

## XXXIV.—On the Production of Varieties and Monstrous Flowers by Pruning. By B. CLARKE, F.L.S., &amp;c.

As the varieties of species are attracting increased attention, and the circumstances in which they originate are becoming more particularly attended to, the following notes on the effects of increased luxuriance from pruning, and especially on the seed, may perhaps assist in throwing further light on this department of vegetable physiology, as making it, I believe, sufficiently evident that varieties, and not improbably improved varieties, could be produced, at least in some instances, by placing a plant in peculiar circumstances during the period of flowering.

Having cultivated female specimens of the variety of Hemp known as *Cannabis indica*, for the purpose of inquiring into the truth of the report that seeds could be produced without the fertilizing influence of pollen, and apparently with success, as a few seeds came to perfection\*, a specimen of the common variety was grown, to further substantiate, if possible, the result of the trial with the *C. indica*.

It was raised so early as to be in flower in the last week of June, but, unlike the *C. indica*, the first flowers produced no seed, although the plant was growing much more luxuriantly. The upper portion of the stem was then cut off, for the purpose of giving to the remaining masses of flowers an increased supply of sap; but this also failed, except that three or four fruits were observed growing on the main stem, the masses of inflorescence remaining quite barren, although the remaining foliage had acquired a deep and very luxuriant green. The experiment was then continued by cutting off each fresh shoot as soon as it appeared; but it bore no more seed till about the latter end of August, and then twelve or fifteen were observed in the outer portions of the masses of inflorescence.

The following spring these seeds were planted; but, as some

\* Two plants of this variety were raised late in summer, and flowering in the autumn, proved to be both females; they produced two seeds each from the first pairs of flowers, some time after the male plants usually have ceased flowering; neither was Hemp known to grow in the neighbourhood. These were planted early in the following spring, and proved to be all female plants, which in some degree confirmed the supposition that they were produced without the aid of pollen. Two or three of them produced seeds from the first flowers as before, and then remained barren until some male plants of the common variety, which had been sown later, came into flower, and they then fruited abundantly. One of them, however, which was quite as strong or rather stronger than the others, and covered with flowers, bore no seed, although masses of male flowers were repeatedly placed upon it; but as its ovules appeared to be perfect, as in the other plants, its barrenness was thought to be the consequence of the seed from which it had been raised having been produced without the aid of pollen.



of them proved to be males, it was concluded that some male plants must have been growing in the neighbourhood. Among them, however, was a plant having a peculiar appearance, and it was found that instead of the two opposite or somewhat alternate leaves which Hemp usually has, it had three regularly opposite leaves at each node, which was continued quite to the summit of the inflorescence. The plant being a female, it was fertilized by the flowers of a male, the inflorescence of which had for the most part been cut off, to give an increased luxuriance to the remaining part, and an abundance of seed was produced. From this seed twenty plants were raised, and six of them not only have three leaves opposite, but five of them germinated with three equal opposite cotyledons; and in two instances, two embryos were produced, in one of them the two being adherent by their cauliculi. Of the five plants with three cotyledons, a part are males, so that a permanent tricotyledonous variety could most probably be produced by cultivation, particularly as the tricotyledonous plants are all of them amongst the largest, the greater part of the dicotyledonous being comparatively small.

This unexpected result suggested that by cutting away the greater part of the inflorescence of a plant just before flowering, so as to give the remaining flowers an increased quantity of sap, improved varieties might be produced. For this purpose a variety of red wheat was allowed to grow till it became evident the ears had begun to form, although they had not protruded from their sheaths; and all the smaller stems were then cut away, leaving only two, the upper half of each ear being subsequently cut off, as soon as it began to protrude from its sheath, by which it was expected a vigour would be acquired by the remaining anthers which could not otherwise be attained. During their progress to maturity, fresh shoots frequently sprang from the roots, which were always removed as soon as they appeared. Of this seed five grains were planted the following autumn, and although grown under circumstances less favourable than the year before, the ears were decidedly longer, from an increased length of the rachis, giving them a peculiar appearance\*; and one of the ears had five of its spikelets containing five seeds each, four being the highest number of the year before†. It may therefore be supposed that an increased vigour in growth

\* An ear had been kept, which allowed the comparison to be made.

† Wheat-ears having some of the spikelets 'five-set,' are found occasionally in the most luxuriant corn-fields (on the borders of them only), but are not known to occur under other circumstances; but this plant was grown in poor ground, being only 3 feet high, and this same variety of wheat, when it is 'five-set,' has not the increased length of ear alluded to as an effect of the experiment.



has been gained in one year, giving to the ear a different habit; and although a distinct variety was not produced, yet the same process continued yearly, selecting the largest grains of the year before, might lead to useful results.

As serving to show the facility with which a departure from an ordinary mode of growth may occasionally be effected, merely through a superabundant supply of sap from pruning, a variety of inflorescence was in a few weeks produced in a plant of *Atriplex angustifolia*, which may deserve attention, because it is not known, that I am aware of, to flower in this very unusual way, however rich the soil may be in which it is growing; and this plant was not very luxuriant, as it grew in a rather poor soil. It was allowed to grow till most of its branches had the appearance of commencing inflorescence, and then about half of them were removed, and the remainder more or less cropped, the young shoots which subsequently sprouted being cut off every week or ten days. The remaining portion soon acquired a congested appearance, and it was found on examination that the receptacles of some of the female flowers had produced additional female flowers; from two to six, and in one instance seven were observed, each having two sepals as usual, and the ovary two stigmas. When two, they were opposite the sepals; when five or six, they irregularly surrounded the ovary.

These flowers, developed from the receptacle, may serve to explain the origin of a singular monstrosity occurring in *Dianthus barbatus*\*, in which a flower, the calyx of which consisted of the usual number of parts, had within it five imperfect flowers, which grew from the receptacle so as to surround the ovary; and the same variation in growth is also noticed as occurring in the Clove Carnation.

A monstrosity occasionally occurs in *Prunus spinosa*, apparently produced in the same way as in the *Atriplex*, consisting of flowers with double the number of petals and stamens, and two or three ovaries.

Should such experiments on other plants be followed by the production of permanent varieties from the seed, it will become obvious that the grazing of cattle would occasionally give rise to varieties, inasmuch as the greater part of the inflorescence of a plant is often destroyed, leaving a few flowers only to perfect seed.

\* Phytologist, vol. ii. p. 667.





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