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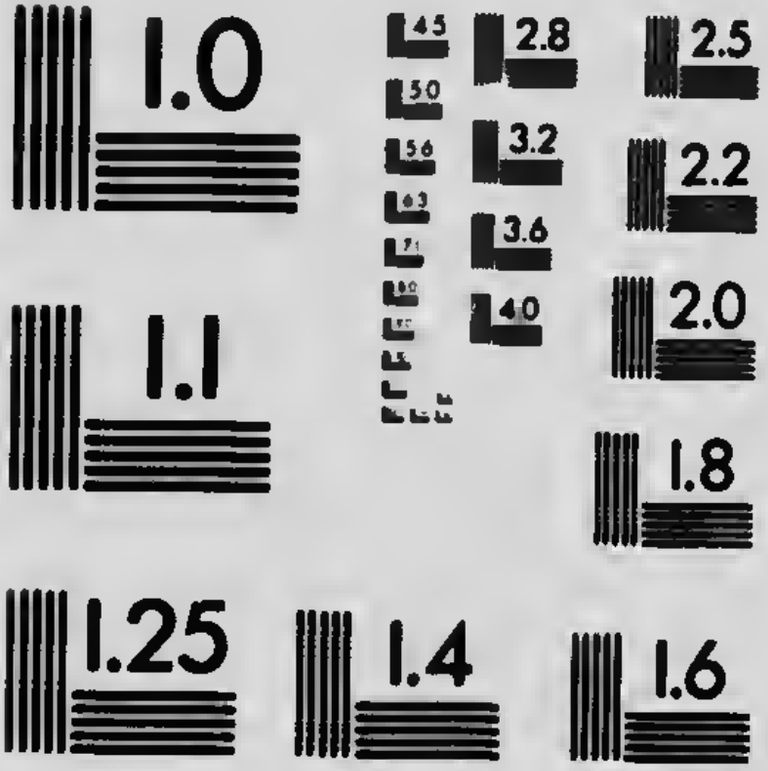

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PAMPHLET No. 22.

DOMINION OF CANADA.

CENTRAL EXPERIMENTAL FARM.

J. H. GRISDALE, B.AGR., D.Sc.A., Director.

W. T. MACOUN, Dominion Horticulturist.

TOMATO CULTURE. MUSHROOM CULTURE. FORCING RHUBARB IN WINTER.

By W. T. MACOUN.

Dominion Horticulturist.

The chief aim in growing tomatoes for the general market or for home use is to have early fruit. The profits from early tomatoes are much greater than from later ones. This being the case, it is desirable to have the plants well advanced when they are set out in the open. To have them well advanced it is necessary to start them early. In southwestern Ontario seed is sown in greenhouses during the month of February. In colder district the time extends to April, but it is sown in most places during the month of March. From nine to ten weeks should be allowed from the time of sowing until planting out, the plants not being set out until danger of frost is past. When the seed is started very early in greenhouses and transplanted several times, it is three months or more from time of sowing until time of planting out.

Every grower of tomatoes should grow his own seed. By careful selection from individual plants from year to year, the variety may be much improved from the standpoint of earliness, uniformity and productiveness. If home-grown seed be not used it should be obtained from reliable seedsmen who are known to have good strains.

The seed is sown in rich, loamy soil. If started in the greenhouse, it is usually sown in boxes or flats containing three to four inches of soil. There should be thorough drainage in the boxes, obtained by boring holes in the bottom. If seeds are planted in the dwelling house, boxes or pots also are used. When sown in a hot-bed the seeds are usually sown thickly, in rows about four inches apart. The seed is planted from one-quarter to one-half an inch deep and after covering with soil the latter is pressed down with the hand to firm it. The soil should be kept moist, but not wet. As soon as the rough leaves appear, the little plants are pinched out about two inches apart each way into other flats or hot-beds. When grown for very early fruit they are again transplanted, when they have filled the space between them, to about four inches apart each way. A final transplanting is made to about six inches apart each way in hot-beds or cold frames, or they are planted in four to six inch pots and given plenty of room to develop. When grown in the hot-bed they should be transplanted at least twice. Strawberry boxes have been found very satisfactory to put the plants in at the final transplanting. What should be kept in mind and aimed at is the production of a stocky, sturdy plant which will have some fruit set upon it when it is planted in the field. A larger crop of early fruit can be obtained by pinching off the top of the plant after it has about six good leaves, which will result in later developing at the axils of the six leaves which are left on. These axillary shoots will each bear flowers if the plants be given sufficient room, and, if far enough advanced when set out, it may be readily seen that the crop of early fruit will be much larger than from the terminal shoot. To obtain the first ripe fruits as early as on the unpruned plants, the seed should be sown about three weeks earlier. Plants which have been pinched back should

eventually be between seven and eight inches apart in the hot-bed to give the axillary shoots a good opportunity to develop. Plants should be hardened off well by giving good ventilation and removing glass in hot-beds in daytime for several days before setting out, as they will stand cool air much better after planting.

In growing plants for the canning factory and in growing the medium and late sorts, much less trouble is taken. The seed is sown during the month of March and the young plants are transplanted once or twice. At the final transplanting they are about five inches apart in the hot-bed or cold frame.

Soil and planting.—Tomatoes do best in a warm soil, either a good sandy loam or a light clay loam being suitable. It should be moderately rich in available plant food. Soil rich in nitrogen induces too much vegetative growth, but while the fruit is earlier on the poor, light soils there is not so much of it, hence one moderately rich in nitrogen with an adequate supply of phosphoric acid and potash is best. A soil which has been manured for a previous crop is usually in good condition for tomatoes, and they do well after clover as a rule. Each grower must learn for himself what his soil needs most. The ground should be thoroughly prepared for tomatoes, as for all other vegetables.

As the tomato is a tender plant it is not set out until danger of frost is over, the time ranging from the middle of May in the warmer sections to the first week of June where frost comes later.

Tomatoes should be planted four or five feet apart each way for field culture, but in the garden, where they may be trained if necessary, three feet each way is sufficient for the early varieties and those that are staked, or four by two and one-half feet for greater ease in getting among the plants. Care should be taken in planting not to disturb the soil about the roots of the plants while taking them from the hot-bed. The great advantage of having plants in pots or individual boxes is now very apparent, as those in this condition are not checked in their growth to any extent when planted out, and to obtain early fruit it is necessary to have as little checking of the growth as possible. If the plants become drawn up and lanky before they are set out they should be planted deeper in the ground than they would otherwise be. Roots will soon be thrown out from the buried stem. By planting tall plants deep in this way they will not be so easily broken by wind as they otherwise would be. Moreover, should there be a frost after planting, killing the plants to the ground, by removing two or three inches of the surface soil new shoots will soon be thrown out, the plants may be saved, and will soon grow rapidly again. This is a good plan in any case in the North where severe spring frosts are liable to occur. It is desirable to mound up the soil about plants to support them and protect from frosts.

As cut-worms are often troublesome about the time the plants are set out, poisoned bran in the proportion of 1 pound Paris green thoroughly mixed with 50 pounds moistened and sweetened bran, should be at once scattered on the surface soil about the plants. The cut-worms will eat this and die.

After planting, the chief work is cultivation, which should be done both ways in the plantation. Some hoeing will also be necessary. The surface soil should be kept loose from the day the plants are set out until they meet one another.

No training of the plants is practised in field culture as a rule, but if the weather should be wet and the soil found to be too rich, causing rank growth, it will check the growth somewhat if the plants are turned over. Usually, however, this is not necessary nor desirable. It is a good plan to mould up the soil towards the plants a little with the cultivator and hoe as this gives them some support.

In the home garden a very good way of growing tomatoes is to train them to stakes, and this method is becoming popular with market gardeners who desire to get fruit of the best quality. By this method only one stalk is allowed to grow, the lateral shoots being pinched out as they appear, but leaving the flower clusters and all leaves on the main stem, the terminal shoot being tied to the stake as it grows. Stakes 5 feet long and about 1½ inches in diameter are needed. Wires may be used for supports

instead of stakes if desired. Tomatoes grown by this method are very clean and more attractive-looking than those grown on the ground.

In parts of Canada where the nights are cool in summer, as on the prairies and in some parts of British Columbia, it has been found that tomatoes will ripen sooner when staked than when the plant is left on the ground, and even in the warmer parts they are sometimes earlier. Tomatoes trained to stakes may escape a light frost when plants on the ground are badly injured.

The tomato is not affected by many insect pests or fungous diseases. If tomato plants are sprayed with Bordeaux mixture, beginning in the hot-bed and keeping the plants covered until the fruit is nearly ripe, several diseases can be controlled, and the flea beetle, which is sometimes quite troublesome, is prevented from doing much injury.

The best varieties of tomatoes change from time to time. At present, the Earliana, of which there are several strains varying somewhat in earliness and smoothness, is the best extra early, and Alacrity, a very early variety of the Earliana type, originated at the Central Experimental Farm, ripens a very large proportion of its crop early. Bonny Best and Chalks Early Jewel are also very good early sorts, the latter being a good main crop variety also. They are smoother than those of the Earliana type. Of later varieties, Matchless and Trophy are two good scarlet sorts, and Livingston Globe and Plentiful two of the best purplish-pink varieties. Ignotum is especially good for canning.

TOMATO CULTURE UNDER GLASS.

It is found quite profitable in Canada to grow tomatoes under glass. Moreover, persons having small greenhouses and who are fond of tomatoes can readily grow a few plants and have enough fruit for home use in this way when there is none outside.

The best and most profitable time to have ripe tomatoes in the greenhouse is during the months of November and December, and the months of April, May and June. By sowing the seed in good time in the summer the main part of the crop will be set before the days become very short and before weather becomes very cold and prevents the thorough ventilation and dry atmosphere which are desirable to ensure a good distribution of pollen and a good set of fruit. The spring crop, on the other hand, should come on as late as possible so that there will be a minimum amount of fuel used, but the crop should be over before tomatoes grown outside are ripe as the price will soon drop when they are. It has not been found profitable to have tomatoes ripen in [illegible]s, on account of the poor light at blooming time, the conditions are unfav[illegible] setting of fruit. Tomatoes should have abundant sunlight and there sho[illegible]ns of good ventilation. Each cropping season covers betwen two and three [illegible]

If it is [illegible]ed to have ripe tomatoes in November and December, seed should be sown during the latter part of June to the first week of July. For a crop in April, May and June, seed should be sown during December. The seed is sown as if the plants were to be grown outside and the young plants are pricked out into flats three by three inches apart as soon as the first rough or true leaf appears. The young plants should be carefully watered so as to keep them thrifty. In about three weeks or less they should be transplanted to three and a half or four-inch pots, in which they remain until they are needed for planting in the bed. They should be ready for planting in about eight weeks from the time the seed is sown. If it is known in good time that the greenhouse will not be ready to receive the plants before they are liable to become pot-bound or stunted in the pots, it is desirable to transplant them into larger pots, as it is important to keep them growing. Some growers make two or three successive sowings of seed at intervals of two weeks, and in case they have not gauged the time of the first sowing accurately, they use the plants from the second or third. The rapidity of growth depends very much on the kind of weather and ventilation given: thus, the plants for the spring crop are usually longer in reaching the desired size for

planting in the bed, which is just before the first flowers open, ten weeks being about an average time from the date of seeding. The best temperature for tomatoes is about 75° F. in daytime, though it may run to 85° F., but if it continues high the plants will be too soft and liable to disease, hence it should be kept as near 75° F. as possible. When the plants are young the temperature should be lower than during the fruiting season—from 60° F. to 65° F. in the daytime being high enough. At night the temperature should not run above 65° F., nor below 60° F. during the fruiting season.

Tomatoes may be either grown on benches in the greenhouse or on the ground. If grown on benches they should have ample soil so that there is no danger of the roots becoming dry, and there should also be good drainage. Good drainage is also very necessary when the plants are in beds on the ground. There should be from six to eight inches of good, rich loamy soil, such soil as they would do well in outside. Soil from rotted sod is good. Two crops may be grown on the same soil, but for the second it is desirable to dig in some well-rotted manure. It has been found that 20 x 18 inches apart is a satisfactory distance to plant in narrow beds, but in wide beds it is desirable to have a two and a half foot space lengthwise between every four rows to let in light and afford a better circulation of air. Another plan would be to have the plants 24 inches apart east and west and 18 inches apart north and south. The soil should be kept constantly moist, but care should be taken not to water too much, as the growth will be too rank and fruit not set well. The surface soil should be loosened from time to time. Provision must be made for staking the plants. A horizontal wire is necessary six or seven feet above each row of plants, and there are several methods by which the plants are trained up to it. The most permanent method is to have a piece of stiff, No. 10, wire for each plant. This is stuck into the soil beside each plant and fastened to the horizontal wire above, then as the plant grows it is tied to the wire with raffia. Another plan is to have a lath serve the purpose of the wire; and another is to have a low, horizontal wire as well as the one above and use heavy cord or binder twine to support the plant, tying the plant to the cord with raffia. All side shoots are pinched out as they appear, the plant being trained to one stem. Two stems have not proved as satisfactory as one. When they have grown to the upper wire the tips are pinched off and kept off. When the plants bloom, it is important to have the air of the greenhouse as dry as possible so that the pollen will be readily distributed, and good ventilation is desirable to keep the air dry. On dark days, particularly, the greenhouse is likely to be too damp unless well ventilated. Usually a good setting of fruit can be obtained of the autumn or early winter crop by tapping or slightly shaking the plants daily about mid-day, thus causing the pollen to be scattered and make it more certain of reaching all parts of the stigma, ensuring both a better setting and more perfect fruit, as, if only part of the stigma receives pollen, the fruit will be one-sided or irregular. For the crop which blooms in winter, artificial pollination is desirable, the pollen being dusted from one flower to another. A camel's hair brush to dust on the pollen which has been previously collected on a watch glass, or on a rabbit's tail tied to a stick, with which the flowers are brushed, are good instruments for this purpose. A fair yield per plant under glass in Canada is 3 to 5 pounds, although the yield may be considerably lower if the fruit sets badly, or it may be somewhat higher. Tomatoes grown in twelve-inch pots in the greenhouse give good results. The soil and drainage should, however, be good. Grown in this way the pots can be moved before the crop is quite over, making the space available for something else.

Ripening Green Tomatoes.—Where frost comes before many tomatoes are ripe, although a large number may be full grown as is the case in some parts of Canada, if the full grown green tomatoes are picked before being frozen and each specimen wrapped in paper and stored in closed boxes in a moderately warm room, they will be found, from tests made at the Experimental Farm of various methods, to ripen well and better than when they are exposed to the sun in trying to ripen them. Even if put into closed boxes without wrapping they ripen well.

The variety most generally grown under glass is Bonny Best, which is scarlet in colour and smooth. The Livingston Globe is a very good purplish-pink variety and is very solid, making it a good shipper. It does not begin to ripen as soon as some others but is one of the best yielders. Many of the English varieties of greenhouse tomatoes have been tested but the majority of them are too small for most Canadian markets. The Comet is one of the most popular. Dobbie Prolific, Sutton Satisfaction, Hipper No. 2, Industry and Stirling Castle have done well.

There are several diseases which affect the tomato when grown under glass, and, as they are difficult to control, it is desirable by good ventilation and proper attention to temperature, to avoid having them. Burning sulphur carried through the greenhouse is one of the best remedies for mildew on the foliage.

FUMIGATING A GREENHOUSE WITH HYDROCYANIC ACID GAS.

As the white fly is sometimes very troublesome in greenhouses, it is necessary to control it, when present, if one is to have success in growing tomatoes and there is nothing so satisfactory as hydrocyanic acid gas for this purpose. This gas is, however, a deadly poison and great care must be taken in using it. Following is a formula found to be effective at Ottawa in killing flies without injury to the plants. As the eggs are not destroyed by the gas, it is necessary to fumigate from time to time to keep the insects under control.

Formula and directions: ½ ounce potassium cyanide (98 per cent pure) or ½ ounce sodium cyanide; 1 ounce sulphuric acid; 2 ounces water for every 4,000 cubic feet of greenhouse space. When a greenhouse is not very tightly built so that the gas finds a speedy exit, it may be necessary to use 1 ounce potassium cyanide or sodium cyanide; 2 ounces sulphuric acid; 4 ounces water, per 4,000 cubic feet in order to kill the insects, but this is a very powerful gas and if used in too concentrated a form serious burning of foliage will result, so that it is best to find what the weakest strength is that will do the work in a particular greenhouse.

Make the greenhouse as nearly air tight as possible by stopping up holes and closing ventilators. The foliage should be dry. If the foliage is damp there may be injury. The greenhouse should not be fumigated in daylight or not before an hour after sunset. The best range of temperature at which to fumigate is between 55° Fahr. and 68° Fahr. One should not fumigate in a high wind as one part of the house will get more gas than another and foliage might be injured.

Wrap the cyanide in thin tissue paper as the acid should almost immediately reach the cyanide. If the paper is thick or tough action will be delayed and one might return to the greenhouse while gas was being given off and be seriously affected by it as it is a deadly poison. Pour the water into a wide mouthed crockery or earthenware vessel, then add the sulphuric acid. Then start walking quickly from one end of the greenhouse towards the other and, if several vessels are used, which is desirable if the greenhouse be a long one, drop a paper of cyanide without unwrapping, when passing, into each vessel containing the right proportion of water and sulphuric acid, and then go on out through the door at the other end, holding the breath and closing the door, and on no account lingering in the greenhouse as there would be fatal results by doing so since the poisonous gas rises and spreads rapidly. The house should be kept closed until morning when open doors and ventilators from the outside. There should be prominent danger signs kept on the doors of the greenhouse while it is being fumigated as someone might otherwise enter and be killed. In order to make the method of fumigation still safer, the cyanide may be suspended by a string above the vessel containing the sulphuric acid and water and lowered into it from outside the greenhouse. To ensure a good distribution of gas, the vessels should be placed at about thirty feet apart and the necessary proportions of the materials used estimated from the formula given and from the area of the greenhouse. For best results there should not be more than from one-half to an ounce of cyanide in any one vessel. After the fumigation is over, the materials in the vessels should be buried and the vessels thoroughly cleaned to avoid danger of accident.

STERILIZING THE SOIL.

Many growers of vegetables under glass and florists also have at one time or another been troubled with nematodes or eelworms in their greenhouses. These cause gall-like masses or swelling on the roots of the plants, and the root system is so injured by them that the crop of vegetables or flowers is almost or quite a failure. They are particularly injurious to the tomato. Sometimes by changing the soil frequently they may be got rid of but they are a constant source of worry to those who have had experience with them unless the soil is sterilized.

One of the simplest methods of sterilizing is the "Inverted Pan" method. Galvanized iron pans are made eight inches in depth and whatever size is most convenient to use, the length and width depending on the width of the beds or benches. These used at the Central Experimental Farm are ten feet long by three feet ten inches wide. They are used crosswise in wide beds and lengthwise in the narrow ones. In order to strengthen them, they are braced with iron straps inside and have two handles at each end so that they can be easily lifted. The pan is turned upside down over the bed and pressed down a little into the soil, and steam is introduced through a half-inch pipe, but in order that the steam may spread rapidly through the soil a half-inch pipe is fastened to the bottom of the pan or top when it is inverted. In this pipe are three half-inch openings about [illegible] feet apart. In the Farm Greenhouses two of these pans are operated at one, by connecting them with half-inch pipe, the couplings being three-quarter inch. In large greenhouses steam could be obtained from the greenhouse boilers, but in this case the greenhouses are heated with hot water, so that a steam engine outside furnishes the steam at a pressure of from one hundred to one hundred and twenty pounds. It is connected with the pans by means of steam hose. The soil is subjected to this steam for one hour. To show how thoroughly the soil is penetrated by the steam, it may be said that a potato is cooked within twenty minutes eight inches deep in the soil. After one hour the pans are moved along to a part of the bed not yet sterilized.

MUSHROOM CULTURE.

There has been a growing interest in mushroom culture during recent years, partly due to the high prices obtained for them and partly because of the large profits said to be made in growing them. The following information should prove useful to any one desiring to grow mushrooms:—

It is of the greatest importance to have good spawn. If the spawn or mycelium is dead there will be no mushrooms, no matter how carefully the bed is looked after. Therefore, mushroom spawn should be obtained from reliable sources.

Spawn is the mycelium of the mushroom and may be compared to the vegetative part in flowering plants, while the mushrooms themselves correspond to the flowers. The bricks in which spawn is bought are merely the carriers of the mycelium which, when the proper conditions are given, continues its growth and eventually produces mushrooms. The mycelium is produced from spores which fall from the mature mushrooms and germinate. The spawn-bearing bricks which are purchased are composed of horse and cow manure and sometimes a little loam. The compost is moulded into the form of bricks and while still moist they are inoculated with mycelium. This grows and permeates the bricks, which, when filled with the mycelium, are dried and stored ready for sale. If the bricks are not kept dry until they are needed for spawning the mycelium is liable to be injured, and, as the older the bricks are the more likelihood there is of their being subjected to unfavourable conditions, fresh spawn should be used. The pure culture spawn differs from the other in that the mycelium is first grown from the tissue of young mushrooms or from the spores in sterilized compost, by which method the best varieties and strains may be grown pure.

The manure for the bed should be partly rotted horse manure; cow manure is not so good. This is usually obtained from livery stables and should be mixed with straw bedding for best results, although mushrooms will grow in manure when mixed with sawdust or shavings which have been used as bedding. It is piled in a place sheltered from rain and kept from burning by turning several times at intervals of four to seven days until the first violent heat is over, by which time it is thoroughly mixed and of comparatively uniform consistency and has lost its rank smell. This will take three weeks or a little less. To heat well, the pile should be at least four feet deep, or more if the weather is cold. If the manure is very dry, enough water may be added to make it moist, but not wet. The bed may be made in a cellar, under a house beneath greenhouse benches, or in any fairly dark place where the temperature in the room does not go much above 60° F. or under 50° F. From 55° F. to 58° F. is a good range. A lower temperature for a few days will delay the appearance of mushrooms, but may not otherwise prove harmful. Mushrooms do best where there is good ventilation, providing moisture and temperature can be controlled. When the manure is put in, it is tramped down solid, and this can best be accomplished by putting on about three inches at a time and pounding down well until there is a depth of fifteen inches, although less will do where the temperature is near 60° F. all the time. When the manure is put in, it should be of such a consistency and moistness that it will not crumble in the hand if squeezed yet is not so moist that water will come out. The temperature of the bed should soon rise to about 100° F. and after it has reached its maximum and has fallen to between 70° F. and 80° F. the bed is ready for spawning. Good results are obtained if the bed is spawned at 65° F. The spawn should be broken into pieces as large as a butternut or small egg, or larger, and the pieces inserted every eight to ten inches or even farther apart and from one to two inches deep in the manure, lifting it up when putting in the spawn, after which the manure should be pressed firmly against the spawn and the whole bed made firm. From five to eight days after spawning, according to how fast the temperature is going down, from two to three inches, or even less, of good loamy soil is spread on top of the manure.

If there is a tendency to dryness, a light covering of hay or straw may be put over the manure until it is time to put on the soil, after which the straw is removed. The mycelium should begin to run in about two weeks, or less if it is good, and sometimes the soil is not put on until it is seen as a white, cobweb-like growth extending in different directions from the pieces of spawn. If it can be avoided, the bed should not be watered at all, as watering, especially shortly after spawning, often causes injury. It is best to keep the floor and walls damp, the moisture given off from these furnishing the soil with enough. If the room is very dry, lightly watering the bed with tepid water may be done very occasionally, but there is danger of rotting the mycelium from watering. A covering of hay over the bed will help to keep in the moisture until the mushrooms come. The growing of mushrooms during the summer months is not satisfactory, as maggots are very troublesome and difficult to control. If the bed is prepared in the fall the mushrooms should appear in seven or eight weeks and the bed continues bearing for from two to three months, but results with mushrooms are very uncertain. The amateur sometimes obtains a good crop, and other times there is failure, although apparently the same treatment is given.

FORCING RHUBARB IN WINTER.

The forcing of rhubarb in winter should be much more general than it is. With very little trouble an abundant supply of this appetizing vegetable can be had in the fresh condition from the middle of January until spring, if desired. A few good sized crowns or pieces cut off the plants in the garden will furnish enough stalks for a family. As the crowns or plants from which the stalks are to be forced have received the necessary nourishment during the season, it is not necessary to plant them in soil when forced, although soil may be found the most convenient material in which to put the plants as the roots must be kept moist for best results. Excellent results have been obtained by filling in between the roots with moss which is kept moist. Even coal ashes about the roots will be found satisfactory. The plants are dug just before winter sets in and before being put into the cellar they are left somewhere to freeze solid. An exposure of frost for from ten days to two weeks is desirable, as they force more quickly afterwards if they have been frozen. The plants are now put close together in the cellar for forcing, either in boxes or on the floor. They may remain in total, or almost total, darkness while being forced. Though they are forced in the dark the colour of the forced rhubarb is a very attractive shade of pinkish red. The one lot of plants will continue to throw up stalks for six weeks to two months, or until the roots are exhausted, but to ensure a supply until spring some roots may be kept frozen and not forced until the first lot is ready for use. The temperature at which the rhubarb is forced should not be very high. Between 50° and 60° F. is a good range, and rhubarb will force at even lower temperatures. The time the rhubarb is ready for use will depend on the temperature of the cellar.

If it is desired to grow plants especially for forcing, seed of the Victoria, Linnaeus, or some other good variety should be sown thinly and about half an inch deep early in the spring. If several rows are sown they should be from two to three feet apart. When the plants are well up they should be thinned out to about six inches apart, and then the ground kept well hoed or cultivated throughout the growing season. If the conditions are favourable they will make strong plants by autumn from which some of the stalks the following spring would be large enough to cut. It is not, however, desirable to cut any stalks from those that are to be used for forcing. After the second season's growth the seedling rhubarb plants will be large enough for forcing.