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Varieties of Rose Understocks

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Mr. Buck is carrying on the work started some years ago by the late Professor T. J. Maney and the American Rose Society is now financially assisting with the project. This extensive review of the types and varieties of roses used for understocks is most informative and thought-provoking.

THE art of graftage, of which the process called budding is a form, has been practiced since early in recorded history. The widespread propagation of roses by budding, or graftage, has been a comparatively recent development in the United States. Originally, roses were grafted for the purpose of getting them on their own roots. Varieties of slow growth, or those which required a lengthy period to form an adequate root system, were grafted on the root of almost any rose available, although the Sweetbrier, *Rosa rubiginosa*, seemed to be the first choice. This lack of selectivity in choice of an understock was of no great importance because the resulting plants were set so deeply that the grafted portion eventually formed its own roots. The understock functioned as a nurse root until the scion had formed an adequate root system of its own. The "nurse-root" method is still in use for the propagation of certain plants such as tree peonies and lilacs. It was felt that plants on their own roots were more desirable than those existing upon the roots of other plants, and grafted plants were tolerated only because they were difficult to grow on their own roots or when more than one variety was wanted on the same plant.

In Europe, by the middle of the nineteenth century, the de-

sirability of grafted roses had become established. The art of grafting, however, as it applied to rose plants was very slow in gaining popularity in the United States although propagation by grafting of other plants, usually fruits, had been a common practice since pre-Revolutionary War days. As late as the last two decades of the past century the established methods of rose propagation in America was either by layerage or cuttage, two methods by which the plant could be produced on its own roots. Propagation of roses by budding on a commercial scale began soon after the turn of the century, when nurserymen in the Pacific Northwest, Texas, and New Jersey adopted the practice almost simultaneously. Without a doubt, the present growth in popularity of the rose as a garden plant stems from the acceptance of this development in propagation.

Without a doubt, the reluctance of American nurserymen to adopt budding in the propagation of roses prior to 1900 was due to the understock materials available at that time. The principle understock in use in Europe was the Dog Rose, *Rosa canina*. It still is the most popular European stock. Canina is erratic in its rooting from cuttings. Its seeds are very irregular in germination. In addition, it grows poorly in the drier, colder climate prevalent over most of North America. With the introduction of *R. multiflora*, the Blackberry Rose of Japan, as an understock, budding became a popular and profitable practice. Today Multiflora, or one of its many varieties, is the understock upon which the majority of America's rose plants are budded.

THE COMPATIBILITY COMPLEX

There are many characteristics which an understock must have before it can be of value in rose propagation. Probably the chief of these is a group of interdependent qualities which can be called the compatibility complex. It is concerned not only with the readiness with which a union between stock and scion occurs, but also with the vigor of growth of the scion. The practice of grafting and budding is based upon the ability of the cambiums of stock and scion to develop callus tissue and unite to form a continuous layer of cambium over stock and scion.

The cambium is a cylinder of tissue located between the woody part of the stem and the bark. It is the tissue responsible for the increase in diameter of a woody stem. The conducting tissues of the plant arise out of the cambium. When the stock and scion have formed a good union, the new cambium layer which has developed gives rise to normal conducting tissues. Reciprocal cambial activity in stock and scion is termed compatibility.

By the nature of a grafted plant, which consists of portions of two plants so intimately joined as to function as one plant, any factor or combination of factors leading to a malfunction of either stock or scion contributes to an incompatible union. Anything which influences the interchange of materials between stock and scion or interferes with the interlocking growth of cells in the tissues formed at the point of union contributes to the plant's failure to function as a complete organism. Incompatibility may result if the callus tissues which are formed in response to the wounding effect of the budding operation fail to differentiate into contiguous vascular and cambial tissues, or if there is a malformation of the cells composing the tissues arising from the mass of proliferated wound cells.

Another cause of incompatibility is concerned with the freedom with which plants of different genera, species and varieties can be grafted. With some plants, for example the citrus fruits, the use of stocks belonging to different genera from that to which the scion belongs is a common practice. In other plants one is restricted to the grafting of varieties of a single species. Even this close relationship does not insure inter-graftability. Due to the highly heterogeneous nature of the majority of our cultivated plants, all varieties of one particular kind of plant will not respond in the same manner to a common stock. With a plant such as the rose, which is the product of diverse parent materials and as a consequence extremely heterogeneous, it is to be expected that the same unidentified factor responsible for the selectivity of stock and scion is operative. For this reason the task of locating a needle in a haystack is much easier than that of locating a universal rose understock. From a practical

viewpoint the stock should have an affinity for as wide a range of varieties as possible. The best criterion of compatibility or congeniality of stock and scion is the vigor of growth from the scion in a large number of plants of the same variety over a period of years. Observation of one or two plants for a short period of time is a poor basis for forming a conclusion on stock-scion congeniality because of the many environmental factors operating to influence plant growth. All things being equal, vigorous growth from the scion induces maximum flower production within the capacity of the variety but we need not expect profuse flowering from a sparsely blooming variety.

ADAPTABILITY

In addition to the compatibility factors there are other characters which an understock must possess. It should be adapted to a wide range of soil types and combinations and to a great range of drainage conditions, varying from perfect to very poor drainage. The average rose root system succeeds best under conditions of excellent drainage. When drainage is poor, the root system does not develop normally. There are rose species which thrive under swampy conditions. Understocks able to grow in poorly drained soils would be of great value to gardeners living in areas with poor drainage.

A rose understock should be at home under a wide range of climatic conditions. It must not only be able to survive wide and rapidly fluctuating temperatures and long periods of exposure to subzero weather without injury, but it should also be resistant to summer killing, a type of injury frequently confused with winter killing. Summer killing results from excessive summer heat which causes varying degrees of defoliation and dormancy. Plants so weakened seldom survive the rigors of winter. However, they have been killed not as a result of winter weather conditions but because their resistance was lowered by unfavorable conditions during the summer.

Along with the quality of adaptability to differing soil and climatic conditions goes a related one pertaining to the root system itself. The typical rose root is a woody system consist-

ing of several thick roots sparsely furnished with small fibrous roots. Some plants develop an extensive matted cluster of fibrous roots, but this is apparently a response to some particular environmental stimulus rather than a clonal characteristic. Past studies have indicated that the variety budded upon the stock will influence to some extent the degree of fibrous root development in the stock, but the degree of development is not consistent. It has been noted that those plants which have an extensive fibrous root growth are the first to develop a new root system after transplanting. New roots appear on the fibrous roots before they have become visible on the larger roots. Other things being equal, the preferred understock should produce a uniformly developed root system which possesses a maximum number of flexible, thin, heavily fibrous roots which will pack and transplant with the minimum injury.

Finally, the stock should be nonsuckering. Since the stock is usually more vigorous than the scion variety, the more robust stock growth tends to outgrow the scion. Unable to compete successfully, the scion usually dies. Suckers result when dormant buds start into growth. Dormant buds may be either lateral leaf buds on stocks grown from cuttings or they may be buds which may have developed as a result of injury. Buds of this kind, which develop on plant parts where buds are normally not present, are called adventitious buds. The tendency to develop adventitious buds is an inherent characteristic of the plant. Many stocks have been discarded, because they form large numbers of adventitious buds.

PROPAGATION

The ease with which an understock may be propagated is largely responsible for its acceptance or rejection. In spite of other characteristics which might outweigh that of difficult propagation, rose growers, commercial and amateur alike, will hesitate to adopt it. The understock may be propagated by either of two methods. Regardless of the method used, a satisfactory budded plant may be produced. Probably the easiest method of propagating understock materials is by seedage. Seeds of the

majority of stocks which may be increased in this manner, germinate more or less freely after a period of time during which the embryo reaches maturity. The period required for maturing the seed varies with the species or variety of rose. Seedling plants are usually large enough to bud during their second season after germination. Because of the large amount of hand labor required for their production, plants grown on seedling stocks are rather expensive to produce. However, an excellent plant with a natural root system which transplants readily is the result. If care is taken to insert the bud in true root tissue below the lowest point on the stem from which branches emerge, the seedling stock seldom suckers. Another merit of the seedling stock is that by careful attention to grading it can be budded over a long season. The largest seedlings are budded first, and continuing through the smaller grades as the season progresses. The chief fault of the seedling stock, aside from its cost of production, is its great variability. The two main understocks grown from seed, *R. multiflora* and *R. canina*, are highly variable species. One needs only to inspect a large population of plants grown from the seeds of either species to be aware of this. To reduce the variation in seedling populations, only species or subspecies should be used since hybridization tends to increase rather than decrease variability.

The other method of propagation is by cuttage. Stocks propagated from cuttings are usually descended from a single plant and are known as clones. The primary characteristic of a clone is the uniformity of the plants comprising it. All of our named rose varieties are clones. As long as each clone is propagated vegetatively, it will retain all of its identifying characteristics. As a result stocks propagated by cuttings are more uniform than those produced from seed. They are also less expensive to produce, although some of the methods used to reduce the possibility of suckering increased their cost. Because the cutting is made from a portion of stem which contains many potential growing points, it has a greater tendency to sucker than the seedling. The root system of the cutting is an unnatural one. It is produced in response to mutilation. However, it carries on

the functions of a root as well as that of the seedling. While cuttings cannot as a rule be budded over as long a period as the seedlings without resorting to special cultural methods, they can be budded earlier in the season. There are two general types of cuttings—the “stuck” cutting and the transplant. The former is rooted in the field where it is budded while the latter is rooted in a frame or cutting bed from which it is transplanted to the field. Both methods produce a good stock, although the increased handling of the transplanted cutting tends to add to its cost of production.

DISEASE AND INSECT RESISTANCE

Other qualities advantageous in an understock are disease and insect resistance and thornlessness. Probably the most troublesome of the soil-borne pests is the nematode. Various soil fumigants have been developed for its control. They have proven more or less efficient but the most permanent control is the use of nematode-resistant or nematode-tolerant stocks. Where there is no stock known to be immune or tolerant, this quality should be introduced through hybridization with plants which have this characteristic.

Also of increasing importance is the incidence of systemic diseases in roses which may be spread by the use of diseased stocks or scions. Virus diseases have made the production of disease-free peaches, cherries, and plums a difficult task. There is every reason to believe that the rose, which is a relative of these fruits, will become infected. Before this happens, our stocks should be indexed for the freedom from known virus diseases, and new ones capable of tolerance or increased resistance should be produced.

From the standpoint of the actual budding operation, freedom from thorns is an important character in an understock. Absence of thorns on the stems and midribs of the leaves should increase the efficiency of the budder.

Three sections of the genus *Rosa* have contributed most of the understocks used in rose propagation during the first half of the twentieth century. The Caninae Section, from the stand-

point of the number of species involved, has made the greatest contribution to our list of understocks. Although it contains only two species, the Indicae Section has contributed two stocks which have played an important role in rose propagation. With the exception of the species comprising the Multiflora group, *R. moschata*, and *R. setigera* and its hybrids, the understock possibilities of the remaining species in the Synstylae Section have been ignored. Further investigation into the possible utilization of other species in this group for understocks would seem to be indicated.

These are the stocks which have been used in rose propagation:

I. The Caninae Section.

Rosa canina. It is difficult to write objectively about a series which has had such a long and honorable understock career. Its use was first recommended by John Claudius Loudon in 1824. Since that time its use has become widespread in Europe and Australia. Plants true to the original species type are difficult to propagate. Cuttings are difficult to root and seeds require two years from the date of harvest to germinate. Young plants grow slowly, but they are very long-lived. It is a valuable stock for those areas in the south and west where medium and strongly alkaline soils are prevalent. Although the species is considered sensitive to subzero temperatures, hybrid teas budded on it are reputed to be hardier than those worked on other stocks. Seedling populations are more uniform than those of other species. This is due to the peculiar seed producing mechanism common to all members of the Caninae Section. However, a number of special selections have been made from seedling populations which tend to differ to a slight extent from many of the species characteristics. The special selections are usually propagated by seed.

R. canina var. *inermis*, Croibier. This is apparently a synonym for Brog's Thornless.

R. canina var. *inermis*, Gamon. The most widely used understock in Germany at the present time is Gamon's Thornless Canina. It has several worthwhile characteristics. It buds well, has a wide range of compatibility and has an excellent root system. Its chief faults are those of

poor germination and susceptibility to rust.

ADELAIDE BRIER. A form of *R. canina* which has become naturalized in the Adelaide Hills of Australia. Its only use is as a stock for standards. It is propagated by rooting hard cuttings in winter, which are difficult to root. The roots produce suckers profusely, especially when they have been broken in digging.

BROG'S CANINA. This is a canina selection which originated in the nursery of Robert Brog, Reichenbach, Germany. It is not important.

BROG'S THORNLESS. A hybrid between some garden rose and *R. canina* which is still being grown in small quantities. It has disease resistant light green foliage, but it is quite tender, (zero will kill it), and has a poor root system. Those varieties closely related to Ophelia and Better Times are not suited to this stock and remain short and stunted.

DEEGEN'S CANINA. This is a selection which originated in the nursery of Max Deegen, Berlin, Germany. It has a more fibrous root system than the typical Canina. Evidently it is not of great importance.

HEINSOHN'S RECORD. This is a very good stock, especially for yellow roses. It is hardy, and in spite of its large spines is very popular in Germany. It is adapted to greenhouse use, where it is valuable as a stock for late forcing roses.

JAGERBATAILLON. Originated by Josef Klinken, Frankenstein, Silesia. Probably only of local importance.

KUKOLINSKY. This was a very valuable understock forty years ago, but it has been discarded because of its susceptibility to rust. Cuttings root readily and it produces a very uniform lot of seedlings. It buds easily, gives a good percentage of "takes," and produces a good union. All varieties do well on it. The root system is typical of Canina, deep rooting, strong roots with few fibrous roots.

PAV'S ROTE CANINA. Evidently this was a local selection which has never become popular and has been discarded.

PFANDER'S CANINA. This is the latest and hardiest Canina selection to become popular as a stock in Germany. All varieties, with the exception of a few yellow hybrid teas which remain stunted, do well on it. It has many large spines.

POLLMERIANA. This is supposed to be a hybrid of *R. canina* \times Multiflore de la Grifferie. It is adapted to very dry heavy soils but is useless on light sandy soils. Pollmeriana has a very short season and must be budded in June or the first half of July. This is probably the same as the Polleriana stock which has come into use recently in the United States.

SENFF'S CANINA. Senff's Canina is quite similar to Kukolinsky. It is a good stock for yellow roses but other kinds are congenial with it too. It is of medium hardiness. The strong plants have a good root system. It is grown from seed. Budding of the seedlings is done when they are two and a half years old. It gives a good bud take if budding is done when the stock has started to slow down in growth. The flow of sap is very strong and has a tendency to drown out the inserted buds. Old plants have a tendency to produce suckers.

SCHMIDT'S IDEAL. This is a typical Canina, but is adapted only to varieties similar to President Herbert Hoover. It has been discarded.

SCHMIDT'S RECORD. There is no record of this. It has probably been discarded.

SCHMIDT'S SPECIAL. This probably has had the same history as the two preceding selections.

SMIT'S BRIER. Supposedly a hybrid of *R. canina* \times *R. rugosa* var. *hollandica* originating in the Netherlands, it is propagated by cuttings. Because only a limited number of varieties were adapted to this stock, it has been dropped.

WADENSWILER. A typical Canina. It was selected to germinate the spring following the harvesting of the hips. A good stock with all the faults and merits of Canina.

R. corymbifera (*R. canina* var. *dumetorum*, *R. dumetorum*). This species is propagated by seeds, which germinate uniformly two seasons after harvesting. Although the plants are thorny when mature, at budding size they are comparatively thornless. It is hardy in Iowa, has a deep, well-branched root system which does not sucker, and buds well. It is suited to a large number of varieties. Hardwood cuttings root easily.

R. coriifolia var. *Froebelii* (*R. laxa*, *R. canina* var. *Froebelii*). Seedlings produce a uniform, fibrous root system; cuttings are difficult to root. It is of moderate growth. The

mature root system is comparatively small. It is easy to bud, and budding may begin early in the season. However, the "take" which results is very erratic. The budding season ends by midsummer. It has a poor reputation because of susceptibility to rust.

R. rubrifolia. The Red Leaf Rose makes a moderately vigorous, very hardy plant with a Canina-type root system. Cuttings do not root readily, and seed germinates poorly. The seedlings are susceptible to rust early in the season and mildew later. Scions grow weakly. It suckers freely.

R. rubiginosa (*R. Eglanteria*). The Sweetbrier produces a small root system of the Canina type. The plant is very thorny, but it grows well from cuttings and seldom suckers. Hybrid perpetuals and the older hybrid teas do well on it. It is quite popular in England where it is particularly well adapted.

II. The Synstylae Section.

R. moschata var. *floribunda*. The plants are very vigorous and have a very extensive, spreading root system, consisting of thick roots with many small fibrous roots. It is propagated from cuttings which root readily. It buds easily, but only strong growing varieties do well on it. It seems best adapted to poor sandy soils.

R. multiflora. This species and its varieties comprise the stocks upon which over half of the annual rose crop of the United States is produced. As with *R. canina*, it is difficult to generalize about this stock. It is root hardy in all save the extreme northern portions of the United States and grows vigorously over a wide range. It is a very variable species, with the result that seedling stocks are not uniform. However, the seedling is a very popular stock in the eastern part of the country. In the South and on the Pacific Coast cuttings are used extensively. It buds easily with a good "take," and it is felt that its resistance to blackspot is transmitted to some extent to the scion. It goes into partial dormancy in late July and August and is susceptible to growth stimulation by moisture and warmth in the fall. In some sections plants on other stocks give better results. The following selections are propagated by cuttage.

BURR'S MULTIFLORA. This selection is supposed to have originated with the C. R. Burr and Company. It makes a good union with a wide range of varieties.

CLARKE MULTIFLORA. This is a thornless selection which originated in Texas. The leaf rachis is less thorny than Welch's Multiflora which it otherwise resembles. It has a short dormant period in winter.

CRESS AND DANIEL'S MULTIFLORA. This is also known as C & D Multiflora. It is sparsely thorny, and gives a good bud "take" with a large number of varieties. Nurseries in the East use this form extensively.

EDDIE'S MULTIFLORA. The vigorous, sparsely thorny plants propagate readily. It originated with the H. M. Eddie and Sons Nursery in British Columbia. A large number of varieties of roses are congenial with this stock. It makes an exceptionally good bud-union.

TATE MULTIFLORA. The thornless, upright plants are highly resistant to blackspot. It has a short period of dormancy in winter.

T620038. This seedling of Upright Multiflora \times Welch's Multiflora combines the good features of both parents. Vigorous plants have a short rest period.

UPRIGHT MULTIFLORA. The vigorous plants have a short rest period.

WELCH'S MULTIFLORA. This originated at the Mount Arbor Nurseries. The thornless recumbent plant with a thorny leaf rachis is highly resistant to blackspot. It is widely used in Texas as a stock.

WYANT'S MULTIFLORA. This is a sparsely thorny selection which has been discontinued.

R. multiflora var. *carnea* (*R. multiflora* var. *rosea*). The very vigorous plant is at home under a wide variety of soils and climatic conditions. It roots well from cuttings and when budded produces a large, heavy-wooded plant. Buds take well and make a good union. A large number of varieties are adapted to it. Profuse suckering from the roots is its chief fault.

R. multiflora var. *cathayensis*. This has all of the attributes of *R. multiflora* var. *carnea*. The plants are drought-resistant when well established, but its profuse suckering has prevented its widespread acceptance.

R. multiflora var. *Chenault* 5892. An excessively thorny, prostrate plant characterizes this variety which is easily raised from seed, easily budded, and gives strong top growth the first season after budding. The roots tend to

sucker wherever they have been bent or injured.

R. multiflora var. *polyantha* (seedlings of the Baby Rambler type). Plants are easily raised from seed. It suckers badly.

R. setigera. The vigorous thorny plant is hardy in all save the extreme northern portion of the United States. It produces a very fibrous, symmetrical root system. The stems are budded with difficulty, but if grafted during the winter satisfactory plants result. Cuttings fail to root readily; seed produces vigorous seedlings. It tends to resent dry weather.

AMERICAN PILLAR. This climber is used as a stock to a limited extent in Australia. It produces an excellent product and is compatible with a large number of varieties. Its chief fault is the difficulty in getting cuttings to root.

BALTIMORE BELLE. This is one of the old Feast hybrids of *R. setigera*. It is used to a limited extent as a stock for difficult-to-bud varieties, especially Maréchal Niel and other Noisettes. It should be tested more extensively.

AMES 5. Professor T. J. Maney's seedling of Welch's *multiflora* \times *R. blanda* produces a tall arching plant with thornless canes, reddish in winter. There are many milk-white flowers in late May and June. It is difficult to root, 50% being a good rooting percentage, but is an excellent stock for those varieties to which it is adapted. Its ability to continue growth during dry, hot weather, blackspot and mildew resistance, and nematode resistance make it well worth investigation.

AMES 6. This selection is similar to Ames 5, but it is slightly less vigorous. It is easier to root from cuttings than its sister seedling, Ames, 5.

B-10. Professor Maney originated this variety from x-ray-treated seed of Ames 5. It has large bright green, Rugosa-type foliage and 5-inch, white, semi-double flowers which are borne more or less continuously all season. The thornless canes are heavily pubescent. In initial trials it appeared to root readily and be compatible with a wide range of varieties. It is still under test.

DR. HUEY. Captain Thomas' large-flowered dark red climber is replacing Ragged Robin to a large extent in the rose-growing districts of California. It is especially adapted to rose production in irrigated districts. It is in condition

for budding earlier than Ragged Robin. It roots more readily than that variety. Weaker growing varieties do especially well on this stock; vigorous varieties make plants which under unfavorable growing conditions, are too coarse. It is not fully hardy to subzero temperatures, and is susceptible to blackspot and mildew. Other defects are that it tends to die back on the side opposite the bud and to sunburn before growth starts in the spring.

GULLIVER. This variety was originated by H. F. Gulliver, Ames, Iowa, from a cross of *Rosa Maximowicziana* var. *pilosa* × Tausendschon. It is thornless, vigorous, and produces a very uniform lot of seedlings. Cuttings also root freely. Preliminary tests are quite promising.

I.X.L. A seedling of Tausendschon × Veilchenblau. It finds its best use as a stock for tree roses. The canes are very vigorous and thornless but are tender to cold, and they sunburn. It will give a bud break in five days after budding; flowers in twenty-eight!

TEXAS WAX (Texas Canina). This is supposedly a hybrid of *R. chinensis* × *R. multiflora*. It resembles *Odorata* quite closely in appearance and it was confused with that stock at one time. There are both thorny and thornless forms. It was formerly very popular in Texas but has been discarded in favor of *Multiflora*. Its tenderness to cold and poor root system were faults. Its chief merit was that the scion could be forced into growth the same season it was inserted.

III. The Indicae Section.

ODORATA 22449 (*Indica* Major, American Noisette, Maiden's Blush, Blushing Bride, Adelaide Boursault, Queensland Manetti). This is an ancient Chinese garden form derived from *R. odorata* which was introduced by Frank Meyer. It produces an extensive, symmetrical root system which roots deeply. The individual root is very flexible. It roots readily from cuttings, and the plants withstand drought and excess water well. The plants transplant well. It makes a good union, and budding wounds heal quickly. Most Hybrid Teas, especially yellow varieties, do well when budded upon it. Since it is not cold hardy, it is best adapted to areas with mild winters. Some varieties are easily excited into growth when worked upon it. It is an excellent stock for forcing roses, especially those rich in Pernetiana blood.

MOORE'S ODORATA. Ralph S. Moore originated this selection which has harder wood, and is easier to keep in budding condition from *Odorata* 22449.

RAGGED ROBIN (*Gloire des Rosomanes*). This old Bourbon rose has had a long, interesting history. For many years it enjoyed second place as rose stock in the United States but now is losing ground to Dr. Huey. It produces a long-lived plant which does not sucker. It is hardier than *Odorata*. The fine, fibrous root system transplants readily. It is propagated from cuttings which are difficult to root during cool seasons. It is well adapted to areas with long growing seasons and relatively mild winters, for it grows steadily through the summer and is less hardy than *Multiflora*. It must have perfect drainage which may effect its winter hardiness in difficult areas.

IV. Miscellaneous Stocks.

R. laevigata (The Cherokee Rose). This species is best adapted to the southeastern portion of the United States because its tenderness to cold is unquestioned. It produces a very thorny plant with a large coarse root system. It suckers badly.

MULTIFLORE DE LA GRIFFERAIE (*De la Grifferaie*). This old rose has a very vigorous plant with a coarse deep root system. It is extremely hardy. It is suited only to very vigorous varieties, and even then the stock has a tendency to overgrow the scion. It resembles some of the older *R. setigera* hybrids in appearance. Totally discarded at one time as a stock, it is experiencing a comeback as a standard stock.

R. Fortuneana (*R. Banksia Fortuneana*), Double Evergreen Cherokee. This stock is quite popular in warm climates. It is supposedly a hybrid between *R. laevigata* \times *R. Banksia*. It is blackspot resistant and appears to impart some degree of its resistance to the scion. It is particularly well adapted to poor sandy soils. The plant is propagated by cuttings which root poorly. It is difficult to bud because the wounds heal slowly.

MME. PLANTIER. This old garden rose is of uncertain ancestry, but is commonly considered as a hybrid between a Noisette and a form of *R. alba*. It is difficult to root from cuttings and difficult to bud because of its crooked stems. Although it is also difficult to graft because of its crooked

growth, grafted plants do extremely well in the southeastern portion of the United States. It produces very vigorous scion growth.

R. Manettii. In the early part of the twentieth century this was second only to Canina in popularity. Today its use as a stock is practically restricted to greenhouse forcing roses. It produces a vigorous plant which tends to be short-lived. Although considered tender, it has lived through many Iowa winters without protection but has never carried enough wood to produce flowers. It blackspots readily. It is propagated by cuttage and may be grafted or budded with equal success.

LIPPIAT MANETTI. This stock is very similar to Manetti. Its origin is unknown. Grown from cuttings.

BRIARCLIFF. This sport of Columbia is being used to a slight extent as an understock for greenhouse roses. It roots readily from mature softwood cuttings, and most varieties of hybrid teas and polyanthas seem to be congenial with it. Buds take readily, and make a good union.

R. nutkana. This species is used to some extent in the Pacific Northwest as a stock for standards where it is collected from the fence rows. Seedling plants have a short crooked shank which makes budding difficult.

R. rugosa. The form used for an understock has a single, purplish-red flower. It is propagated from cuttings for bush roses; from seeds for standards. It produces long-lived plants and has a shallow, fibrous root system. Its chief fault is its abundant suckering.

WRIGHT #2. This is a seedling of unknown ancestry originated by Mr. Percy H. Wright, Moose Range, Sask. Although it is claimed to be thornless, ours is sparsely thorny on the stems; the leaf rachis is free of thorns. The stems are slender, erect to arching. Has given 90% rooting from cuttings in British Columbia. It grows vigorously in Iowa and has healthy persistent foliage.

WRIGHT #4. A backcross of Ames 6 to the Blanda parent, (Welch's *multiflora* \times *R. blanda*) \times *R. blanda*, produced this seedling. It does not differ greatly from Ames 6 except for greater hardiness and smaller flower size. Further investigation into its value is warranted.