GROWING HORSE-RADISH IN OHIO

DONALD COMIN

Horse-radish belongs to the Cruciferae or mustard family and is a hardy perennial producing a tuft of large leaves similar in appearance to the leaves of dock. It is most frequently grown in this country (as an annual) for its fleshy tap root which has a very pungent flavor and is valuable after grinding and preservation in vinegar as a condiment.

Climatic and soil requirements—Horse-radish is found to do best in rather cool, humid climate, although this is not essential. The crop requires a full growing season in Ohio for best development and largest yields, although the enlargement of the root occurs chiefly in early fall. The roots are very resistant to freezing, the leaves are also frost hardy (—4° C.), and the crop may be left in the field over winter.

Horsh-radish, like other root crops, will thrive in a soil of medium texture. Loams, sandy loams, or silty clay loams favor production of large, smooth, unbranched roots for market purposes. On shallow or hard soils, the tendency is to form branched and crooked roots. A subsoil of clay at 10 to 15 inches makes possible a check on the growth of the roots which eliminates the undesirable long roots often found where the crop is grown on deep soils such as muck. On a moist, but not wet, soil, the roots will develop to a good size and be of fine quality; whereas on a dry location they will be small and woody and will lack, to a large degree, the characteristic sharpness.

Manures and fertilizers—Horse-radish seems to thrive in a soil high in organic matter, and for this reason manure is the best fertilizer for this crop. If the soil is already rich and in good physical condition, commercial fertilizers will suffice.

Manure should be plowed under in the fall and preferably before a previous crop, especially if it is not well rotted, in order that it may be well decomposed and mixed with the soil down in the root zone; for the roots tend to grow down and manure placed less than 5 to 10 inches beneath the surface (anywhere above the base of the set) will produce more small, lateral roots on the set. These lateral roots are very undesirable. Manure plowed down just previous to planting contains too much nitrogen and will not develop as large a root. The manure application usually supplies enough nitrogen and potash, but phosphorus should be added in amounts of 500 to 750 pounds per acre. To a certain extent green manures may be used to replace animal manures and will increase the efficiency of the commercial fertilizers used.

Where manure is not used, 1000 to 2000 pounds of a fertilizer high in potash (4-10-6 or 2-12-6) broadcast and plowed under so as to get the fertilizer down where the roots will develop are recommended.

Propagation—Lateral root cuttings or "sets" (1/4 to 1/2 inch thick) are saved at the time when the main roots are trimmed for market. The length of set determines the length of the root which will be harvested;

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thus, cuttings 12 to 14 inches are preferable but shorter ones will do. As these roots or "sets" are nearly uniform in diameter throughout their entire length, they are cut off square at the top (the end next to the tap root) and slanting at the lower end. This is necessary since shoots always arise from the top (square-cut end) while roots may arise from any part of the cutting but mostly from the base (slanting-cut end).

It has been found that cuttings as short as 1/4 inch would produce plants but that well shaped roots were not produced unless the cuttings were 6 inches long or longer. Cuttings planted vertically or slanting made equally good roots, but when laid horizontally the roots were much branched and worthless. Inverted cuttings made shoots from the lower end. Little difference was observed in the crops from cuttings planted with the upper end near the surface or 3 to 7 inches below.

When the "set" roots are taken from their cool, moist sand pits, fresh cuts should be made at both ends of each root and those showing discoloration should be thrown away. The remaining apparently healthy roots should be dipped in a 1 to 1000 (0.1 %) bichloride of mercury solution for 15 minutes just before planting. It is economical to plant only strong and healthy roots.

Soil preparation and planting—The ground for horse-radish is plowed early in the spring and as deeply as possible. It is then harrowed and leveled and allowed to lie for a few days to settle. The field may then be marked with a corn scorer, one-horse shovel cultivator, or a lister into rows 30 to 36 inches apart and 3 to 5 inches deep. Another method used in some districts is to lay the cuttings against the furrow slice at the time of plowing, covering them with the next furrow slice; thus, a row is set every second or third round.

The cuttings or sets are placed 12 to 24 inches apart, all pointing in the same direction, and with the apical or straight-cut ends slightly higher, on the side of a deep furrow. A sharp stick is used to open a hole if the cuttings are long. It may be convenient for the planter to take an armful or basketful of sets and begin on the outside row, dropping the sets into the rows, with the crowns (straight-cut ends) about 2 feet apart and always away from the planter. After the sets are dropped into the row, the ground is pulled over the tail of the set with the toe and firmed with the ball of the foot. The one-horse cultivator is then used to cover the rest of the set with 3 to 7 inches of soil and to level the field.

The roots in alternate blocks of 10 or 20 rows can point in the other direction; this permits round-trip cultivation always in the direction of the tops. Fewer plants are torn out in cultivation by this method. If the roots are not to be stripped, the sets can be planted more or less vertically in holes made with a dibber or a rod, although it is claimed that a much branched root is liable to occur.

Cultivation—The greatest value derived from cutivation is in removing weeds, thus reducing weed-crop competition and conserving soil moisture. Frequent stirring of the soil while the horse-radish is young kills the weeds when they are small, resulting in the greatest efficiency and economy of labor. The weeder should be used at least once a week, or as soon as permissible after each rain, until the plants are a few inches high; then, the cultivator is used at least once a week until the rows grow together. Cultivation is always in the direction in which the crowns are

planted. This crop usually responds to cultivation, especially on higher soils which have a tendency to be more or less dry and where moisture conservation is more essential.

Double cropping—Horse-radish occupies the land from early spring until late in the fall; so, it usually proves profitable to plant other quick-maturing crops such as early radishes, turnips, beets, early cabbage, and lettuce between the roots in the rows. Best results are secured if the early crop is started in hotbeds or cold frames and good sized plants are set in the field as soon as the horse-radish roots are planted.

Stripping or lifting—The German practice of stripping or lifting the roots is claimed to result in the finest market roots which are thicker, larger, straighter, smoother, and more compact than unstripped roots. The yields, or at least the percentage, of fine market roots are increased; although without careful handling, serious injury may follow and the yields be reduced. The practice, although rather costly, is probably justified in view of the superior quality of root obtained.

The soil is taken away from the set (by plow or other tool), care being taken not to disturb the end of the set or the roots formed thereon. The crown end of the set is then lifted and all but one or two of the best sprouts are removed. Any small roots which have started from the crown or set are rubbed off, with the exception of those at the extreme tip which must not be disturbed. The set is then returned to its normal position and the ground replaced. The earlier in the season the trimming is done, the less check there is to growth. The usual practice is to trim the roots when the largest leaves are about 8 to 12 inches high and again in 4 to 6 weeks. A woolen glove or rag is desirable for this operation, because the side roots are hard to rub off with the bare hand.

Harvesting and storing—Since horse-radish makes its greatest growth late in the fall and steadily gains in size and quality after September until freezing weather, the crop should not be harvested until just before the ground freezes, although the roots may safely be left in the ground over winter. Harvesting and storing in the fall provides for a more accessible supply of the roots for market during inclement winter weather.

In harvesting, the tops are cut from the roots as near the crown as convenient from 2 to 4 days before the roots are to be dug. This method seems superior to twisting or cutting off the tops at the time of removing the roots from the soil.

A two-horse plow is usually used to remove the roots. It is operated against the crowns and is set as deep as possible so as to get a long set-root and remove the roots from the soil as completely as possible to avoid a "volunteer" crop the following year, from roots left in the soil, as horse-radish, if neglected, may become a bad weed.

With 30-inch rows, a 15-inch furrow is made, beginning with the outside rows. Every furrow will include a row of horse-radish which is turned over with the furrow.

At this time, cuttings may be made from small basal roots or the largest of the lateral roots, and the main "sticks" or roots scraped, cleaned, and grated with white vinegar.

Outdoor storage—It may be desirable to store the roots as they come from the ground and clean them at any future time. They may be placed in a cool, moist cellar or in an outdoor trench or pit. A well-drained spot is selected and the soil removed to a depth of 6 to 12 inches and not over 6 feet across. A layer of clean, dry straw is placed on the bottom and sides of the excavation, after which the roots are dumped in until a conical or circular pile is built to the lower edge. This pile should be covered with 5 inches of clean, dry straw. As the weather becomes colder, 2 to 3 inches of soil are thrown on before the ground freezes. After freezing and during the winter, additional soil is added to protect the roots until they are taken out.

Cleaning and preparing for market—In cleaning for market the roots are stripped of all small roots, neatly trimmed around the crown and end, partly scraped to get all of the small root stubs off, and washed.

All small roots not less than the diameter of a lead pencil and 8 to 14 inches long are saved, sorted carefully, cut, and stored as indicated under the section on propagation. The remaining small roots may be sold as "scrap".

Yields and prices—Horse-radish yields vary with the soil, fertilizers used, crop management, and seasonal conditions. Yields of 5 tons of marketable roots per acre have been reported, although the average is close to 2 or 3 tons.

A few growers contract for all or part of their crop; many others rely on the open market. The price has varied between 8 and 15 cents per pound with the lower price prevalent at the present time. Some growers have found it profitable to place a part of their crop in cold storage so it may be placed on the market quickly should the market price suddenly advance.

Varieties—Most horse-radish is known simply as "common", although the so-called "Bohemian" or "Maliner Kren" variety is used to some extent and is supposed to be superior.

Disease and insects—Horse-radish is remarkably free from disease and insect troubles. A root rot caused by bacteria is the only serious disease affecting the crop. The infection is greatest from the storage pits but may occur in the field and takes the form of a discoloration and decay of the interior or complete rotting of the root starting in the outer rind.

Leaf spot diseases, caused by various fungi, have been reported but are seldom injurious.

The horse-radish flea-beetle as well as a web-worm, caterpillar, and the Harlequin beetle are attracted to this crop. Fortunately, none is serious, and a Bordeaux mixture spray repels the flea-beetle which is most destructive in Ohio.