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DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

GROWING FIELD ROOT, VEGETABLE AND FLOWER SEEDS IN CANADA

BY

M. O. MALTE, Ph.D.
Dominion Agrostologist.

AND

W. T. MACOUN,
Dominion Horticulturist.

BULLETIN No. 22
Second Series

Bulletins of the Second Series treat of such subjects as are of interest to a limited class of readers and are mailed only to those to whom the information is likely to be useful.

Published by direction of Hon. MARTIN BURRELL, Minister of Agriculture, Ottawa, Ont.

OTTAWA
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1915

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75478—1

OTTAWA, February 15, 1915.

The Honourable,
The Minister of Agriculture,
Ottawa.

SIR,—I have the honour to transmit herewith, for your approval, Bulletin No. 22 of the Second Series, entitled Growing Field Root, Vegetable, and Flower Seeds in Canada, and prepared by the Dominion Agrostologist, M. O. Malte, Ph.D., and the Dominion Horticulturist, W. T. Macoun.

The prospective scarcity of root and vegetable seeds for the year 1916 and for some time thereafter, on account of the probable disorganization of seed production operations by reason of the present great war, in those European countries whence such seeds have heretofore been imported by Canada and the United States, makes the production of root, vegetable, and flower seeds in Canada a matter of great importance. Already a considerable number of farmers are interesting themselves in this new line of work, and it is hoped that the present bulletin, including as it does quite comprehensive instructions as to how to go about growing these seeds in Canada, will prove helpful to many and act as an inspiration to others to try a small plot themselves.

I have to recommend, therefore, that a edition be printed sufficient to reach all probably interested persons.

I have the honour to be, sir,

Your obedient servant,

J. H. GRISDALE,

Director, Dominion Experimental Farms.

75478—1½

GROWING FIELD ROOT, VEGETABLE, AND FLOWER SEEDS IN CANADA.

BY

M. O. MALTE, Ph.D., *Dominion Agrostologist.*

AND

W. T. MACOUN, *Dominion Horticulturist.*

The great European war which is in progress has affected trade in many ways, and to what extent the various industries both in this and other countries will be changed by the war no one can yet tell. Canadians have been quick to see that the time is ripe for establishing and developing certain industries in the Dominion, which were either not in existence before or were conducted on a small scale, and it is to give some information which may lead to a greater quantity of field root, vegetable, and flower seeds being grown in Canada that this bulletin is published. It would have been advisable to postpone issuing this bulletin until more experiments had been tried in producing seed in Canada, had not the great demand for some information seemed to warrant its publication now.

In the October issue of the *Agricultural Gazette* (Vol. 1, No. 10), Mr. Geo. H. Clark, Seed Commissioner, drew attention to the fact that, at present, enormous quantities of field root, vegetable, and flower seed are imported to Canada, principally from France and Germany. Thus, during the fiscal year 1913-14, not less than 800,743 pounds of beet and mangel seed were imported from the said countries. Of turnip seed, 350,849 pounds came from Holland and France, and of carrot seed, 32,966 pounds were imported from the latter country. Mr. Clark also states that "last year (1913-14) the importations from France at the port of Toronto alone amounted to 4,621 pounds of radish seed, 1,835 of cabbage, 95 of cauliflower, 6,825 of garden beet, 920 of garden carrot, and 1,202 of celery. We obtained 1,900 pounds of parsnip seed from Germany at the same port."

What it would mean to Canadian agriculture, if the importation of these quantities of root and vegetable seeds were made impossible is too evident to need discussion. Suffice it to say that such a calamity would seriously affect almost every branch of agriculture and horticulture.

Fortunately, as Mr. Clark states, the European seed crop for 1913 was good and as a result thereof there is, as far as it is possible to determine now, no fear of a pronounced shortage of seed for the spring of 1915. But, Mr. Clark continues: "It is the seed crop of 1915 that must be reckoned with, and while growers in friendly or neutral countries may assure their customers of their ability to supply them, in the judgment of the writer, Canadian farmers, gardeners, and consumers can not afford to take the risk. They should make a special effort, this autumn and next year, to produce a fair portion of their own requirements."

It is, however, not only the seed crops of 1915 that should be reckoned with, but the seed crops of all years to come. *Canada should make herself independent of foreign markets, and produce at home what now is to be bought from abroad.* Canadian

farmers should not only try to meet the emergency demand for field root seed in the immediate future, but also try to establish a permanent seed-growing industry which would make them independent of any other countries.

With the establishment of such an industry, hundreds of thousands of dollars which now go to other countries, could be saved yearly by Canadian farmers. But apart from this other advantages, which also mean dollars and cents, would be gained by the farmers, were their seed grown at home. Thus, the Canadian farmer has no guarantee at present that the seed he buys comes true to name. The importer, however earnest the efforts he may make to secure genuine seed of the best quality for his customers, has, himself, in many cases, no reliable guarantee that the seed he imports represents the variety asked for. Were the seed grown in Canada, effective supervision and inspection could easily remedy this, the immediate results being that the Canadian farmer would run much less risk of paying hard-earned money for a variety he does not want or even cannot use, than he is doing at present.

Another advantage, and a very great one indeed, which would automatically come to the farmers of Canada, were they raising their own seed, is that, as far as forage plants at least are concerned, home-grown seeds give the better crops. In those districts of Canada where field root seed is now raised on a comparatively small scale, the farmers have recognized this fact and, in consequence thereof, prefer home-grown seed of a certain variety to seed of the same variety imported from somewhere else.

Much more could be said in favour of using home-grown root seed, but the above may suffice at present.

The question which then naturally has to be answered is: Is it possible to grow seed for field roots in Canada?

Before answering this question it must be admitted that only a few data bearing on the same are, up to the present available. In the district of Yarmouth, N.S., turnip seed has been grown by a number of farmers for many years. Not only is this seed of excellent quality and, as a matter of fact, in many cases far superior to the average seed obtained commercially, but the quantity produced per acre is also rather high, the average being about 1,100 pounds to the acre. There is, however, no doubt that with improved methods, this average can be raised considerably above the 1,100 line. That this can easily be done is indicated by the fact that in some cases farmers have harvested as much as 1,800 pounds to the acre.

In Waterloo county, Ontario, seed of mangels, carrots, and sugar beets has been grown for a number of years. As far as yield and quality are concerned, seed growing in this district must be characterized as a decided success. Of mangels and carrots, an average yield of about 1,200 pounds was secured, last year, to the acre, and in addition to this, the home-grown seed has proven itself capable of producing a much better crop of roots than imported seed.

Although data on root seed growing are not available from most parts of Canada, there is no doubt, in the writer's mind that experiments will, in the future, bear out the belief that many districts of Canada where root seed growing is unknown at present, will prove themselves not only able to produce seed of good quality, but also to be especially well adapted to seed raising. Where these districts are, and what kind of root can be successfully grown for seed in the different districts are, however, questions which can only be answered by actual experiments.

Many farmers and horticulturists in Canada have for a long time saved their own vegetable and flower seed, and find it profitable to do so. Experiments at the Dominion Experimental Farms have shown that when the plants and seeds have been properly selected, as good or better results are obtained by using home-grown seed than imported seed. It is true that a few kinds of vegetable seeds are somewhat difficult to grow, but the great majority are comparatively easily grown, although the climate of certain parts of Canada is more suitable for some than for others.

GROWING OF FIELD ROOTS FOR SEED.

In the following pages, general advice is offered to farmers intending to take up root seed growing.

As actual data on root seed growing at present in Canada are not available, it must be pointed out that the information given on the following pages is based chiefly on experience gained in European countries where seed growing has been practised for a long time. This being the case, farmers are respectfully asked to regard the methods, described in the following, as of a general character. Some of them may not be practicable in Canada or in certain districts, but may need slight modifications, made necessary through climatic and soil conditions, cost of and access to labour, etc.

GENERAL PRINCIPLES FOR SUCCESSFUL SEED GROWING.

Mangels, Sugar Beets, Carrots, Swede and Fall Turnips are all biennial plants, *i.e.*, need, as a rule, two years to develop seed. During the first year, the roots are developed and stored with food which, during the second year, is utilized for the formation of the seed-bearing stalks.

Selecting Roots for Seed Production.—When selecting, from an ordinary field, roots to be used as "seed roots" for the following year, care should be taken that the roots picked for the purpose are perfectly healthy, smooth, and even. Roots having undesirable characteristics such as pronginess and large neck should be carefully avoided. Above all, care should be especially taken that only such roots are selected which in general appearance come as close as possible to the ideal type of the variety from which they are picked. *Roots which in shape and colour deviate from the type of the variety should under no circumstances be set aside for seed production.* The rule must be most scrupulously observed, as the value of the seed depends, in the first place, on its purity and trueness to name.

It is not necessary to select, for seed production, the very largest roots. This practice, which is sometimes advocated, is really poor economy. Medium-sized roots are easier to handle, take up less storing room, generally keep better than very large ones and produce just as good seed as far as both quantity and quality are concerned.

Harvesting Roots Selected for Seed Production.—Roots selected for seed production should be left as intact as possible. That is to say, their ends and rootlets should not be chopped off, as is the practice with roots harvested for feed. As, furthermore, the seed-bearing stalks are developed from the crown of the roots, it is evident that too close trimming may result in injury to the crown, thus diminishing its seed-stalk developing ability. To be on the safe side, the tops should be cut off, about three or four inches above the crown.

It is also of importance that the selected roots be handled as carefully as possible. Rough handling, for instance loading on wagons with a pitchfork, is not to be recommended, as injured roots are more susceptible to rot during the winter, and also, on the whole, produce seed of a poorer quality than do perfectly sound and uninjured roots.

Storing during the Winter.—The roots should be stored during the winter in such a way that they are not injured by frost and, at the same time, not damaged by heating.

To protect the roots from freezing is a comparatively easy matter, to prevent them from heating and, as a result thereof, rotting, is often a far more difficult problem. Both difficulties can, however, be successfully overcome, whether the roots are stored in cellars or pitted outside.

A good root cellar should be dry and well ventilated. It should also keep a uniform temperature a few degrees above freezing point. A most essential thing is that good

ventilation be provided for and that the temperature can be kept fairly low in the spring. This is the period when there is most danger of the roots heating and beginning to decay.

Where no root cellar is available, the roots can be pitted outside.

For successful pitting outside it is essential to select a dry, well-drained place for the pit, to cover the pit properly, to regulate the covering according to climatic changes during the storing period, and to provide for necessary ventilation.

A slight elevation or a hillside, where water cannot accumulate, will prove a good location for a pit. The building up of the pit may then be varied according to local requirements.

A convenient-sized pit should not be made more than 5 or 6 feet wide, with the roots piled up 3 or 4 feet above ground level. If the roots are piled up higher, it may be difficult to regulate the temperature properly, especially towards the spring.

When the roots are stacked, they should be covered with a layer of straw; later in the season when the cold weather sets in, a layer of earth should be put over the straw. In order to provide for ventilation, the straw should be left uncovered in spots about 4 feet apart, or special ventilation shafts inserted.

The thickness of the covering layers of straw and earth will depend on the severity of the winter. For colder parts of Canada a 12- to 18-inch layer of straw covered with a layer of earth 6 to 9 inches deep will provide ample protection during the coldest parts of the winter.

In the spring, the layer of earth should be gradually removed and, generally speaking, the thickness of the covers be modified according to the temperature.

Selecting and Preparing Land for Seed Growing.—A rich, warm soil, can be used to advantage for seed growing. Especially well adapted is a somewhat sandy loam or loamy clay. Heavy clay does not give as good crops as lighter soils. The only roots which can be grown satisfactorily for seed on comparatively heavy clay are Swede turnips, but even for these the loams are to be preferred.

As a general rule, a soil which grows good crops of certain varieties of feed roots will also prove suitable for seed roots of the same varieties.

The soil should be *well drained*. The sooner the surplus moisture is drained away in the spring and early summer, the better and safer will the seed crop be.

A liberal application of well rotted manure to the land will materially increase the yield of seed. This should if possible be incorporated with the soil during the previous season.

On soil deficient in lime, a good application of ground limestone will prove most beneficial. The seed crop is also likely to be materially increased if a commercial fertilizer somewhat rich in phosphates is applied a short time before the land is to be planted with the seed roots. Too much nitrogenous manure tends to retard maturity.

The land should also be *as free as possible from weeds* especially Couch grass, Canada thistle, and others possessing a perennial root system. The presence of such weeds is most undesirable, as a field occupied by seed roots can be cultivated only a short time in the spring and early summer. Later in the season, the development of the seed stalks will prevent thorough cultivation, at least where large fields are allotted to the seed growing.

Number of Varieties to be Grown.—The value of the seed produced depends largely on its purity. Not only should the seed be free from weeds, but, above all, be genuine, *i.e.*, it should, when sown, produce a perfectly pure root crop, uniform in type.

The maintenance of the varietal type should under all circumstances be a prime consideration. A seed lot which when sown produces a mixture of different types is worse than useless. This has been quite clearly realized in countries where root seed is grown extensively. In Denmark, for instance, there has even been passed a law to the effect that certain root seed offered for sale must be strictly genuine, the penalty for offence in this respect being heavy fines, and compensation to the unfortunate buyer.

By careful selection of the roots which are to be used for seed production, the grower can to a great extent avoid raising mixed seed. There may, however, arise, during the flowering time of the seed roots, a possibility of the purity of the seed being endangered which should be carefully guarded against. *This danger lies in crossing with other varieties.*

All kinds of *Beets*, including mangels, sugar beets and garden beets, readily cross. This being the case, it is evident that a farmer who grows say a certain variety of mangels for seed, should grow neither other varieties of mangels nor any varieties of sugar beets or garden beets for seed, *unless* the seed plots can be located so far away from each other that danger of crossings between them is entirely out of the question. About 300 yards is considered a safe distance between beet fields growing different varieties for seed.

The different varieties of *Swede Turnips* and *Fall Turnips* also cross-fertilize each other easily, and should therefore, when grown for seed, be kept far apart. The danger of cross-fertilization between Swedes and fall turnips or between different varieties of either is, as a matter of fact, generally considered greater than between different kinds of beets, and it is therefore recommended that seed fields of Swedes and fall turnips belonging to different varieties be located not less than half a mile from each other.

Carrot varieties are cross-fertilized as easily as Swede varieties, and the distance from a seed field of a certain variety to a field growing another variety of carrot should therefore be not less than half a mile.

Beets, turnips, and carrots do not interbreed, *i.e.*, crosses between beets and turnips, beets and carrots, and turnips and carrots are utterly impossible. Consequently, beets, turnips and carrots, can be grown side by side without there being any danger of crossing.

SPECIAL METHODS.

MANGELS AND SUGAR BEETS.

Time for Planting.—The roots are planted as soon as the soil is in good shape, *i.e.*, generally speaking, at the time when Mangels and Sugar Beets are sown for ordinary farm use.

Methods of Planting.—The roots are generally planted in rows 24 to 30 inches apart, with 20 to 24 inches between the roots in each row. For very rich soil the smaller distances can be recommended, for ordinary soil the greater distances are likely to give better results. Sometimes the distances between both rows and roots in the rows is made 24 inches. This method has the advantage of allowing horse-cultivation in either direction.

The distances having been decided upon, the roots are planted either with a spade or after the plough. When the first method is employed the cost of planting will be lessened if two men work together thus: One man starts to dig holes at the distances decided upon; the other man follows, placing one beet in each hole. When the first row has thus been dug and supplied with roots, the second row is worked in the same way. The soil, dug up from the holes in the second row, is used to fill the holes of the first row, in which, as explained, a beet has already been placed. The soil is packed around the beets carefully. The third row is then started, the soil dug up from it being used to fill the holes occupied by beets in the second row, etc., until the field is completed.

Planting beets after the plough is generally cheaper than planting with a spade, but should be used only where the soil is comparatively light and easy to work

When a furrow has been started, the roots are placed in half-upright position along the off-side of the furrow, say 24 inches apart. The first furrow thus having been completed, a second and a third furrow are ploughed, covering the roots planted in the first one. In the fourth furrow the beets are set out as in the first one; then follow two empty furrows, etc. The beets are thus planted in every third furrow.

It is evident that when the beets are planted after the plough, the pull should be so arranged that the horse (only one horse is generally used) is walking on the unploughed part of the field.

It is absolutely necessary, whether the beets are planted with a spade or after the plough, to make the holes or furrows, whatever the case may be, so deep that the *roots become completely covered* with the necks barely protruding from below the surface of the soil.

Cultivation.—During early summer, the field should be carefully cultivated. Horse cultivation should not be employed after the seed stalks have reached a height of from 12 to 18 inches.

Harvesting.—The harvesting takes place when the seed clusters have taken on a brownish-green colour. The very top of the roots is then cut off with a sharp spade, and the seed stalks left on the ground, for a few days, to dry. They are then tied together in small sheaves which are placed in rather loose and open stooks. These are left for about two weeks, after which time they are ready to be hauled from the field, providing, of course, that the weather has been favourable. As the seed clusters easily shatter in dry and sunny weather the hauling to the barn should not be done in bright sunshine if it can be avoided.

TURNIPS.

Methods of Planting are practically identical with those described for mangels and sugar beets.

Cultivation.—It is of great importance that the land be kept in good condition throughout the summer and that weeds be eradicated as thoroughly as possible. Special care should be taken that a certain kind of wild mustard, generally called Charlock (*Brassica campestris*, L.) be entirely destroyed both in the turnip fields and in their vicinity. This particular wild mustard is so closely related to the turnip that it crosses very readily with it. When turnip flowers are fertilized by the wild mustard, just mentioned, they will develop seed which when sown produces perfectly useless roots.

Harvesting.—When the seed pods have assumed a yellowish-brown tint and the seed has turned brown, then it is time to harvest. The seed stalks are cut off with a sharp and strong knife or with a sickle. This operation should, if possible, be undertaken in the early morning or in the evening when the pods are covered with dew, because then the least quantity of seed is wasted. The seed-bearing stalks are tied together in small bundles which are then placed together in open stooks. These are left on the field until the stalks are almost dry. In hauling the crop to the barn the greatest care should be exercised. As the pods very easily shed the seed, rough handling should be avoided, and the wagon on which the crop is loaded be lined with tarpaulins or strong cotton cloth in which the loose seed can be gathered.

CARROTS.

Methods of Planting.—Seed carrots should be planted in the spring as early as possible. They are set out as described for mangels, the difference being, however,

that the distances between the rows and between the plants in the rows need not be so great. Twenty-four inches between the rows and 16 inches between the roots in the rows is ample.

Cultivation.—The land should be well cultivated until the seed stalks are about 2 feet high. The carrot seed grower should above all be on the lookout for *wild carrot plants*, which, when present in or near the seed field, readily cross-fertilize the flowers of the seed carrots. Seed, originated from a cross with a wild carrot, is worse than useless. All wild carrot plants found in the neighbourhood of where carrots are grown for seed, should therefore be destroyed. In a district badly infested with wild carrot, no seed growing should be undertaken.

Harvesting.—Carrot seed can not be harvested like mangel or turnip seed. It must be hand-picked several times during the ripening period, because the individual seed clusters do not ripen at the same time. The seed clusters should be picked when they have assumed a brown colour.

On account of hand-picking being necessary, a large carrot seed field should be provided with roadways between every four rows, so that, at harvesting time, ready access is given to all rows.

SEED GROWING FROM SMALL OR HALF-GROWN ROOTS.

The methods described in the preceding pages are employed when seed is raised from full-grown roots. In Europe, full-grown roots are not always used, but the seed is raised from half-grown or even very small roots, known as "stecklings." There is so far as the author knows no equivalent English word for 'steckling." The term "rootling" is therefore proposed for small and undeveloped roots, used for seed production.

The rootling of mangels, sugar beets, long turnips, and carrots should be about as thick as a finger, whilst those of round turnips should have the size of a hen's egg.

In order to obtain rootlings, the seed is sown later in the season, for full turnips as late as the last week of July or the beginning of August, depending of course on the length of the season.

The advantage of using rootings instead of full-grown roots is considerable. Not only is it more economical, but the seed produced from rootlings generally becomes larger and more even than seed produced from full-grown roots.

In spite of these obvious advantages the rootling method should be avoided for the present. The reason for this is, that rootlings are not sufficiently developed to allow the average grower to determine with any amount of certainty whether they are true to the type of the variety from which they are taken. And as it is most essential in successful seed raising that the seed produced come true to type, it is evident that there is a certain amount of danger in using rootlings indiscriminately for seed production.

At present, rootlings should be used only when they originate, directly, from elite-stock seed, i.e., seed which is [illegible]nteed, by recognized plant breeders, to be perfectly pure.

THRESHING AND CLEANING.

Mangel and Beet Seeds.—When only small plots are grown, the stalks bearing matured seed may be threshed when cut, on a canvas spread on the ground. A short limber stick or flail is effective. By this method the harvesting and threshing are done at different times as the seed ripens. The seed so threshed should be spread over a floor until it is thoroughly dry, when it may be cleaned with a fanning mill fitted with

riddles to separate out seed clusters with bits of stem adhering to them which require further threshing with flail or machine. Flail threshing in the field is impracticable with larger areas, and the ordinary threshing machine is generally used. On large seed farms, cleaners of special design for mangels are used for separating, to be rethreshed, any mangel or beet seeds with portions of stem adhering to the seed cluster.

Swede and Turnip Seed.—Like mangels, these seeds may be threshed to good advantage on canvas in the field. This prevents waste. For large quantities, however, the ordinary grain thresher is generally used. The seed should be thoroughly dried, as it is apt to heat when kept in sack unless it is quite dry. Cleaning is done with an ordinary fanning mill.

Carrot Seed.—The heads or seed clusters, which are gathered by hand when mature, should be spread over a floor and repeatedly turned until they are thoroughly dry. Much of the seed will drop from the clusters during this process. Threshing should be done in decidedly dry or cold weather. Sometimes it is advisable to put both the seed clusters and threshed seed through an ordinary grain thresher twice, in order to secure what is referred to in the trade as "well rubbed seed." A clover seed huller is said to give good results in threshing carrot seed. Cleaning is done with a fanning mill fitted with screens that will remove all the seed with stems adhering, which require further rubbing or threshing.

VEGETABLE SEED PRODUCTION.

Seeds of Annual Vegetables.—It is a simple matter to grow seed of vegetables which have only an annual growth, such as beans, corn, peas, peppers, tomatoes, cucumbers, melons, squash, pumpkins, radish, lettuce, etc. The seed crop is grown much as the plants are grown. When ripe all that is necessary is to harvest and clean the seed as soon as possible after the vegetables are ripe, dry it rapidly and then keep it dry until it is needed for sowing for ordinary use. The seed should be thoroughly screened or selected, saving only the best.

Raising seed of biennials such as beets, carrots, parsnips, onions, cabbage, cauliflowers, and celery is a little more difficult, but it is these mainly which are imported from other countries, and it is hoped that a large number of persons will try raising seed of them.

Beet, Carrot and Parsnip Seed.—To raise seed of beets, carrots and parsnips, good, medium-sized, shapely specimens are selected at digging time, the tops are cut off to within about 2 inches of the end of the specimen, thus leaving the centre shoot. Cutting back close to the root will remove this centre shoot, which is not desirable. Store the roots in a cool, fairly dry cellar, or they may be pitted outside, but if the latter plan is followed, care should be taken not to cover them with much soil until really cool weather sets in, so as to avoid danger of heating. Early in the spring, plant the roots out in good well-drained soil, about 2 feet apart in rows 3 feet apart. When planting, it is desirable to have the tops of the beets, carrots, or parsnips slightly below the surface of the ground. Cultivate the ground regularly and the reward is likely to be a fine crop of seed. The stalks are cut when the seed is beginning to ripen and allowed to dry thoroughly, after which the seed may be threshed out and put away in a dry place until it is needed in spring.

Cabbage and Cauliflower Seed.—To grow cabbage seed, plants having the best heads should be selected, and the whole plant dug. Half-formed heads or even the stumps after the head has been removed will produce seed, but it is recommended to use plants with good heads. During the winter the plants should be kept in as

cool a place as possible without freezing, and if freezing cannot be prevented they should be kept where they will thaw out gradually. The best plan is to store them outside. A trench is opened where the water will not lie, wide enough for three or four cabbages side by side. They are set in this in a slightly sloped position with the roots down. The tops are then covered with straw at first or a light covering of earth to keep out light frosts, and later covered with sufficient soil to prevent freezing. It is important not to put the soil on until it is necessary to prevent frost, as there is danger of the cabbage heating. Cabbage can be successfully stored in any cool cellar if it is not very dry nor very wet. In the spring when severe frosts are over, the cabbages are taken out and planted about 3 feet apart each way, putting all the root and stalk below ground and leaving the head above. When solid heads are used, slits should be made cross-wise on the top of the head at the time of planting. This will make it easier for the seed stalk to force its way out. Seed stalks will soon be thrown up, and each plant will produce a large quantity of seed. Banking the earth against the stalks will help support them. When part of the seed pods have become brown the stalks should be cut and hung up and threshed when dry, and the seed kept dry until needed. Cauliflowers are treated much the same as cabbage, but are much more difficult to bring through the winter. Where the season is long, plants from early spring planting might ripen seed the same season.

Onion Seed.—In growing onion seed the first step is to select medium-sized well-shaped and well-ripened bulbs and then store them in a cool, dry place. Early in the spring they should be planted out about 6 inches apart in rows 3 feet apart. If the onions have sprouted, the sprout should be cut off when being planted as they will then throw up straighter stalks. The upper side of the bulbs should be an inch or two below the surface of the ground after being planted. This will protect them from spring frosts. The ground is then kept cultivated. When the plants have grown sufficiently they should be banked up about 6 inches to help support the plants when the tops become heavy with flowers and seed. When the seed stalks show yellow near the ground the seed balls are cut off with about 2 inches of the stalk attached, it being necessary to go over the plantation several times, as they do not all ripen at once. They are then spread out to dry, and when dried are threshed and the seed is cleaned and put in a dry place until needed. It is important to dry the seed as rapidly as possible.

Celery.—It is rather difficult to grow celery seed in the colder parts of Canada. Where celery seed is grown in quantity, the plants are left outside and protected from frost if it should be sufficiently severe. In most places in Canada it will be necessary to store the plants unless they can be protected sufficiently in the rows they are growing in to keep out frost. This may be done with care, but there is danger of the plants heating in the spring unless some provision is made for ventilation. This can be effected by nailing two boards together in the shape of a trough and then inverting this and putting it over the plants after they have been well moulded up, supporting and raising it enough for air to pass through readily. When there is danger of the plants being injured by frost they should be banked up well, the inverted troughs put in place and then some straw put over. As soon as severe frosts come and there is no danger of the plants heating, more soil should be put on and the plants protected sufficiently to keep out frost. Towards the close of winter the ends should be opened to let the air pass through. Celery may be stored for seed purposes in the cellar, but it is very difficult, unless conditions are very good, to prevent it from rotting before the plants can be set outside in the spring. When severe frosts are over in the spring the plants are set out about a foot apart, in rows 3 feet apart and the land kept cultivated. It will not be long before seed stalks are thrown up. The seed is gathered when about ripe, dried, and cleaned, and put away until needed.

The methods which have been suggested for obtaining home-grown seed may not in all cases be such as are adopted by large commercial seed growers; the object now is rather to tell how the average householder can grow his own seed.

SOME OF THE BEST VARIETIES OF VEGETABLES FOR STOCK SEED.

Asparagus.—Palmetto, and Argenteuil.

Beans.—Round Pod Kidney Wax, Wardwell Kidney Wax, Stringless Green Pod, Early Red Valentine.

Beets.—Crosby Egyptian and Early Model.

Cabbage.—Early Jersey Wakefield, Copenhagen Market, Succession, and Danish Ballhead.

Cauliflower.—Early Dwarf Erfurt and Early Snowball.

Carrots.—Half Long Chantenay.

Celery.—White Plume, Golden Self-Blanching, and Giant Pascal.

Corn.—Early Malcolm, Early Fordhook, Crosby Early, and Golden Bantam.

Cucumber.—White Spine, Davis Perfect, and Boston Pickling or Chicago Pickling

Egg Plant.—New York Improved.

Lettuce.—Grand Rapids, Iceberg and Giant Crystal Head.

Muskmelon.—Hackensack, Montreal Market, Emerald Gem and Rocky Ford.

Watermelon.—Cole Early.

Onions.—Yellow Globe Danvers, Large Red Wethersfield and Extra Early Red

Parsley.—Double Curled.

Parsnips.—Intermediate, Improved Hollow Crown.

Peppers.—Cayenne and Early Neapolitan.

Peas.—Gregory Surprise, Thos. Laxton, Gradus, McLean Advancer and Stratagem.

Radish.—Scarlet White Tipped Turnip and Rosy Gem.

Salsify.—Sandwich Island.

Spinach.—Victoria.

Squash.—White Bush Scalloped, Long White Bush, Delicious and Hubbard.

Tomatoes.—Earliana (best strains), Alacrity, Chalk Early Jewel, Bonny Best and Matchless.

FLOWER SEED.

Many kinds of annual, biennal and perennial flowers produce an abundance of seed in Canada. What is needed is the same care in selecting and keeping pure the parent plants, as is practised by the best houses in Great Britain, Europe and the United States.

Practically all the well-known annuals, such as Antirrhinum, Aster, Balsam, Coreopsis, Larkspur, Gaillardia, Sweet Pea, Nasturtium, Nemesia, Poppy, Petunia, *Phlox Drummondii*, Scabiosa, Verbena, Zinnia, and many others produce good seed.

Among biennials and perennials, which bear a good quality of seed may be mentioned, Hollyhock, Columbine, Campanulas of several species, Larkspur, Gaillardia, Iceland and Oriental Poppies, Foxgloves, and many others.

Like vegetable seed, flower seed should be dried rapidly, and kept dry and thoroughly cleaned and selected to have the best results.

SUBVENTIONS TO GROWERS OF FIELD ROOT AND VEGETABLE SEEDS.

As an inducement to the growing of field root and garden seeds in Canada, the Dominion Government is willing to aid seed growers by cash subventions, full particulars of which can be obtained from the Seed Branch, Department of Agriculture, Ottawa. It may be stated here, however, that the purpose is to encourage the growing of Selected Seed, and only bona fide growers of such seed are eligible to receive the subventions.