

black, very prolific, and growing to a large size, but ill-flavored; and a third, completely red, of large size, but yielding only one or two tubers to each stock or plant. My object was to give the black potato a milder flavour, and to render the red one more prolific, by crossing them with the white. In the first week of May, when they were well above ground, I took up several sets of each of the above varieties, and disturbing as little as possible the clay attached to the roots, I joined them by cutting a slice out of the clean parts of the shoots without injuring the roots or leaves, placing the cut surfaces (which were made to fit each other as nearly as possible) together, tying them with strips of linen, and covering the parts with tenacious clay, in which state I put them, each double plant having two sets of leaves and two sets of roots, down again, and carefully drew up the clay about them without covering the leaves. No. 1. Black and white; No. 2. Red and white; No. 3. Black and red. I put down about half a dozen of each of these double sets, all of which appeared to thrive as well as the sets in the single rows from whence they were taken. In August, on stripping the clay from some of the plants, I found I had succeeded in hybridizing, so far as color was concerned. When taken up in October the following were the results:—No. 1. All the produce were most curiously coloured, one side being thoroughly black and the other perfectly white, the dividing line running from the roots to the tops of the tubers, nearly dividing them into equal portions. Some persons to whom I showed them imagined at first sight that I had slit white and black Potatoes and attached the parts. No. 2. All the tubers were colored, the red showing in circular and crescent-shaped patches, except a few which were colored in nearly equal proportions, the colors taking opposite sides. The smaller tubers had the colors most intermixed. No. 3. Produce irregularly spotted and striated, the red color predominating."

In the foregoing it will be seen that the stems of two growing potato plants of different kinds were grafted together by inarching, and that the produce of tubers was a complete hybrid, partaking even of the conjoined colours of the parent plant.

This is a beautiful experiment, and proves what all have supposed who can have thought about it at all, that the sap forming the tuber goes first from the fibrous roots which spring from the set, ascends into and through the branches and leaves, there, from contact with the air, supplies itself with the required reproductive power, and then descends into the embryo tuber, forming that portion of the plant for its future continuance and reproduction. The mixture of the sap of the two kinds in the foregoing experiment not only arose from each root to the branches, but descended again from the branches, commingled, and produced a con-

junction of sorts, which has never heretofore been obtained, except by chance, or from the mixture of pollen in the seedlings. This fact may also account, and does in my estimation, for a great deal of the potato disease still existing.

It has only been of late years that potato insects have attracted much attention. A cutworm, to which the name "black grub" has been applied, sometimes, though very rarely, would nip off the stem as it appeared above ground, but the mischief was so very trifling that it was scarcely either observed or appreciated. Now, however, the case is altered. We have the Striped Yellow Beetle (*Lema trilineata*), an insect much resembling what is called the Cucumber and Melon Beetle (*Diabrotica vittata*), and which eats the leaves of the potato vines in both its larval and perfect states. In the former it is a most disgusting-looking object from its habit of voiding its excrement over its back, and keeping itself constantly covered with the horrid deposit—a provision of nature to protect it, probably, from the attacks of birds and parasitic insects, who would, no doubt, think twice before venturing to make a meal off such an uninviting object. We have also, occasionally, in some parts of the country, a Blistering Beetle (*Lytta cinerea*, Fabr.), and a tiny Flea Beetle (*Haltica cucumeris*, Harris), which bears a strong resemblance to what is commonly called the Turnip Fly. Again, there is the huge horned, or rather tailed, caterpillar of the handsome Tomato Sphinx (*Sphinx maculata*, Haw.), about whose poisoning properties wonderful, but utterly fabulous, stories are told; and last, but not least, the terrible Colorado Potato Beetle (*Doryphora 10 lineata*, Say), which has not yet reached Canada, but which is steadily marching eastward, devastating the fields wherever it goes.

All these insects injure the stem and leaves of the plant, and in doing so either actually destroy the tuber, or so far injure it as to leave it open to destruction, from rain or imperfect keeping.

The fact is now proved that the potato plant has but a certain term of life. It starts from the seedling, attains such maturity and excellence as it will attain in about five years, then continues in perfection for a certain series of years, supposed to be from ten to twenty, during which it is most prolific, and produces the best kind of food; then gradually gets worse and worse, until in the course of some fifty years, more or less, according to different sorts, it finally runs out, and is lost. This has been the fate, or rather was the fate, of all the good old sorts, and as they were all pretty much of the same age and standing, the simultaneous loss of them culminated in the so-called "potato disease," which in Ireland alone cost millions of human lives.

This was the course of events before the advent of the plagues which now afflict the potato plant. Now, we may expect, and in

fact do find, that the natural decay of sorts is infinitely hastened by the injury to the vines caused by insect attacks, and the consequent depreciation and ultimate destruction, or at all events degradation, of the tuber.

Such being the case, and the general facts are too patent to be altogether denied, although the data may and will be doubted and disputed, (for what fact, however self-evident, is not doubted by some in this age of free thinking?) too much importance cannot be attached to this new method of producing varieties. Sorts and flavours should be balanced against and with each other, productiveness against the contrary, and tardiness in ripening should be balanced by intermixture with sorts of more rapid maturity. But the thing of all others to be looked for is a sort that "yet possesses the power of resisting insect attacks." In this alone is our hope of avoiding disease and destruction to the sort. We all have seen where, many different sorts of potatoes are planted together, one or more amongst others which still flourished in full leaf and branch, flower and seed ball, whilst all around it were fading and rotting. It is, we believe, from such plants that we may hope for permanence of kinds, and if they can transmit this quality by inarching or grafting, and at the same time combine other excellency, that man's time is well employed, if he does nothing else, who can produce such a result.

Chemical analysis ought to help us here. Some varieties of the genus *Solanum*, to which the potato tribe belongs, contain more or less of a poisonous quality, called solanine, which may specially resist insect encroachment. Or it may be that some kinds contain more potash or mineral matter than other kinds. At all events, the resisting kinds (and we strongly suspect those kinds bearing seed or potato balls will be found such), should be analysed and examined, and their constituents put on record, for future study and experiment.

Fifty years ago there was a general belief that the apples and seed vessels of the potato were poisonous, and that uncooked or raw potatoes were so unwholesome as to be nearly if not quite poisonous, and also that the water in which potatoes were boiled was very hurtful. These popular ideas have generally a considerable foundation of truth, and it is quite possible that the sorts then in existence, and which certainly resisted all insect depredation, were in particular states unwholesome and even poisonous. These qualities, if they ever existed, may have been lost by cultivation, or have died out through age in the plant, or from some other operation of nature may have disappeared. Certain it is, that the raw juice of some kinds of potatoes is very active in its effect on steel or iron. Other kinds will barely stain these substances. Some kinds cook in a very short time, others require a full hour's boiling before they are