

The Mutual Influence of
Stock and Scion

by
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There have been a great many experiments and observations made on this subject by prominent fruit growers and horticulturists all over the world, and much has already been written upon it. In all lines there are those who discredit what has been said contrary to their own views and this is no exception.

Some claim that grafting is a devitalizing process, and one which should never be resorted to as a means of propagation.

They claim that trees and shrubs grown on their own roots are far superior to any grafted on other roots. Some even go so far as to say that any plant which will not grow on its own roots had better be dug up and sent to the rubbish pile. Mr. T. W. Burbridge of Dublin, as well as some other writers of note, holds this view. They claim first, that grafting gives bad results; second, that it is unnatural; and third, that own rooted plants are the best in all respects.

As to the first objection, altho grafting does sometimes give bad results, the good effects to be obtained when it is properly done,

more than compensate for the evils. The holders of this view claim that it causes the plant to sucker and choke the graft. This is more particularly true of some ornamental shrubs; but no such tendency is noticed among fruit trees, such as the peach, apple and pear. If it is true of plums, it can be no worse than when they are propagated from cuttings, or the seed.

Secondly, grafting is no more unnatural than cuttings, or some other means of propagation. If we were to take nature as an example, we should find that were very few plants which reproduce themselves by cuttings, while many trees unite their different limbs by grafting.

Lastly, any one who has ever planted apple or peach trees, knows that one seed in a thousand will grow and produce fruit which is as good as that from which the seed was taken. On our own place, a few years ago, we planted a number of peach seeds from the Stump of the World. Nearly all of them grew and produced fruit, each after his kind. As a result, we have some light colored fruit, some that is small

tinged with red, and some is of very fair size and resembles the Stump of the World very closely. We also have three seedling apple trees, only one of which bears fruit that is eatable, altho all were planted from seed of very fine apples.

It seems to me that the fruit grower can not afford to waste his time growing seedlings and waiting for them to come into bearing in order to select good varieties for his orchard, when by means of grafting he can get what he wants with much less trouble.

Grafting, instead of being a new science, is one of the very oldest. It was known and practiced by the ancients. Vergil, Columella and Pliny all understood how to graft, and used this method of propagating plants. Varro, who lived in 116 B.C., mentions twenty modifications of grafting.

These ancient writers believed, however, that there was no influence exerted between stock and scion. The more modern writers claim that there is a change in every graft, altho it may not be noticed.

(1) Prof. L. H. Bailey Mich. Hort. Rep. for 1891.

ced by the casual observers.

In studying this subject, several points are to be considered: (1), that of early fruitage; (2), the greater production of fruit; (3), the time of ripening; (4), increased size of fruit; (5), the effect on color; (6), the effect on the character or texture of the fruit; and (7), the delaying of the degeneration of varieties.

Those who have orchards have often wondered why some trees, of the same variety came into bearing one year, two years, or even four years, before its neighbor, which was set out at the same time, in the same soil, and received the same tillage as the one which bore the earlier fruit. This is doubtless due to the stocks upon which the scions were grafted.

It is customary for the nursery men to buy a mixed lot of apple seeds, plant them, and after they are a year or so old, use their roots upon which to graft scions of the apples they wish to grow. For instance, they will graft Ben Davis scions on seedling stocks of the Early Harvest, Siberian Crab, Geniter, Romanite, or any other that they happen to have. Some of these are of slow growing habits, others grow more

rapidly and come into bearing sooner. The scions which are grafted on these roots will be influenced to a greater or less extent by these tendencies.

Mr. S. B. Peck of Muskegon says, "In a number of apple trees bought in the nursery and planted in the same way, on the same kind of ground, and cultivated alike, some fruited in three years, others in six, others in ten, and some not at all. I attribute this unevenness to the stocks used in grafting as they were all treated alike."

Greater productiveness is often obtained by grafting. This may be due to an obstruction of the flow of sap caused by the union of stock and scion. Some authors claim that grafting acts in a similar manner as ringing.

Thomas Knight a noted experimenter holds this view. A. A. Brozier² says, "Increased fruitfulness, as a result of grafting, is in some cases due to added vigor." A vigorous stock imparts vigor to the graft and makes it more fruitful. Darwin³ is of the opinion,

(1) Mich. Pom. Soc. Rep. 1890, p. 30.

(2) " " Hort Soc Rep. 1891, p. 110.

(3) Animals and Plants Under Domestication, Vol. II p. 180.

however, that the union of the stock and scion will result in greater productiveness, even tho the stock is no more vigorous than the scion.

Mr. Knight says that if a tree blossoms with difficulty, it is a good plan to graft it on some stock which will keep it alive for a few years, but not permanently. He has tried this plan with the following results, "I have obtained a heavy crop of apples from a graft which had been inserted in a pear tree only twenty months previous, in a season when every blossom of the same variety was destroyed by frost. The fruit was externally perfect, and possessed all its ordinary qualities, but the cores were black, and without a single seed. The graft, however, perished the next summer."

The *pyracantha japonica* is more fruitful and a better bloomer when grown upon the root of the Quince or *Eduothome*, than when grown on its own roots.

There seems to be a tendency, then, for grafted fruit to be more productive. This is caused from the vigorous stock used and the retarding of the sap in the

process of grafting.

Grafting causes the fruit to ripen earlier. The many experiments, with few exceptions, go to establish this fact. There is difference of opinion as to the cause of the earlier ripening. Prof. Knight believes that this is also due to the retarding of the sap by grafting. Prof. Bailey believes it is due to the ripening of the wood of the stock, that which ripens early, will cause the fruit to ripen early. Which of these two theories is correct, or whether they are both correct and both operate in the same way, has not yet been determined, and more investigation along this line must be done. It can not be denied, however, that in many cases there is an influence exerted on the scion which causes it to ripen its fruit earlier. There is abundant testimony as to this point.

Mr. Bonnier² says, "The peach grafted on the apricot grows more rapidly than on the plum or almond, yields more and finer fruit, which ripens from six to

(1) Garden and Forest, 1890, p. 101.

(2) Revue Horticole, 1890, p. 182.

twelve days earlier than on those stocks."

William Hill of Massachusetts states that he grafted the Styrian or Keel Hall Beurre pear on the *Bitron des Barnes*, an early summer variety. As a result, the Styrian is nearly three weeks earlier than on the ordinary pear stock.

It seems that the grape is not effected so much by the stock as some of the other fruits. For instance, Mr. G. Lauppee² says, "About ten years ago, I grafted the Lady grape upon the Isabella with the result that it now ripens a week or ten days later. I have the Lady on its own roots within one hundred feet of the grafted vine and am thus able to make accurate comparison."

Mr. D. P. Fish,³ of England, thinks that the time of ripening of the grape is not much effected by the stock.

Apples seem to be as easily effected in this line as any fruit. Mr. D. P. Fish again states that the Paradise Stock hastens the maturity and increases the yield.

(1) The Garden, 1873 p. 334.

(2) Mich. Hort. Soc. Rep. 1891, p. 115.

(3) The Garden, Vol. XX. 1881, p. 590.

Mr. H. Weir¹ states that the Dutchess of Oldenburg grafted on an Early Strawberry which had been grafted on the Duince, came into use nearly three weeks before the usual time.

Dr. W. J. Beal² of Michigan gives similar testimony as to the Red Canadas grafted on Northern Spy, and another on the Early Harvest. Those on the latter ripens much earlier than on the former.

4. The size of the fruit, as every one knows, is very much increased by grafting or budding. It is this kind of fruit which brings the highest price and sells when none other will. Of course much depends on how full the tree is as to the size of the fruit; but of two trees, each having the same amount of fruit on, one a seedling, the other a budded tree, the latter will always have the largest fruit.

Patrick Barry³ believes that many apples are increased in size by being grafted on the Paradise Stock. He says, The size of the fruit is also considerably changed

(1) Mich. Hort. Soc. Rep., 1891, p. 117.

(2) Ill. " " " 1882, p. 144

(3) Fruit Garden, p. 38.

by the use of different stocks.

The color is, as a rule not much effected by grafting. It may be a shade lighter or, darker, but in general it is about the same as that of the parent tree.

Some few cases are on record where the color was changed. For example, Dr. Hamel¹ the celebrated French pomologist, ingrafted a young lemon the size of a pea, upon a branch of an orange tree. The lemon grew and ripened and had all the qualities of the lemon and none of those of the orange, but the color, taste, and smell of the orange were changed. This is a good example of the influence of the scion on the stock.

George B. Campbell² of Ohio gives an account of two roses which he grafted: one was a bright red, but poorly formed; the other was a light blush, but finely formed. He inserted buds of the latter into the former and this was the result. The buds grew and retained all their habits of growth and foliage, as well as form of the

¹ Amer. Agriculturist, vol. 3, p. 212.

² Iowa Hort. Rep. 1879, p. 411.

flower, but the color, instead of the light blush was a rich dark crimson nearly, but not quite, as dark as the bloom of the stock upon which it was budded."

Most testimony goes to show that the color of the foliage and flowers, undergo a greater change than the fruit.

The character of the fruit is materially affected by the stock upon which the scion is worked, as testimony goes to show.

We know that if the farmer uses poor animals for breeding purposes, his herd will never reach a very high state of perfection. Our best herds have been raised by the men who were the most careful in selecting the animals they bred from. The same applies to the cultivation of fruits. Use the best stocks upon which to graft the scions, and better results will be obtained.

Mr. M. H. Merriam of Massachusetts, said, "The quality of the fruit must become deteriorated when when wrought on stocks the fruit of which is worthless.

(1) Trans. of Mass. Hort. Soc. 1879, p. 29.

Horace Piper¹ states that when the common apple is grafted on trees that bear very inferior fruit, it is injured by the crude and bitter sap, but if grafted on superior stocks it is very much improved.

The Porter apple if grafted upon a sour apple tree becomes more sour, as experience has shown. Fuller² of Sharon grafted the Porter on a very sour apple tree and it was even more sour than the fruit borne by the stock. Mr. Joseph Baley of Bedham recounts a similar circumstance.

On the other hand if the Porter be grafted on a sweet apple tree it becomes less acid and makes a very fine apple. Stephen Adams³ says, "My monstrous Pippin was grafted near the ground about thirty five years ago. It soon began to bear superb fruit large and fair, but too tart to eat raw. About twenty years ago I sawed off five of the limbs and grafted with a sweet apple, called Hay Boys. Soon the Monstrous Pippin grew milder, until it has become a sweet apple tho the Hay

(1) Rep. of U.S. Patent Office, (Ag). 1867, p. 315.

(2) Mass. Hort. Soc. 1870, p. 9.

(3) Quoted in Mich. Hort. Soc. Rep. 1891, p. 122.

Boys is not so sweet as formerly."

Mr. S. B. Pullen¹ of Harwood had an apple tree that bore very sweet apples, but very small. Into this tree he grafted the Orange Sweet, and as a result obtained an apple larger than that borne by the stock, and much sweeter than the Orange Sweet.

The same gentleman grafted some scions of the Sweet Pumpkin Russet on a neighbor's tree of unknown variety, and some on a thrifty Roxbury Russet of his own. His neighbor's tree bore Sweet Pumpkin Russets; his own bore fruit of the same shape, size and color, but as sour as the Roxbury Russet.

George W. Browbridge² gives an account of a seedling apple tree, bearing small green fruit, which was grafted with King of Tomkins bountiful and a few other striped varieties. The next year large striped fruit appeared on the tree below the graft showing that the scion effected the stock.

The effect of different stocks on the pear has also been noticed. Mr. G. W. Merriott, in *The Garden*, vol. IV, 1873, page 255, says, "The Rok-

(1) Mass. Hort. Soc. Rep. 1879, p. p. 6-15

(2) Rep. of Ohio Hort. Soc. 1881, p. 93.

every pear on pear stocks was in every stage of ripening very bad, being dry and mealy; while the same sort worked on the Quince, in the same ground, was full of juice, mellowing and deliciously flavored, and was a fortnight earlier."

A. J. Downing in his, "Fruits and Fruit Trees of America" says that altho some pears are superior in flavor, others are inferior, when worked on the Quince.

W. L. Lodge in the Report of U. S. Patent Office (Ag.) 1865, states that our best pears are improved by being worked on the Quince.

In regard to the peach, most writers and experimenters are of the opinion that the plum is not a good stock upon which to graft the peach. Thomas Andrew Knight' thinks the peach does not do so well on the plum as on the native stock. He gives an account of two trees in his garden, one on the plum, the other on the native stock. The latter produced much better fruit as to grain and flavor; altho there was an increase in size and a deeper color of those on the plum.

Mr. Willenmeyer of Kentucky claims

1) Hort. Trans. Vol. V, p. 289.

that the peach or the plum is inferior in quality and that the tree soon dies.

As to the last point, every farmer knows that his oats, wheat and corn will "run out", as he calls it, after a few years of cropping. This is more particularly true of potatoes than perhaps any other crop. In two or three years, a variety will so degenerate that it will be hard to recognize it.

The same is true of fruit trees. If left to perpetuate themselves by the seed, they would soon become worthless. For instance, take the peach. If the seed from budded fruit be planted, the trees from them will bear a much smaller and more inferior peach than the budded fruit. If the seed from the seedling be planted, the fruit is still smaller and finally becomes worthless. At least, this is so in nearly all cases tho there is once in a while an exception. There is a tendency in all fruit to breed back to the parent stock, which is usually inferior in quality.

We can not propagate altogether from cuttings, altho they would retain the characteristic of the parent tree, for all trees will

not grow from cuttings.

Grafting gives us the means of perpetuating and improving the species, if the proper amount of care is used. We have seen that there is a mutual influence between stock and scion, and if care is used to select the best and most vigorous stocks upon which to graft our scions, we can not only perpetuate the species, but produce better fruit, thus building up the fruit industry. Let every one study this subject, use care and forethought in the cultivation of his fruit, and success will crown his efforts.