

yellow seed<sup>11</sup> with pollen of a tall maize having red seed; and one head alone produced good seed, but only five in number. Though these plants are monoecious, and therefore do not require castration, yet I should have suspected some accident in the manipulation, had not Gärtner expressly stated that he had during many years grown these two varieties together, and they did not spontaneously cross; and this, considering that the plants are monoecious and abound with pollen, and are well known generally to cross freely, seems explicable only on the belief that these two varieties are in some degree mutually infertile. The hybrid plants raised from the above five seeds were intermediate in structure, extremely variable, and perfectly fertile.<sup>12</sup> In like manner Prof. Hildebrand<sup>13</sup> could not succeed in fertilising the female flowers of a plant bearing brown grains with pollen from a certain kind bearing yellow grains; although other flowers on the same plant, which were fertilised with their own pollen, yielded good seed. No one, I believe, even suspects that these varieties of maize are distinct species; but had the hybrids been in the least sterile, no doubt Gärtner would at once have so classed them. I may here remark, that with undoubted species there is not necessarily any close relation between the sterility of a first cross and that of the hybrid offspring. Some species can be crossed with facility, but produce utterly sterile hybrids; others can be crossed with extreme difficulty, but the hybrids when produced are moderately fertile. I am not aware, however, of any instance quite like this of the maize, namely, of a first cross made with difficulty, but yielding perfectly fertile hybrids.<sup>14</sup>

The following case is much more remarkable, and evidently perplexed Gärtner, whose strong wish it was to draw a broad line of distinction between species and varieties. In the genus *Verbascum*, he made, during eighteen years, a vast number of experiments, and crossed no less than 1085 flowers and counted their seeds. Many of these experiments consisted in crossing white and yellow varieties of both *V. lychnitis* and *V. blattaria* with nine other species and their hybrids. That the white and yellow flowered plants of these two species are really varieties, no one has doubted; and Gärtner actually raised in the case of both species one variety from the seed of the other. Now in two of his works<sup>15</sup> he distinctly asserts that crosses between similarly-coloured flowers yield more seed than between dissimilarly-coloured; so that the yellow-flowered variety of either species (and conversely with the white-flowered variety), when crossed with pollen of its own kind, yields more seed than when

<sup>11</sup> 'Bastarderzeugung,' s. 87, 169. See also the Table at the end of volume.

<sup>12</sup> 'Bastarderzeugung,' s. 87, 577.

<sup>13</sup> 'Bot. Zeitung,' 1868, p. 327.

<sup>14</sup> Mr. Shirreff formerly thought ('Gard. Chron.,' 1858, p. 771) that the offspring from a cross between certain

varieties of wheat became sterile in the fourth generation; but he now admits ('Improvement of the Cereals,' 1873) that this was an error.

<sup>15</sup> 'Kenntniß der Befruchtung,' s. 137; 'Bastarderzeugung,' s. 92, 181. On raising the two varieties from seed, see s. 307.