

## Horticulture.

EDITOR—D. W. BEADLE,

CORRESPONDING MEMBER OF THE ROYAL HORTICULTURAL SOCIETY, ENGLAND.

### On the Improvement of Plants.

#### HYBRIDIZING AND CROSS-BREEDING.

By hybridizing we understand the crossing of two different genera or species, by cross-breeding the intermixture of two different varieties of the same species. Practically speaking, the work is the same. It would be out of place here to enter into a lengthened description as to how far the different species of plants may be hybridized. Doubtless there are limits: I have tried on various occasions, and in various ways, to obtain a hybrid between the *Pyrus spectabilis* and the *Cydonia japonica*, two different genera, but without success. On the other hand I have succeeded in raising hybrids between the Moss Rose (*Rosa centifolia*) and the alba Rose, two different species; also between a hybrid China Rose (*R. gallica* x *R. indica*) and *Rosa multiflora*. Then, again, I have often tried, in vain, to obtain crosses between certain varieties. So that it does not seem to be exactly a question between species and species, or between variety and variety, as these are at present classified by botanists. I have found, however, as a rule, that the more nearly allied the varieties the more certain is the cross. The Tea-scented and Noisette Roses are found to cross readily, but then, although these form separate floricultural groups, they belong to the same species, *R. indica*. But the hybrid Bourbon and Moss Roses also cross readily, and here we have intermixed three different species according to most botanists—*R. indica*, *R. gallica*, and *R. centifolia*. The grandest and the most beautiful of all the floral groups of the Rose—the hybrid perpetual—has a curious genealogy; *R. gallica* crossed with *R. indica* produced hybrid China; the latter crossed with an autumn flowering variety of the *R. damascena* produced hybrid perpetual.

My first attempt at crossing the Rose was made in 1843. I crossed three flowers of the Tea-scented Rose known as Goubalt with the Bourbon Rose Souchet, with the view of obtaining a dark-coloured Tea-scented Rose. Of these seeds four only germinated. Three of the plants were curious cross-breeds, of no floral value, and having little in common with either parent; and one, in leaf, habit and flower, was very similar to the wild Dog Rose! As the seeds were sown in pots, and placed under glass, I do not think any stray seed could have found place among them. I was here, no doubt, unfortunate in the choice of my parent or parents, and regard this issue as an instance of the well-known tendency which the offspring of some cultivated plants have, of reverting to the normal form. The same year I crossed about forty other flowers,

but the crop of seed was indifferent, and the result nothing worthy of record. This non-success led me to submit to microscopical examination the flowers of a number of varieties of the Rose, with the view of ascertaining which were likely to prove the best seed-bearers. The conclusions I drew were:

1st. That certain varieties are sterile, and incapable of forming perfect seeds under any circumstances. Of these I found such kinds predominate as roll the petals inwards, the centre of the flower being quartered in the manner of a crown. In others the pistils were weak or imperfect. 2nd. That many kinds where the pistils are perfect, which in their natural state form seed-pods that wither before arriving at maturity, may be induced to perfect their seeds by artificial fertilization. This class of Roses is the best for him who intends raising seedlings to choose his female parents from, because there is little here to interfere with, mar, or counteract his plans. 3rd. That those kinds which we find seeding abundantly in their natural state are self-fertilized, and that their abundant production of seed is due to this point mainly, the more perfect development of the organs of reproduction, especially the polleniferous parts of fructification.

Thus fortified I selected some twenty sorts of Roses, planted them in a separate corner of the nursery, and in the month of June, 1846, crossed nearly a thousand flowers. Success in seeding was complete. On the 30th of September in that year I gathered 223 well-ripened pods of seeds, some of them of extraordinary size. Two successive gatherings, of about 100 pods each, were made at intervals of about a month, the whole number of hybridized and crossed pods gathered and stored amounting to 444. The seed was sown the same winter, vegetated during the succeeding spring and summer, and these seedlings bloomed at intervals over the next six years—that is to say, some bloomed the first year, others were six years old before blooming. The result of the hybridizing and cross-breeding was apparent in many cases, but not in all. Two of the most striking and complete I will describe.

I had long thought that a bright dark-coloured climbing Rose was a desideratum, as at that time nearly all our climbing Roses were white or yellow. To obtain this I hybridized the Rose Athelin (hybrid Bourbon) with *Russelliana* (*multiflora*). Paul's Vivid, a bright crimson climbing Rose, of great repute in its day, and even now sought after, was raised from this effort. Again, I had conceived that if anything could add to the beauty of the Moss Rose, it would be to impart to it the exquisite tint of the *R. alba* or Maiden's Blush. To obtain this I hybridized the Moss du Luxembourg with an alba Rose, and among the offspring was a Moss Rose, with flowers like the Maiden's Blush, and afterwards named Princess Alice.

The next flower with which I experimented was the Hollyhock. I crossed numbers of these flowers in the years 1857. A bluish seedling crossed with White Globe, with the view of obtaining better bluish flowers, gave, among others, ten seedlings answering to this end. Fireball Superb, crossed with Metro-

politan, with the view of obtaining a better scarlet Hollyhock, gave one plant of the character sought. A pink seedling crossed with Lizzie, with the view of combining the bright colour of the former with the quality of spike and flower of the latter, gave a large number of seedlings, 23 of which were realizations, more or less complete, of the object sought. These are three cases selected from many of similar import. With regard to the results in crossing the Hollyhock, I may add that Mr. Rooke, of Clewer, at one time a most successful raiser of seedlings, obtained three of his most marked improvements, all differing in colour, from one fertilized pod of seed, whereas with seedlings raised from seed-pods not fertilized, he found the degree of progress slow and uncertain.

Some of my latest efforts in hybridizing and cross-breeding have been directed to Zonal Pelargoniums. Attempts to hybridize the Zonal varieties with the Unique have never succeeded; and yet Mr. Willis has obtained hybrids between the Zonal and Ivy-leaved, species probably as distantly removed. He tells me that he hybridized some thousands of flowers without success, until he thought of dipping the hybridized flowers into water after applying the pollen, by which means he obtained seeds and seedlings, two of which, evidently hybrids, are now before the public under the names of Willis's and Willis's roses.

Leaving flowers, let us glance momentarily at fruits. I have now growing in my nurseries a brood of seedling strawberries, the result of various crosses, the parentage on both sides having been carefully preserved. As they are not yet named, I can only speak of them as seedlings. Two seedlings, raised from Sir Charles Napier, crossed with Myatt's Pine, are worthless. Of eight seedlings, between Eleanor and Carolina superba, four are worthless, one is flat and rough in flavor, one resembles Keen's seedling in appearance, but is of a much richer flavor; one bears large fruit, remarkable for its solidity, of the shape of British Queen, with the fine rich flavor of Myatt's Pine; and one is a full-sized handsome fruit, of fine colour and good flavour, bearing abundantly and of hardy constitution. Two seedlings, between Oscar and Myatt's Pine, are deficient in flavour. Of eight seedlings, between Sir C. Napier and Crimson Queen, three are large handsome fruit, solid, heavy, of good colour and rich flavour; one is flat and insipid, one is very acid, and three have no prominent character. Of five seedlings, between Filbert Pine and Myatt's Pine, one is large, of fine flavour, and very juicy; one is small, of good colour and flavour, solid—the flesh notwithstanding very tender; and three are deficient in flavour, one of which is a prodigious bearer. Four seedlings, between Oscar and British Queen, are all deficient in flavour. Of seven seedlings, from British Queen crossed with La Constante, five are worthless from the fruitist's point of view, although one is so distinct in habit as to be scarcely like a strawberry, and one so positively nauseous in flavour that it leaves an unpleasant sensation on the palate long after tasting, yet from the same fruit and parentage one is of good flavour and another of positively fine flavour. Of eight seedlings, raised from Admiral Dundas crossed with Crimson Queen, four are small and almost flavourless; two are large handsome fruit, of fine colour and fine flavour; one is very late, of pleasant but not rich flavour; and one is early, the fruit large, of moderate flavour, and produced in extraordinary quantities.

I shall now conclude these remarks with a few practical deductions. In the improvement of races much may be accomplished by mere selection, but hybridizing and cross-breeding, if in some cases and with some experimentalists unsuccessful, are in the hands