

## THE MARKET FRUIT GARDEN.

### DEAD WOOD IN PLUMS.

THE early season has facilitated the carrying out of the Silver-leaf Order. The compulsory cutting out of dead wood was not begun until March and by then the trees were either in bud or full bloom, and it was easy to distinguish the dead branches and shoots. This is much more difficult whilst the trees are completely dormant. A surprising amount of this dead stuff was removed from some of the older trees, and they look all the better in consequence. This is almost all the pruning that old Plum trees require, but few would suspect the amount of dead wood in trees that appear to be in good order until it is actually looked for.

### DRESSING WOUNDS ON TREES.

Various dressings are used by different growers for wounds on fruit trees, the most common being gas tar, Stockholm tar, copper sulphate solution, and paint made from white lead and linseed oil. My pruners are always provided with a pot of Stockholm tar with which large wounds made by sawing off branches or otherwise are painted. A lot of tar is used when pruning badly-cankered Apple trees, the diseased spots being cleansed with the knife and then tarred. One feels that freshly-made wounds ought to be covered with some protective dressing to prevent infection by fungous diseases, but I am not at all sure that Stockholm tar is effective. Messrs. Brooks and Bailey, in their well-known Silver-leaf investigations, successfully inoculated Plum trees with the fungus *Stereum purpureum* through dressings of gas tar and Stockholm tar that had been applied two or three months before. The stems of the trees were sawn through and the cut surface painted with tar. Two or three months later spores of the fungus were caused to fall on the tarred surface, under the protection of a glass tube, and the result was the appearance of Silver-leaf disease on branches arising a few inches below the point of inoculation. Apparently, therefore, a dressing of tar, after a few weeks exposure to the weather, does not afford complete protection against inoculation by the fungus causing Silver-leaf. This makes one doubt whether it is protective against other fungi, such as canker and brown rot. Canker wounds, pared clean with the knife, generally heal over nicely after tarring, but then so they do, as a rule, if not tarred. In bad cases the canker often extends after treatment whether the wound is tarred or not, but this, of course, is from mycelium already in the wood, and does not mean reinfestation from outside.

A simple solution of copper sulphate is highly recommended for painting wounds by some growers. This, no doubt, protects the wound for a time, as there is no better fungicide, but the chemical, being soluble, must wash off before long.

On a small scale I am trying a dressing recommended by one of the correspondents of the Ministry of Agriculture for use against American blight. For this purpose it is excellent, and, as it contains sulphur, it should serve as a fungicide in addition. The ingredients are three parts, by weight, of flowers of sulphur and 37 parts, by weight, of vegetable oil. These are mixed and heated cautiously to about boiling point. The solution so obtained is diluted tenfold with oil before use. This dressing penetrates and covers well, and its oily nature should make it lasting. Unfortunately, all vegetable oils are very expensive now.

### BLACK CURRANT BUD MITE.

Some Black Currants of the variety Seabrook's Black, planted four years ago, already have a sprinkling of big buds on them. In the eastern counties this variety apparently enjoys almost complete immunity from bud mite, and, on the strength of this reputation, it has been planted very largely in other parts of the country in recent years. It is to be feared that it will not retain its good character for long. From one district comes the report that it is quite as badly affected as Boskoop Giant. *Market Grower.*

## FURTHER INVESTIGATIONS ON THE EELWORM DISEASE OF NARCISSUS.\*

IN the spring of 1917 I delivered a lecture on the Narcissus disease, and although at that time the investigation was still in its infancy, it was definitely shown that eelworm was the cause of the disease which has been giving growers great concern during the past few years. Since 1917, two papers have been published by me in the R.H.S. Journal on the treatment of the disease, and occasional notes have appeared in the Horticultural Press.

On taking up the investigation of Narcissus disease in 1918, I was amazed to find that eelworm infestation had reached such enormous

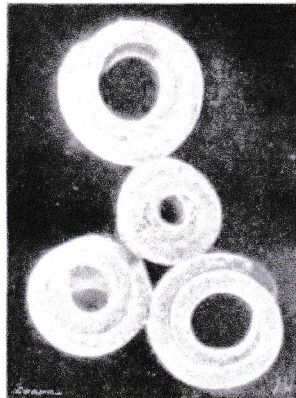


FIG. 93.—EELWORMS IN A QUIESCENT STAGE (x 144), IN WHICH CONDITION THEY RETAIN THEIR VITALITY FOR AT LEAST TWO YEARS.

proportions, and I was inclined to believe that the dangerous character of the disease had been greatly underestimated by growers. Affected bulbs were receiving careless treatment, clean land was being infected, and stocks hitherto free from eelworm were becoming diseased because growers did not realise the seriousness of the matter, consequently, not only were the majority of stocks infected, but land was rendered unfit for the cultivation of Narcissus.

It is essential that growers interested in the bulb industry should be able to recognise the Narcissus disease, to enable them to take correct measures at the right time and in the proper manner. If the disease is allowed to go



FIG. 94.—HEAD OF AN ADULT EELWORM (x 350), SHOWING THE NEEDLE POINT (WITHDRAWN) BY WHICH IT PIERCES THE PLANT TISSUES.

unrecognised and disregarded this negligence constitutes a direct danger to the industry. Some growers are of opinion that the one and only trouble of the Narcissus is eelworm, and therefore it is not surprising to hear it stated that the bulbs can grow out of the disease. In such cases I feel certain that if the bulbs had righted themselves, then these bulbs were not

affected with eelworm. Thus it will be seen that another danger arises, for if the trouble is misdiagnosed and the so-called eelworm disease does not prove very destructive, the dangerous character of true eelworm disease is not realised.

The best time to examine stocks of bulbs for the presence or absence of the disease is during the growing period. In a badly diseased stock the symptoms of the disease will be noticed in many stages of development. There will be plants which look perfectly healthy with regard to the quantity of foliage made, but close examination will generally show that such plants are diseased, the disease appearing in the form of small, pale coloured, swollen areas, which stand out in contrast to the deeper green of the rest of the leaf.

Pale spots which are not due to eelworm sometimes occur on Narcissus foliage, and the best test is to draw the leaf between the thumb and finger. If a decided swelling is felt, then the leaf is affected with eelworm; if there is no swelling, then the spot has been produced by causes other than eelworm. On carefully examining the swollen area, it will be seen that the swelling is beneath the skin of the leaf, and when the spot is cut across, the internal tissue of the leaf is found to be brown, indicating the position of dead plant cells. When scrapings of these swollen areas are examined under the microscope, eelworms (sometimes very few in number) will be found (see Figs. 93 and 94), together with a large number of eelworm eggs. The disease shows up very markedly in the foliage of broad-leaved varieties, such as Emperor and Victoria, but in the case of *N. poeticus* varieties and hybrids the swellings, although present, are not so pronounced. Sometimes the swelling occurs away from the edges of the leaf; at other times it appears on the edge.

When making observations in the field, a diseased stock which has been planted one or more years may be found to contain a number of plants which have produced plenty of foliage, but growth is quite abnormal. The leaves are yellow and sickly; they twist and have ragged edges, and are deficient in cell sap and spongy in texture. The swollen areas are also to be found, but, owing to the yellowness of the leaves, they are not so readily observed as in the case of a plant which is only slightly affected, and in many cases the swollen areas become very irregular in shape. Some bulbs may have refused to grow at all and entirely decayed away. Thus we may find three types: 1st, those which show an occasional spot; 2nd, those which produce twisted and contorted foliage (see Fig. 35); 3rd, those which have produced no foliage at all.

Another symptom, although it cannot always be attributed to eelworm, is the production of stunted and late flowers. Where bulbs are found throwing flowers a few days later than the bulk it is always advisable to examine them. In some cases it may be found to be due to deficient root action or other causes; it may be found also to be due to eelworm.

When a stock of diseased bulbs has been left in the ground for two or more years the disease occurs in more or less circular patches. If one of these patches is examined it is usual to find that no foliage has been produced in the centre of the infected area, and, working from the centre outwards, bulbs producing the contorted and twisted foliage will be found; while, just outside the circle, bulbs will be producing plenty of strong foliage, but spotted with swollen areas. This is readily explained. A diseased bulb was planted, the eelworm escaped from the bulb on its decay and infected the neighbouring plants, producing spotted plants; next year the spotted plants produced twisted foliage or no foliage at all, while increasing numbers of eelworms were liberated and affected healthy bulbs, so that the diseased patches became greater in extent the longer the bulbs were left undisturbed.

Turning to the symptoms of the disease in the bulbs, one of the outstanding characteristics of the disease is that, although the bulbs may be badly diseased and produce contorted foliage, there is always an abundant production of roots.

\* Lecture by Mr. J. K. Ramsbottom, delivered before the Royal Horticultural Society and Horticultural Club, April 13, 1920.



If bulbs showing a trace of disease in the foliage are lifted in spring, they will be quite white inside, whereas when the bulbs of plants showing the disease in a more advanced stage are cut open, the tissue is discoloured (see Fig. 96), is very difficult to describe the symptoms in the bulb, because other diseases may cause the fleshy scale leaves to turn brown. So much depends upon the degree of infection.

In slightly diseased bulbs it is possible to trace the disease from the "nose" downwards. When the bulb is transversely cut, the diseased, fleshy scale leaves have a brown colour and the texture of the scale leaf is dry and spongy where the eelworm is working. With other diseases causing a brown, fleshy scale leaf, the colour is usually much darker than in the case of eelworm disease, and the dead tissue is usually wet. When a bulb is badly diseased, the base separates from the fleshy scale leaves, and it is not uncommon to find swarms of eelworms hanging from the rupture, like a tuft of cotton wool. In other cases the embryo growth of the bulb is affected (i.e., that portion of the bulb which is to produce the foliage and flower the next spring). In such cases, if any foliage is produced at all, it will be malformed. Thus it requires a very practised eye to discern by merely cutting open a bulb whether it is affected with eelworm, and personally, after spending the best part of four years on this work, I never diagnose the trouble until I have taken scrapings and examined them under the microscope. Therefore I am inclined to place more stress on the symptoms of the disease during growth than on symptoms during the dormant stages of the bulbs.

With regard to the diseased patch in the field; lifting time arrives and the bulbs are sorted ready for planting. It is quite impossible, without cutting open the bulb, and by so doing destroying it, to distinguish a healthy bulb from one which is slightly affected, and no matter how diligently the sorting is done, it is certain that quite a number of diseased bulbs will escape notice. These slightly infected bulbs are distributed over a large area (i.e., instead of having the disease confined to one spot as it was before lifting, it is now distributed over a large area) and it has happened within my knowledge, that after these bulbs have been left in the ground two years the disease has reached such proportions that all of them have been rendered absolutely worthless. This is not mere theory; it has been the bitter experience of some of the biggest bulb growers in this country.

The question now arises as to what can be done to prevent the disease from spreading. We know that the disease is due to eelworm and we know that eelworms are not confined to the bulbs only, but are present in the soil. Every care should be taken to keep a diseased stock isolated, as infected soil may be easily transported by means of implements, horses and the boots of the workers. In Holland men are employed on every bulb farm to examine the plants carefully. All bulbs showing symptoms of the disease are marked with a stick and these men are immediately followed by "eradicators," who remove the marked plants with an instrument specially designed for the purpose. This instrument, called the "Koker," consists of a circular zinc cylinder about 5 inches in diameter and about 2 feet in length. It is thrust into the soil and the surrounding earth together with the diseased bulb is removed. Some growers take out about a cubic foot of soil and sacrifice the healthy bulbs enclosed in that area. The wide planting system which the Dutchmen employ and the texture of their soil make this elimination of the diseased bulbs a simple matter, and much good results from the work, for not only are bulbs removed while only lightly affected, but the removal of the soil reduces the spread of infection.

I do not think, however, that the method can be relied upon to entirely eradicate the disease from the field; much depends on how carefully the work is done, but it is a method which is very useful in keeping the disease within bounds in a stock which shows a trace of disease. Unfortunately, the greater density of the Lincolnshire soils prohibits the use of the

"Koker," but an attempt is being made to find a suitable instrument for the purpose.

It appeared to me in 1916 that the only way to fight the disease was to find some practical means of killing the eelworms in the bulbs and so eliminate their power of infecting healthy bulbs. Soaking the bulbs in cold solutions of chemicals for one, two, three and four days proved useless, simply because the solution never gained entrance to the interior of a bulb. Gaseous disinfection was also attempted, but with equally unsuccessful results. By placing slides of eelworms on a thermal stage and examining them under a microscope it was found that the pests could not withstand a high temperature, consequently soaking bulbs in water at temperatures varying from 110° to 120° for different lengths of time was tried.

In the spring of 1917 it was found that bulbs which were treated at a temperature of 120° F. were killed and those which were treated at a temperature of 110° F. had suffered very little; no live eelworms were seen in bulbs which were submerged in the hot water for four hours. In bulbs which had been treated for two hours in water at 110° a few live eelworms were found, although the

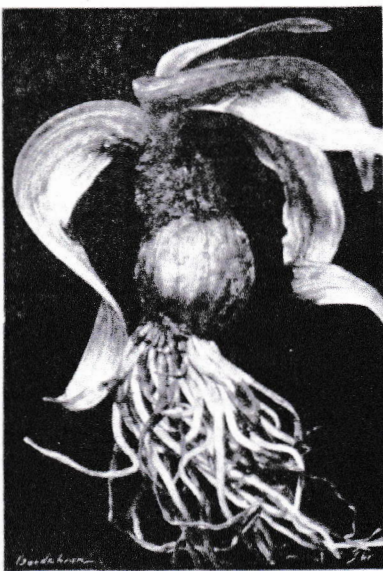


FIG. 96. DAFFODIL BULB BADLY INFESTED WITH EELWORM, AND SHOWING DISTORTED FOLIAGE.

great proportion of them had been killed. I had no information regarding what a three-hour treatment would do. I took the information to two of the Spalding growers, Mr. Geo. Munro, Junr., and Messrs. J. T. White and Sons—two growers who had done much to further the investigation—and they resolved at much cost to place the treatment on a commercial basis. An apparatus was designed and completed in November and soaking operations commenced immediately; a four-hour treatment in water at 110° was adopted. I took advantage of this opportunity to treat four lots of 500 bulbs each from a very badly diseased stock showing 95 per cent. infection, and these were treated for 1, 2, 3 and 4 hours respectively. These bulbs were transferred to Wisley.

The following year it appeared as though the bulbs treated for four hours had been badly damaged. The treated bulbs at Spalding occupied about 6 acres of ground and there was hardly a blade of foliage to be seen. The treatment seemed to be a dismal failure. The growers left the bulbs in the ground for another year, as they were found to be quite hard, although they had not produced roots. Next year (1919) these bulbs grew healthy and strong.

(To be concluded.)

## FLORISTS' FLOWERS.

### VERBENAS.

THE number of people who can recall the days when the Verbena held the chief place in the flower garden must now be few. Like nearly every popular flower, its period of popularity had its limits and extended from the early forties to the eighties of last century, when, if any were to be found who gave no place for Verbenas in his garden, he would have been regarded in much the same manner as Dick Swiveller did the Marchioness when she admitted her ignorance of the taste of beer. The earliest known species worth growing is *V. Aubletia*, the Rose Vervain, but it was not until the advent of the South American species that the Verbena was worth, and obtained, practical attention. The first of these of gardening value was *V. Melindres* (Gillies) figured in *Bot. Mag.*, tab. 3333, as *V. chamaedrifolia* (Hooker), and at the same time *V. pulchella* was introduced, a species that varied from seed and which produced a white variety at Couli in Ross-shire in 1834. It long continued to be grown as a bedding plant.

*V. venosa*, which is hardly in many parts of Great Britain, came next in 1835, and the year following, *V. Tweediana* flowered at Glasnevin, where it was grown in a stove-house. This species was figured in *Bot. Mag.*, tab. 3541, and there is also a fine plate of it in the *Magazine of Botany*. I imagine that it is from these, with the exception of *V. venosa*, that garden sorts were raised. It is recorded that Mr. Wills, when gardener at Huntroyde, raised thousands of seedlings from *V. venosa* crossed with others, but none of these ever proved of value. Many varieties were imported annually from the Continent, and in the Verbena period, Scott of Merriot had no fewer than 500 French and British sorts.

In my recollection, the best varieties for bedding, which were distinct from the pure florists' kinds, were *Defiance*, raised by Robinson, a private gardener at Thames Bank, Pimlico, and distributed by Charles Turner, in April, 1848, at 7s. 6d per plant, the usual price being 5s. for novelties. Subsequent history of *Defiance* has proved the anticipation of its introducer to have been correct, for in its colour it has never been surpassed. *Purple King*, the best of that colour, was raised by Seobie, of Holland House, and sent out by Dobson of Isleworth in 1853; *Brillante de Vaise* before 1856; *Aristo* at the same date, and Mrs. Halford, the best white, in 1856. *Crimson King* was grown extensively in the early seventies. Miss Willmot is the most popular variety that has appeared since, and now is almost always grown from seed, as indeed are Verbenas of all colours, where grown at all.

There is no more difficulty in producing a stock of these Verbenas from seed than of any other easily-grown plant. Some establish them in pots, but I favour box culture. With *V. venosa*, a different treatment is needed where propagation by the stolons is not carried out. Seeds will sometimes not germinate for twelve months after sowing, and they are always tardy in germinating. My own plan is to sleep the seeds in warm water for two days previous to sowing, and never to allow the soil in which they are sown to become the least dry. By this means I have never found them to fail, nor to be too late to plant out with other bedders. *V. venosa* is best planted in broad masses to obtain its wonderful colour effect. A simple but pretty edging, where an edging for Verbenas is desired, is one of mauve dwarf *Ageratum*. This year *Matricaria eximia* "Golden Ball" is to be used here. It also associates well with other plants, and I have had it thus with *Godetia Schamini* fl. pl., with a very broad edging of *Saponaria calabrica*, which was particularly striking. Donald Beaton, who, by the way, tried to cross it with other kinds long before Mr. Wills' experiments, planted it very thickly among variegated scarlet *Pelargoniums*. Beds of these were called "shot-silk beds." It is



remarkably fine too, mixed with the old Mangles' Variegated Pelargonium.

Various reasons have been advanced for the loss of popularity by Verbenas. They may have been over-propagated, but doubtless the bedding Viola, the Begonia, Nemesis, and others, had a great effect in shouldering them aside. Surely it would be worth while to resuscitate Verbenas in named varieties, and probably those noted above are still to be had.

One cause of failure with many growers was too late propagation in autumn and using artificial heat to induce root formation. Verbenas root so readily that I knew a very successful grower of many thousands annually, who rooted stock for keeping over winter out of doors. But the plants were established by the beginning of August. Then it must be remembered that the Verbena is all but hardy and should not be housed—though protected—

### HOME CORRESPONDENCE.

[The Editors do not hold themselves responsible for the opinions expressed by correspondents.]

**English versus Scottish Gardeners.**—I have been very much interested in Mr. F. C. King's article (see p. 172), *English versus Scottish Gardeners*. I have served under both, and I could not regard one class as better than the other. All gardeners have their own special methods of cultivating fruit, flowers and vegetables, therefore the merit of one class as compared with another is largely a matter of opinion. I quite agree with Mr. King's idea of varying a lad's work and giving him a little job to do by himself; he will naturally try to do right, and if he fails the opportunity arises to explain and show him how it should be done. A little encouragement goes a long way. If head gardeners took a little more interest in their young men, and imparted a little more of their know-

hybridist in the production of new greenhouse varieties; it is a tender species and cannot be grown out of doors, except in especially favoured localities in the south west of England and Ireland. The earliest hybrid from it was, I believe, Princess Alice, the result of crossing *R. Edgeworthii* with *R. ciliatum*. This latter is also a native of the Himalayas and hardier than *R. Edgeworthii*, but as it flowers early in the year the blossoms, if unprotected, are liable to be injured by frost. Other hybrids of *R. Edgeworthii*, all of which possess its fragrance, are *R. Forsterianum*, a particularly fine plant whose other parent is the Monbusin *R. Vetchii*; and *R. sesterianum*, between *R. ciliatum* and *R. Edgeworthii*. Some years ago the late Mr. Isaac Davies, of Ormskirk, raised a number of valuable hybrids between *R. Edgeworthii* and *R. multiflorum* (*R. ciliatum* × *R. virgatum*), including Countess of Derby, Countess of Selkirk, Duchess of Sutherland and Mrs. James Shawe. In all of them the flowers are nearly white and highly fragrant. W.

**Datura sanguinea.**—This plant belongs to the section *Brugmansia* of the genus, and is characterised by the shrubby or arborescent habit of the species. I have just been reminded of the handsome and subtropical appearance of the above plant by receiving specimens from Cornwall, where it is grown in a private conservatory, and blooms all the year round, as a result evidently of the mild climate. In greenhouses it is usually treated as a deciduous plant, though naturally evergreen, and is often cut hard back after flowering. In the conservatory in question it is both evergreen and perpetual flowering. At present the small tree bears hundreds of flowers, with buds in all stages of development upon the growing shoots. Originally in a pot, it grew through the bottom, after which the pot was broken away and the plant left to grow where it stood. It has now attained a height of 14 feet, with a considerable spread. The funnel-shaped flowers are eight to nine inches long, though described as seven inches, and the tree four to eight feet high in this country. The long tube is orange, while the limb of the corolla is blood-red, or bright crimson, at its best. A plant of this character is capable of prodigious effects, when planted out in a cool conservatory, and requires far less attention and feeding than when grown in pots. The species is figured in Sweet's *British Flower Garden*, II., 272, as *Brugmansia sanguinea*. J. F.

**The late Mr. W. J. Tutchet.**—The late Mr. W. J. Tutchet, Superintendent, Botanic Gardens, Hong Kong, began his gardening career with his father at Kingsweston, after a sound education at a Bristol city school. From the first he showed a keen and intelligent interest in his work, and his motto: "What is worth doing is worth doing well," was carried out in his attention to every detail. From Kingsweston he went to Ashton Court, under Mr. Bethel, and thence to Messrs. Jas. Veitch and Sons' nurseries, and on to Kew Gardens, where he became deputy foreman of the Orchid department. From Kew he went out to Hong Kong as deputy superintendent, and after a few years he became superintendent of the Botanic Gardens. While in the East he did not forget his native land. He sent accounts of Orchids, Roses, etc., to the horticultural Press, and the last, I well recollect, was on the *Phaius grandifolius*, as it is grown at Hong Kong, in the *Gard. Chron.* of January 21, 1919. Mr. Tutchet made a great name for himself in Hong Kong, and I desire to pay my tribute to his merits, to his tenacity of purpose, and to his high ideals. Such men as he are an honour to the name of Kew and a credit to British horticulture. J. Prince.

**Freesia Names and the R.H.S. Floral Committee.** With reference to your remarks on Coloured Freesias on p. 164, may I say that Buttercup is a well-known variety. It has appeared in Van Tubergen's list since 1914. It seems to me to need explanation why the members of the Floral Committee took upon themselves to say that the variety Mr. Dalrymple sent up for an award under the name of Buttercup was not Buttercup. Robinetta, which I

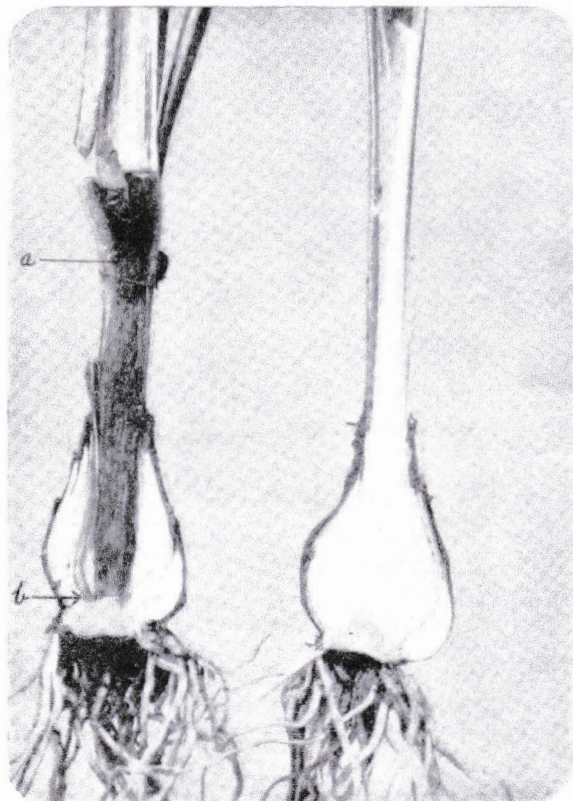


FIG. 96.—A NARCISSUS BULB SHOWING (a) POINT OF INOCULATION BY EELWORM IN FLOWER-STALK AND (b) INVASION OF THE BASAL PLATE BY EELWORMS. D. HEALTHY BULB.

(By courtesy of the Royal Horticultural Society.)

before the middle of November, and as it is important to get cuttings early in the year, slight warmth must be employed towards the end of January. The few weeks in winter are therefore the only period there ought to be any danger of the stock deteriorating, aphids and mildew being the two fatal enemies to fear. The cuttings root so readily in spring that scarce sorts, split up so as to have an eye and a leaf, will even root in an ordinary propagating pit or frame hot-bed in little more than a week. Hardening off used to be responsible also for much debility in the stock for summer planting. This was due largely to growing the young plants in too much heat and also, perhaps, to starvation, for Verbenas undoubtedly need a fairly rich soil and no stint of water at the roots. R. P. Brookerston.

ledge to their assistants. I feel sure that a better feeling would be created. If they were given more encouragement they would take a greater interest in their work and still give "the head" the respect due to him. By learning to obey one learns how to command. William McCombie, *Osprey Hall Gardens, Selby*.

**Rhododendron Edgeworthii.**—This Himalayan *Rhododendron* forms a rather loose-growing shrub with prominently veined leaves, which are more or less hairy on the upper surface and quite woolly beneath. The flowers, borne a few together in loose heads, are about three inches in diameter, white, with a central blotch of yellow, and deliciously fragrant. The fragrance of *R. Edgeworthii* has led to its use by the



### FURTHER INVESTIGATIONS ON THE EELWORM DISEASE OF NARCISSUS.\*

(Concluded from p. 207.)

LAST year (1919) the treatment was commenced early, for I was convinced that damage occurred if root action had commenced. The bulk of soaking was completed by the end of September and no bad effects have resulted from the treatment. Where the treatment was given after September, the bulbs did not grow with the same freedom as those treated earlier in the

on behalf of the Dutch Government, has experimented more with the application of hot air than with hot water. I visited Holland last May, but found the work had not yet been placed on a commercial basis, and until that time arrives, we cannot compare the two treatments.

Having treated the bulbs, the utmost care should be taken to plant them in ground which has not previously carried a diseased crop of Narcissi. I know of no commercial method of rendering infected soil clean. Steam sterilisation may prove to be effective, but the expense attached to the process would be too great. Disinfection of soil by such chemicals as carbon

bulbs early (particularly if the stock is a costly one) and when they have dried off, soak them in water at a fixed temperature of 110° for three hours. Do not carry the work of soaking beyond the end of September. If the bulbs are required for forcing, I think it would be safer to treat them for two hours at 110° and so eliminate the danger of damaging the flowers. This two-hour treatment does not free the bulbs entirely from eelworm and if the bulbs are again required for planting they must first undergo the full treatment. I ought also to point out that the apparatus used should be capable of doing the work efficiently. A tank with a gas ring underneath it may result in more harm than good, as it is next to impossible to keep the water at a fixed temperature. Even the temperature of water in the tank varies greatly. Where tons of bulbs have to be treated, the apparatus becomes very costly and is work for a heating expert.

(c) If Narcissus disease is present on the farm, see that infected soil is not carried about and keep the infected ground isolated. For at least five years grow upon the infected ground crops which are immune to the eelworm which affects Narcissi.

(d) Having treated the bulbs, see that they are planted on ground which has not carried a diseased crop of Narcissi, and as far away as possible from land which has carried diseased stock. Do not contaminate the bulbs during the interval between treatment and planting.

(e) Be ever on the look out for trouble. It should not be taken for granted that because a stock is healthy one year, it will be healthy the next.

The time may not be far distant when the purchaser will demand from the grower an absolute guarantee that the bulbs supplied are free from eelworm. I am certain that it is possible to tell whether diseased bulbs have been supplied or whether the bulbs have contracted the disease since leaving the growers' hands.

I am quite confident that if growers take the advice which has been offered then they will be in a position to guarantee their bulbs to be free from disease. It is a debatable question as to whether rigid control ought to be brought into force, but I feel certain that the bulb industry of this country has a greater future before it than ever it had and con-



FIG. 100.—FORCED NARCISSUS GOLDEN SPUR: THE STOCK SHOWED 95 PER CENT. INFECTION WITH EELWORM.

season. Last year nearly 200 tons of bulbs, representing a total of about 5 million were treated at Spalding. I think growers will agree that the results are highly satisfactory. I do not lay claim to have killed every eelworm and the countless number of eggs contained in 200 tons of badly diseased bulbs, but I have walked through the stocks of treated bulbs and examined many beds, and can find no trace of disease.

I do not propose to describe in detail the apparatus at Spalding. The principle is that of circulating water through a boiler to a supply tank and from there to two soaking tanks and back again through the boiler. The apparatus is capable of taking 8 cwt. of bulbs at a time. Thermometers registering the heat are inserted in the flow and return pipes and there are also two wall thermographs, which serve as a check on the work, recording the temperatures.

Last year lots of 300 bulbs were treated at a temperature of 110° F. for 1, 2 and 3 hours, to see what effect the treatment had on bulbs which were to be used for forcing. Golden Spur was the variety employed. I was alarmed to find the damage done to the flower in the bulbs treated for three hours. Records show that these bulbs were treated early, and I believe the flower bud had not sufficiently advanced to withstand the treatment. Bulbs of different varieties—Emperor, Empress, Sir Watkin and ornatus, treated later, produced marketable flowers when forced and were not injured in any way. Out of doors the flowers came practically normal, although in some cases the edges of the perianth segments were imperfect, but by no means unfit for market. Thus it has been found that by soaking the infected bulbs for three hours in water at a temperature of 110° F., the eelworms are killed, and if the treatment is carried out throughout July, August and September, the bulbs suffer no harm. It is also advisable not to commence the treatment too early, but to wait until the bulbs have ripened (about three weeks after lifting time).

The cost of the hot-water treatment, inclusive of labour, is estimated at about £1 per ton. Not only are the eelworms killed by this hot-water treatment, but the grubs of the larger and lesser Narcissus flies are also destroyed.

Dr. Slogteren, who is investigating the disease

\* Lecture by Mr. J. K. Ramsbottom, delivered before the Royal Horticultural Society and Horticultural Club, April 13, 1920.

bi-sulphide, toluene, naphthalene, mercuric chloride and formaldehyde. I have proved to be entirely useless. The best course is to starve the eelworm out of the ground by growing crops that are immune to attack. Eelworm has been recorded on many crops, but in nearly every case I have not been able to get the eelworm affecting Narcissi to attack these crops. The Onion was the exception, the crop being absolutely destroyed when sown upon land infected with Narcissus disease. How long the eelworm can remain active in the soil I am not prepared to say, but I think that infected



FIG. 101.—NARCISSUS FROM SAME STOCK AS IN FIG. 100, BUT TREATED FOR ONE HOUR IN WATER AT A TEMPERATURE OF 110°. THESE BULBS SHOWED 65 PER CENT. OF EELWORM INFECTION AFTER BEING FORCED.

ground should not be utilised for Narcissi for at least five years, possibly longer.

In conclusion, I know that I have left much unsaid, but I have given the main points of the work without too much detail.

To summarise:—

(1) Make certain how to recognise the disease and do not confound it with other troubles which are not half so serious as the eelworm disease.

(2) Examine all your bulbs, and if a diseased stock is found, then (a) carefully remove all plants showing signs of infection. (b) Lift the

sequently it behoves every grower to keep his stocks in a high state of perfection and free from disease. The hot-water system is an easy and effectual method of rendering Narcissus bulbs free from the disastrous attacks of eelworm, but the precautions I have given in treating the bulbs must be rigorously observed, especially as regards the correct degree of temperature of the water in the whole of the vessel. For this reason it may be necessary to employ a special apparatus, such as that employed in the treatment of the bulbs at Spalding.



# VEGETABLES.

## CABBAGES.

If Darwin in writing his *Origin of Species*, had required an additional instance of the extraordinary capacity for variation of any recognised species, he could scarcely have chosen a more typical example than the Cabbage, which, under various forms, is perhaps the most prominent and certainly one of the most indispensable crops of kitchen gardens and allotments.

In referring to the "greens," as they are

selection seems to have been in favour of heads having particularly white centres, while the French varieties have a tendency to red in the outer leaves. Probably soil has much to do with this colouration, for further north, in the Netherlands, the all-red Cabbage was developed. In the South of Europe, a type having crinkled instead of smooth and glossy leaves gave us the familiar Savoy, so named from the district whence it was first brought to this country.

Of the varieties which, instead of forming one large mass of leaves, send up a tall stem and

flower buds. These, again, are divided into purple and green sorts, and lead us naturally to the most remarkable development of all, the production of a large head of closely-packed flower-buds.

Gardeners often argue as to the difference between white Broccoli and Cauliflowers, and do not seem to agree upon the point. As they obviously sprang from the same source, it seems impossible to find a clear definition, although it may well be that the Cauliflower, which is not so hardy as the Broccoli, was produced independently. This section, most highly esteemed of all the Cabbage group, seems to have come to Europe from the Island of Cyprus. Seventeenth century English gardeners considered that only seed procured direct from the Mediterranean region would produce the true large-headed "Kale-flower." We have changed all that, and Veitch's Autumn Giant will produce heads a couple of feet in diameter, a size that would certainly astonish the Cypriote who first took to munching selected fat buds of the "Cole-flower." *Herbert Mace.*



FIG. 102.—NARCISSUS GOLDEN SPUR; SAME STOCK AS IN FIG. 100, FORCED AFTER THE BULBS HAD BEEN TREATED FOR TWO HOURS IN WATER AT A TEMPERATURE OF 110°. FLOWERS AND FOLIAGE GOOD; BUT ABOUT 1 PER CENT. OF EELWORM INFECTION REMAINED. (See p. 218.)

generally classed by the cook, the gardener usually calls them the Brassica "family," but as a matter of fact, they belong, not to one family, nor, indeed, one genus, but one species only. That species, *Brassica oleracea*,—Cabbage, Colewort, Collet or Kale, as it is variously named—is still found wild on various parts of the British coast, and is sometimes used as a cooked vegetable in places where it grows freely. It is a Cruciferous plant whose appearance may readily be recognised by those familiar with undersized Cabbages which have "bolted" and flowered.

Bearing in mind this simple, wild plant, with its loose spike of bright yellow flowers, it is amazing to think of the strange developments which it has undergone under cultivation. Every part of the plant has been modified, sometimes in one direction, sometimes another. Four main lines have been followed—(1) the development of an enormous number of large, closely-packed leaves in one head as in the Cabbage and Savoy; (2) a development of stem and lateral shoots as in Brussels Sprouts and the Sprouting Broccoli; (3) a great increase in the size and number of leaves, as in the familiar Borcole or Kale, and (4) the extraordinary agglomeration of flower buds into a fleshy mass, as in the Cauliflower and Broccoli.

If not the most highly esteemed vegetable for culinary purposes, the Cabbage unquestionably takes pride of place in regard to the extensiveness of its cultivation, and apparently it was in this direction that the original Colewort, which attracted the gastronomic attention of primitive man, first started on its highly specialised career. The Gauls, indeed, must have grown it, or found it growing in this form, for it is distinctly referred to by them as *Chou capu*. The former name is retained by the French not only for the Cabbage, *Chou cabus*, but for all the other types, for example *Chou-fleur*, the Cauliflower. Its development seems to have been carried on simultaneously in most of the Northern European countries, and at the present time all the innumerable varieties may be classed in groups springing from a few distinctive forms produced in different countries. The typically British Cabbage seems to be that represented to-day by the variety Enfield Market. In Portugal, the

side-shoots, the Brussels Sprout is perhaps the best known. It also has blistered leaves of the Savoy type, and its peculiarity is that the tendency to compact folding of the leaves into a ball is brought out in the numerous sprouts which form in the axils of the leaves. This variety, as its name indicates, is of Belgian origin, and is mentioned in market records of that country as far back as the thirteenth century.

Perhaps there are more variations of this tall sprouting form than any other, for we have the Tree Cabbage, which in the Channel Islands



FIG. 103.—FORCED NARCISSUS GOLDEN SPUR, SAME STOCK AS IN FIG. 100; BULBS TREATED FOR THREE HOURS IN WATER AT A TEMPERATURE OF 110°. GROWTH VIGOROUS AND BULBS FREE FROM EELWORM INFECTION. (See p. 218.)

grows to a height of ten feet or more and produces an enormous quantity of side-shoots; the Flanders Kale, which is like the Tree Cabbage, but, as in the dwarf form, has the local purple colour; and Scotch Kale, with deep green, intensely curled leaves.

In the section known as Broccoli, there is a bewildering variety. Some are cultivated mainly for the side-shoots thrown out in the spring, and instead of forming miniature heads like the Brussels Sprout, produce tender

but guard against the temperature exceeding 85° to 90°. The distance for planting should depend on the length of rafter and the future method of training; a distance apart of from 4 feet to 6 feet or more is suitable for vines to be grown on the extension system. The planting of super-numerary vines for fruiting a year after planting is not to be recommended, as it requires a very strong resolution to remove them in time, and if this is not done, harm results to the legitimate vines. *J.*

## THE SPRING PLANTING OF VINES.

Those who have facilities for propagating, raise vines to have them in readiness for planting during the present month, or as late as the middle of June. May, however, is the best month for planting vines, as genial weather which usually follows is favourable to the vines making rapid growth and also for ripening the wood. Do not grow young vines in very small pots; those of 7 or 8 inches in diameter are the most suitable size. Another method is to insert the eyes in squares of turf, and later place them in boxes of a convenient size, for planting. The border should be made in advance to allow the materials to become thoroughly warmed; the sun will soon warm the surface, and, with a lining of fresh Oak leaves, the soil will be warmed to a good depth. In these conditions, with a moist, genial atmosphere in the house, the young, green vines will make rapid and healthy growth. Do not plant the vines deeply, but place warm compost firmly round their roots, and water them with soft, tepid water to settle the soil. Although shade is hardly needed, a slight covering may be necessary for a few days in very bright weather. Keep the house fairly close until the roots have grown in the fresh soil, and the shoots are developing freely.