessive character continues ever to breed true, while those plants bearing the dominant character are one-third pure dominants, which ever after breed true to the dominant character, and two- thirds hybrid dominants which contain the recessive character in a hidden condition." (East).

Mendel's experiments in cross-breeding were made with the common garden peas, which are capable of self-fertilization, and which have numerous varietal forms, distinguished by the color and shape of the seed, the color of the flowers, the color of the pods, the length of the stems, and the arrangement of the flowers on the stem. He determined the heredity first of all, of each set of characters; i. e., yellow and green seeds, round and angunlar seeds, smooth and wrinkled seeds, and so forth. He found, for example (a) that when yellow and green seeded varieties were crossed he obtained only yellow-seeded hybrids. (Generation F. 1) the yellow being dominant to the green which is recessive.

(b) When, however, the hybrid plants were self-fertilized, the seeds obtained in this second generation (F 2) were composed of both yellow and green forms,—in the proportion of three yellow to one green.

(c) When the plants arising from green seeds of the second generation were self-fertilized, only plants with green (F_3) seeds were obtained.

(d) When the yellows of the second generation were self-fertilized, some gave rise to plants with yellow seeds only, while others gave rise to plants with yellow and green seeds in the proportion of three to one ,as in the second generation (F_2).

In like manner Mendel crossed peas, each possessing one of a set of characters and obtained similar results. He found "round seeds dominant over wrinkled, colored seed coats over white seed coats, tallness over dwarfness," etc. The similarity of the results led "Mendel to the conception of pairs of unit-characters of which either can be carried to any gamete, or sex cell, to the exclusion of the other." De Vries adopts this idea of an organism being composed of a bundle of unit-characters in his theory of mutations, and considers a mutation to differ from the parent plant in the addition of a unit-character, not previously possessed by the parent. Such is the idea of a discontinuous variation.

Mendel carried on experiments where peas possessing two or more pairs of contrasting characters were crossed, and found that the separate pairs were transmitted entirely independently of one another. 'When, for example, a tall yellow-seeded pea was crossed with a dwarf green-seeded one, the F1 plants all exhibited the dominant character of each pair, and were tall yellows. In the next generation appear, as usual, talls and dwarfs in the ratio of 3. 1, and also yellows and greens in the same ratio. If we suppose that there are 16 plants, it is clear that 12 of these will be tall, and that the other 4 will be dwarf. Now, of every 4 talls, 3 will be yellows and the other green. Out of our 12 talls, therefore, 9 will be yellows and 3 will be green. Similarly, of the 4 dwarfs, 3 will be yellow and one will be green. Consequently, the F2 generation arising from the cross will consist of 9 yellow talls, 3 green talls, 3 yellow dwarfs, and one dwarf green. In other words, thre will be for every 16 plants a class of each showing the dominant character of one pair and the recessive of the other; and one plant with both recessive characters. Mendel established by experiments that these were the proportions that actually occurred, a result which has been amply confirmed since his time for other plants as for animals. And the principle may be extended indefinitely for any number of pairs of characters." (Punnett). —Prof. Wm. Lochhead, Macdonald College, in the Canadian Horticulturist.

COLOR OF THE HORSE — WHENCE CAME IT?

By J. H. S. Johnstone in Canadian Farm

If you should chance to ask a friend if he ever saw a white horse he would surely reply that he had, and the chances are that he would be wrong—quite wrong. Why? Because a white horse is a white horse and most horses which people think are white are not white at all. They are merely grey horses, which with advancing age, have grown lighter and lighter in color until they seem to be white. Nevertheless they were not born white, never were white and never will be white. I have known red roan horses turn whiter—if the term is admissable—than any grey one I have ever seen, but, even they were not white, though the reason why they should be more nearly white than those originally grey is not hard to give.

Now, did you ever see a horse that was born white? In an experience which covers the best part of four decades I have had personal knowledge of two in widely separated portions of North America. Five others I have seen which I know must have been born white. Horses that are really white are Albinos and come into this vale of tears as pure sports of nature or as the immediate descendants of such freaks.

The Pre-historic Horse

Perhaps to the horseman the subject of equine coloration may not be of much practical interest in dollars and cents, but as a field for academic speculation and research it is fertile in the extreme. In the rocks we can trace the evolution of the horse from his original ancestor (Phenacodus primaevus, ancestor of all ungulate animals, to the Pliocene form in which he had assumed a horse-like appearance, if not size. His earliest history is as plain as if written, up to that time, but of course his color must remain a mystery. Fossils tell nothing about the liveries worn by animals of an age prior to the advent of man on this round earth.

For many years a great gulf remained fixed between the pre-historic and historic horse, but the Russian explorer, Prjevalski, solved the mystery. In the Altai Mountains in Mongolia he discerned what is considered to be the original type of horse—a mere pony in size, but a true horse in specific characteristics. Prjevalski's horse has been captured, reared in captivity and thoroughly studied. He breeds true to color, and that color is a light dun or clay bank. Therefore it is accepted as true that dun —a yellowish sort of color—was the hue of the original equine coat, and it is a very persistent color to this day, so much so that in range bands "yallers" are very unwelcome indeed. A "yaller" sire will make a "yaller" band in a comparatively short time, and "yaller" is not a popular color nowadays.

Starting with this yellowish or dun color as the foundation, we are confronted with the curious fact that the Tarpans, which before Prjevalski's discovery were believed to be the earliest equine type available, were mouse-colored. This race is now probably extinct—Western Asia was its habitat—but a very curious fact is that the only specimen of the Tarpan ever captured, so far as I can find out, was mouse-colored with one bay foreleg. This may or may not throw light on the following contentions, but there is surely some unknowable connection between the dun and the mouse-color.

The Bay Horse

Bay is the general name bestowed on the equine color in which the foxy red predominates. No good reason has ever been advanced why this color should have been called bay. When you come to think of it, the term has no real derivative significance, save by common consent. Lexicographers of undying fame in every clime and nation give but halting definitions and derivations of the word. However, we all know what a bay horse is, but why a horse is bay we take on trust. Once upon a time a man undertook to prove that the word bay referred originally to the location of the region in which the color was evolved—somewhere around a bay—but the gentleman was unknowing of the antiquity of the historic horse and its original montaine habitat.

Be the derivation of the term bay whatever it may, delvers in the dusty lore of the past are agreed that toward that hue—foxy red—was the first variation in equine coloration. A red horse is more attractive to the eye than a dun one. Reading your Darwin you learn how variations in color are perpetuated—they attract the female and so survive. Foxy red (bays), then, was the first improvement on the dun, later the golden chestnut, or golden sorrel as it is commonly but erroneously termed. But still we have no greys and no blacks. These came as sports—accidental exponents of Albinism and Melanism. Whether the dark chestnuts and browns came as the result of the coupling of the black with other colors, or the black came as a sport from these darker hues, need not bother us. After the white and the black came on the earth, whether after the domination of the horse by man or before it, the equine race could run the full gamut of color-tones. As bearing somewhat on this situation the fact remains to this day that white and black horses are the hardest to breed true to color.

The White Horse

So now we return to our white horse. Really white horses—Albinos—are foaled white, with pink pigmentless skins. Grey horses are foaled black. Black horses are foaled a rusty brown. Dun horses are foaled dun. Red roans, bays, browns and chestnuts are foaled much the same color—more or less of a rusty red. A foal will begin to shed around the eyes the coat that was born on him. There you can first discover his true color. The domesticated horse is such a composite that exceptions to all rules are frequent, but the facts as detailed hold good in the main. All of which gives us quite a clear insight into the evolution of color in the equine subject. The grey was a later color than the black, the black later than the red, the white a freak, the dun original, the other common colors nearly contemporaneous with each other.

If a grey horse is foaled black and later turns what is called white, it is perfectly plain that he is not a white horse, because if he is foaled black he has a black skin, and black his skin remains to his dying day. On the contrary, if he is foaled white he has a skin which is devoid of pigment and the hair must be white. Then we have a really white or Albino horse. Parallels drawn in any sort of a dissertation anent the horse are usually easily shattered, but this one is ventured. Incidentally, the horse is the meanest thing on earth in this regard, as he is the noblest, if the least intelligent, in many others. Paying particular attention to this matter of coloration, I have noted men with hair on their heads "as white as the driven snow," yet with a hirsuit adornment of the bands as black as the ace of spades. Which proves that the whiteness of the poll is an accident, a result, an effect of post-natal environment. So with the everyday white horse of the streets.

So far I have taken no account of piebalds and skewbalds, or of the white markings common to most horses, more especially to the Clydesdale, Shire, Hackney, Thoroughbred and other well known breeds, nor do I propose to here. I invite no controversy, but if we take Captain Hayes' word for it we can account for the parti-colors easily enough. He says that the Batak ponies in Sumatra were originally a mouse-colored breed. An Albino stallion, however, was foaled within the domain of a certain native potentate, which was commandeered as a sort of royal prerogative, as it were. This white pony was used in the "royal" stud, with the result, the fashion being set, that the Batak ponies are now a piebald race. Piebald means black and white; skewbald some other color, such as bay or chestnut, and white. If, as Dr. Andrew Wilson was wont to drill into us at the Edinburgh University in the days of long ago, "the present is the key to the past," we know how the parti-colors originated. And yet there are other theories and opinions. Perhaps the true gospel of the evolution of the coloration of the horse has not yet been preached. As I began with a question, yet me finish with another—just to keep interested people interested Did anyone ever see a grey horse which had not, at the least, either a sire or a dam of that color?

DISEASES OF THE HORSE'S FOOT—QUARTER CRACK

Quarter cracks—or sand cracks as they are sometimes called—are cracks in the wall of the hoof beginning at the top of the hoof between the hair and the horn and extending downwards to the shoe. They usually occur on the inside quarter of the front feet. They almost always produce more or less lameness. Every time the foot is placed on the ground and the weight of animal thrown in it the crack will spread to a certain extent and produce soreness of the part. Occasionally a red colored fluid will be seen issuing from the crack.

This condition may occur in an instant by the horse treading on a stone or other hard substance but ordinarly it comes on gradually because of some interference with the healthy growth of the horn, which becomes first dry and brittle and then the crack gradually appears. It is more likely to occur in weak feet and in fact a quarter crack is usually considered a sure sign of a weak foot, although the best of feet are liable to suffer from it if exposed to injuries suficient to cause the trouble.

Treatment

A quarter crack will never grow together again. The only treatment is to start a healthy growth of horn from the top, in which case the crack will gradually grow downwards until the new and healthy growth will have reached the shoe and the crack of course disappear. In order to do this the top part of the crack next the hair is either cut out or seared with a hot iron so as to obliterate the crack at the top and start a healthy growth of horn. All dirt should be carefully removed from the crack and the foot put in a poultice of some kind every night to soften the parts and remove any inflammation that may be present.

Care must also be taken in applying the shoe. There should be no weight allowed to rest on the shoe on the quarter in which the crack is seated. The whole quarter should be rasped a little shorter than the rest of the foot, so that when the foot is on the ground and the weight of the animal thrown on it, there will be bearing on the diseased quarter. A bar shoe is very useful in order to place a share of the weight on the frog ,which in the natural unshod foot is required to bear its share of the pressure.—Dr. H. G. Reed in Farm and Dairy.

PACKING EGGS FOR HATCHING

It is a well known fact that eggs for hatching sent by post or rail frequently give poor results. The fault lies sometimes with the eggs, but still more frequently with the system of packing adopted. The aim should be to avoid not only broken shells but also to prevent injury to the delicate membrane enclosing the yolk, as an egg may be completely spoiled for hatching without a trace of fracture appearing on the shell. This can be prevented by using a package of moderate size and weight.

Of the many patent egg boxes some of the best are too expensive, others are too small, and a still greater number too fragile. The popular cardboard boxes are objectionable. They undoubtedly save labor in packing, and are light in weight, but their initial cost, the number of breakages that occur whenever they are used, and the fact that so few people return them, make these boxes an expensive item for the small poultry keeper.

After trial of many different kinds of package, nothing has been found to compare with a plain wooden box 11 x 7½ x 3¼ inches (outside measurements) made of the very lightest boards. Divisions of wood or cardboard are not necessary; they add to the cost without increasing the efficiency. Boxes should be bought from the manufacturers in pieces; that is, the wood, should be cut to the exact size ready for nailing together, the nails being supplied with the wood. The advantage of buying in this way is that the cost of carriage is less, and the pieces can be packed in a sack, and are, therefore, far less liable to damage in transit than the made-up boxes would be.

To pack a dozen eggs a layer of hay is placed at the bottom of the box. Each egg is first wrapped in a piece of newspaper and then in a strip of soft hay, after which it is placed on end in the box. A box of the dimensions given holds twelve eggs in four rows of three eggs each. It is most important that the eggs should stand on end, and that they should be so tightly packed that they cannot move when the box is roughly handled or shaken. The proper amount of hay to use is easily determined with a little practice. The lid should be tied on, never nailed, and no label is necessary, as the address can be written with indelible pencil on the white wood. The danger of having valuable high-priced eggs broken or interfered with when sent in a box that is tied only, and not nailed, can be overcome by screwing down the lid.

Every vendor of eggs for hatching should be provided with a stamp and a bottle of endorsing ink to stamp every egg sold. By this means, any attempt to substitute inferior eggs on the journey or to claim falsely for the replacing of infertile eggs can be detected.

In order to get best results, all eggs for hatching that have been sent a journey should be unpacked and allowed to rest on their sides for twenty hours before they are placed under the hen.

A POULTRY-GARDEN COMBINATION

Along the line of the articles in Country Life on the truth about the poultry business, I would like to suggest that the poultryman who would raise poultry only, without a garden or selling eggs for hatching, would lack so much in business acumen that he would not succeed in anything under heaven.

One of the most valuable assets of the hen yard is the fertilizer produced; no one who throws this away can hope to succeed. This guano is worth $3 per barrel. What business could afford to throw away such a by-product?

A combination of small fruits or truck and poultry is ideal, and the only way one can make the fullest use of the products of the enterprise.

To utilize the manure it is only necessary to have a few barrels—whiskey barrels are best—and bore about two hundred small holes around the sides in rows. Then fill this with soil and the guano, and in each of the holes place a strawberry plant. As you fill up the barrel gradually to the top place a small hollow tile vertically in the barrel so that the top of the tile comes just to the top of the barrel; then water through the tile every other day, filling the tile with water. In this way two hundred plants can be raised on space that would take care of but five plants.

Another way is to use tomatoes instead of strawberries. Fewer holes would be necessary and it would be further necessary to prune the vines quite closely as they grow. The guano should also be used in botbeds in early spring. In fact, it should go very far toward supplying the fowls with food.

The yards soon become foul from droppings. The ordinary poultry keeper grows despondent at the losses through disease from this filth. The proper way should be to make a frame about six inches or more high and cover with wire netting. Under this frame cover the ground completely with wheat or oats and then cover with a thin layer of soil. Water this daily and a very thick sod will spring up and the wheat or oats will grow up through the wire to feed the chickens. They will eat it as fast as it grows high enough to reach, but will not scratch the roots up.

When the soil is thus purified place the frame elsewhere in the yard and repeat the operation till the whole yard is purified, and then keep on doing the same thing over again. Thus the great value of the guano is made an asset, while the ordinary poultryman makes it a source of contagion. This little plan will furnish green food perpetually.

The selling of eggs for sitting should be counted in as part of a utility plant; it would be madness for any poultryman to do otherwise than breed from pure-bred fowls. There is a demand for eggs from such stock which will advertise itself, and no breeder would be wise to breed from mongrels when there is a demand for eggs at from fifty cents up to $30 per sitting for eggs from pure-bred stock.

Poultry raising goes naturally with small and large fruits. Each needs the other, and fancy breeding is also a part, for no one would buy eggs of the very finest mongrels at anything more than say five cents per dozen above market price.—Milton W. Brown.

THE ARMY HORSE PROBLEM

A conference of representatives of the various agricultural societies and the chief associations connected with horses has been discussing, in London, the question of the supply of horses for war purposes. There has been a considerable decline in horse breeding in the last 30 years, especially in the lighter breeds, and at recent years the rapid introduction of motor cabs in London and other cities has lessened the demand for horses to an alarming extent. The London Omnibus Company is disposing of its horses at the rate of as many as 150 a day, and motor omniubses replace the older horse-drawn vehicle. The South African war took 400,000 horses, and in case of emergency the government would need from 300,000 to 500,000 horses within 12 or 18 months.

The conference recommended a much more liberal appropriation for the encouragement of horse breeding than the present grant of £5,000. France spends £300,000, Germany and Austria £200,000 each for this purpose and the suggestion was made that the United Kingdom could well afford £500,000 a year for such a laudable cause. Another proposal was that 50,000 brood mares throughout the country should be "ear-marked for military purposes and that such a subsidy should be paid to the owners as would prevent such brood mares being exported.

Whatever course the government adopts must be done quickly as the remount problem is a serious one. Ever since the South African war there have been many weedy looking horses in even crack cavalry regiments.

THE DANGEROUS FLY

In an evening address at the recent annual meeting of the Ontario Entomological Society, Dr. Hewitt, the new Dominion Entomologist, entertained and instructed a very large audience by an account of the common house fly. He said that these insects were among the most dangerous of all, chiefly through the part they played in spreading disease. Numerous cases of typhoid were caused by them, and the death of thousands of infants was shown to have been brought about by their agency. The main way in which the flies carry disease is by first frequenting excrement from sick patients, or filth laden with disease germs, or sores on animals of any kind, and thus getting thousands or even millions of the germs on their legs, tongue and body. Then, alighting on the food and drink, they contaminate it with these germs, and thus introduce them into the human system. All mothers and housekeepers should see that food, and especially milk for infants, is kept where flies cannot get access to it. Moreover, no filth of any kind, but especially horse-manure, should be left exposed, because it is in these that the flies lay their eggs and breed. A single fly may lay about 1,000 eggs, and these may all turn into full-grown flies in about ten days after they are laid.

The other day a teacher in a school showed a little girl a picture of a fan, and asked her what it was. The little girl didn't appear to know. "What does you mother do to keep cool in hot weather?" asked the teacher. "Drinks beer!" was the prompt reply.

"For goodness sake!" exclaimed mamma, returning from a shopping trip, "what's the matter with little Tommy?" "'Tis a bad boomp he got, ma'am. Ye know ye told me I was to let him play on the pianny, and whin he was slidin' on the top of it he slid too far, ma'am."

Dugald—"Yon was not a verra neighbor-like thing to be doin', Angus, when you was tellin' the whole toon that I was drunk aal the week that we was in Glasgae." Angus—"I never said no sich word oot o' my lips, Dugald Mackay. Aal I said was that you was perfect sober on the Sawbath Day!"