

ON THE RECIPROCAL INFLUENCE OF THE STOCK AND ITS GRAFT.

By James Mease, M. D.

The opinion that the fruit produced by a graft is not in the least affected by the stock in which the graft is inserted, has long been held as an axiom in vegetable physiology, merely on the authority of Lord Bacon, who lays it down, "that the scion overruleth the stock quite, and that the stock is but passive only, and giveth aliment, but no motion to the graft." In other words, he considers the stock merely as a source of nourishment, to be communicated to the scion in the vessels of which it is to be decomposed or digested, and made to produce fruit in the time natural to the tree whence the scion is taken, and according to its peculiar kind.

I think I shall make it appear, that although as a general rule, the principle is correct which assigns a passive agency to the stock, yet on many occasions it has a decided influence not only on the vigor or fertility of the grafts, but also on the nature and quality of the fruit, and that a scion even affects the production of the stock.

1. The first proof I had on this subject, was given to me by the late Joseph Cooper, of New Jersey, an experienced and observing farmer and horticulturist, who in the year 1801, showed me two trees, both ingrafted with the same kind of apple by himself, and at the same time. The stock of one was the Campfield apple, a native and excellent fruit, that of the other was an early apple, and in both instances, the fruit produced by the graft partook of the flavor peculiar to the fruits of the stocks.

Mr. Cooper afterwards communicated to me in writing, his remarks on this subject, as follows: "I have in numerous instances seen the stock have great influence on the fruit grafted thereon, in respect to bearing, size, and flavor, and also on the longevity of the tree, particularly in the instance of a number of Vandevere apple trees, the fruit of which was so subject to the bitter rot, as to be of little use. They were ingrafted fifty years ago, previously to 1801, and ever since, those of them which had tops composed of several different kinds, though they continue to be more productive of fruit than any others in my orchard, yet are subject to the bitter rot, the original and well known disease of the fruit of the stock. I have had frequent opportunities of observing the same circumstance, in consequence of my receiving many scions from my friends, which, after bearing, I ingrafted, and the fruit uniformly partook in some degree of the qualities of the former, even in their disposition to bear annually or biennially.

2. A correspondent of Mr. BRADLEY, (Mr. FAIRCHILD) budded a passion-tree, of which the leaves were spotted with yellow, into one that bore long fruit; and though the buds did not take, in the course of two weeks, yellow spots began to show themselves about three feet above the inoculation, and in a short time afterwards, such spots appeared on a shoot which came out of the earth from another part of the plant. The publication of these facts is a proof of the candor of Bradley, inasmuch as they opposed his theory, which was similar to that of Lord Bacon, for he says, "the scion preserves its natural purity and instinct, though it be fed and nourished by a mere crab."

3. The late celebrated English gardener, WILLIAM SPEECHLY, regarded the stock as overruling the scion, and in confirmation of this opinion says, that "whenever a cutting is taken from an aged tree in a state of decay, and ingrafted upon a thriving stock immediately from seed, it may with propriety be considered as a renovation from decrepit old age, to youth and healthful vigor." In his treatise on the culture of the vine, he adds, that "he had improved many kinds of vines, by engrafting those which have generally weak wood on plants that are stronger."

1. THOMAS HILL, another well known English gardener and writer, says, "that the future vigor of trees depends equally upon the soil and stock, and that the taste of the fruit may also be improved by proper stocks." Hence he gives very particular directions as to the selection of stocks for various fruits, and illustrates the necessity of attention to them, by stating the fact, that "if two nonpareil branches are grafted, the one upon a paradise stock, the other upon a crab, and both planted in the same soil and situation, that upon the crab stock will produce fruit so sour and ill tasted, in comparison to the fruit of the other, that if a person should taste them both in the dark, he could not imagine them to be the same fruit."

"I have also," he says, "seen very great difference between the fruit of these trees, when one was grafted upon a paradise, and the other upon a codlin stock; for though the juice were so far changed by passing through the buds and pores of nonpareil branches, as to produce fruit alike in shape, yet their tastes were different, and somewhat resembled the taste of that fruit which the stock would have naturally produced. The juices of the crab and codlin are known to be very acid, but the juice of the natural fruit of the paradise is sweet." He adds, "as most kinds of apricots when fully ripe, are rather too sweet and mealy, so when they are budded upon any kind of plum stocks which have that sort of juice, their fruit becomes more mealy and sweet than those which are budded upon stocks, whose juices were more acid."

5. Mr. THOMAS A. KNIGHT, President of Horticultural Society of London, in a paper "on the effects of different kinds of grafting" observes, that "the form and habit which a peach tree of any given variety is disposed to assume, he has found to be very much influenced by the kind of stock upon which it is budded: if upon the plum or apricot stock, its stem will increase in size considerably as its base approaches the stock, and it will emit many lateral shoots: when on the contrary a peach is budded upon the stock of a cultivated variety of its own species, the stock and the budded stem remain very nearly of the same size, as well above as below the point of their junction. No obstacle is presented to the ascent or descent of the sap, which appears to ascend more abundantly to the summit of the tree." He also gives the following striking fact to demonstrate the influence of the stock upon the graft inserted in it. The "Moor Park Apricot tree in his garden, as in many others, becomes in a few years diseased and debilitated, and generally exhibits in spaces near the head of its stock, lifeless albumen beneath a rough bark. Sixteen years ago a single plant of this variety was obtained by grafting upon an apricot stock, and the bark of this tree still retains a smooth and polished surface, and the whole tree presents a degree of health and vigor so different from any other tree of the same kind in his garden, that he has found it difficult to convince gardeners who have seen it, of its specific identity."

6. Mr. THOMAS TONNISON, gardener to the Countess of Bridgewater, says, that "choice sorts of pears by being grafted upon the quince, come several years sooner into bearing, and produce much better crops, than those upon the common, or free stock. He adds that "the fruit will be in no respect inferior, and that he has had opportunities of seeing the superiority of the quince stock in three different counties in England."

7. Among the extracts given by Sir JOSEPH BANKS, from French authors, in the appendix to the 1st volume of the Transactions of the London Horticultural Society, it is stated that "the Cassane pear may be improved, and all its harshness destroyed by grafting up in the Doyenne; and that the Reine Claude plum is much improved, by being grafted upon an apricot or peach stock."

8. BRADLEY says, that "since the Jordan almond had been grafted on plum stocks in

England, they bore very well, whereas in the time of RAR, they seldom produced ripe fruit—Canary almonds, grafted on the plum, succeed well; while the seedlings of the same species, of five or six years' growth, appear all nipped and shrivelled."

9. The "Spitzenburg apple," which originated near Albany, in the State of New York, is one of the finest apples of the United States. When I was in New York a few years since, I was informed, that the flavor of this apple is much influenced by the apple stock upon which it is grafted.

10. I have in some British publication read the fact, that a shaddock ingrafted on a sweet orange stock, will become sweet, and that the orange grafted upon the pomegranate at Malta, gave fruit which was red inside. I regret that I am not able to give my authorities for these two last facts. I find them in my common-place book, and would not have put them there, had I not been well persuaded in my mind at the time, of the high credit due to the source whence I obtained them.

11. Dr. DARWIN says, "it is not certainly known whether the ingrafted scion gives, or takes any property to, or from the tree (stock) which receives it, except that it acquires nourishment from it." He afterwards says, "there are no instances recorded, where a communication of juices from the graft, has varied the flavor, or the form of the flowers, or fruits of either of them. For though the same vegetable blood passes along both the upper and lower part of the caudex of the new scion, yet the molecules secreted from this blood are selected or formed by the different glands of the part of the caudex which was brought with the ingrafted scion, and of the part of it which remained on the stock, in the same manner as different kinds of secretions are produced from the same blood in animal bodies." This remark is made in Sect. xvi. 4, "Of the Phytologia, or Philosophy of Agriculture and gardening," nevertheless, in Sect. v. 2, of the same valuable work, when treating of the circulation of the juices of plants, and after quoting the experiments of Fairchild and Lawrence, Dr. D. says, "I think I have myself observed in two pear trees about twenty years old, whose branches were much injured by canker, that by ingrafting, hardier pear scions on their summits, they became healthier trees, which can only be explained from a better sanguification produced in the leaves of the new buds. It has also been observed by an ingenious lady, that though fruit trees ingrafted on various kinds of stocks are supposed to bear similar fruits, yet that this is not accurately so; as on some stocks she has known the ingrafted scions of apple trees to suffer considerable change for the worse compared with the fruit of the parent tree." This fact, which I deem highly important, and worthy of the greatest attention, is to be coupled with the above related on the authority of the American rural philosopher, Joseph Cooper, and with those in section 5, 8, 9, and 10. Dr. Darwin doubts the influence of the stock on the fruit or flower, or of the graft on the stock, because of the want of "recorded" cases in point, but he had forgotten that he had himself adduced two proofs of such influence, and had referred to two others.

12. In the second volume of the Transactions of the Horticultural Society, London, p. 44, Mr. Luttrell gives an account of several pears which were formerly cultivated; among these is the *orange vert*, or orange Bergamot. After describing it, he adds, "the true time to eat it is whilst the color is upon the turn. The fruit colors most upon quince stocks." This is admitting the principle of the influence of the stock upon the fruit.

13. In the report of the Transactions of the Caledonian Horticultural Society, (May, 1829,) Loudon's Mag. 5, p. 334, it is stated that "the Society was put in possession by Capt. Smith, of Dysart, of an interesting account of the effect of introducing buds of the Ganges apple into branches of the Russian transparent ap-