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by

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GROWING LATE CABBAGE

by

A. G. B. Bouquet

Cabbage is one of the important staple vegetables grown widely all over the United States. By far the greatest acreage of cabbage in the country is that of the late crop, either for market or for the manufacture of kraut. According to the figures given by the United States Department of Agriculture, the acreage of the intermediate and late crops for market is approximately 130,000 acres, while the additional acreage of cabbage for kraut approximated 25,000 acres in 1930. Of the states producing the late cabbage crop, Oregon was credited in 1937 with 1400 acres, with a total production of 9,800 tons.

In contrast to some other vegetable crops raised in Oregon, such as onions, celery and cauliflower, but few straight cars of cabbage are shipped, only 8 cars being shipped out in 1936. This figure does not include less than carlot shipments or those which went in mixed cars or by truck. Cabbage is widely grown all over the state for home markets and in farm and home gardens for local consumption. By varying the times of seeding and planting and also through the medium of storage, cabbage can be used over a greater portion of the year.

Climatic Conditions

The cabbage plant, both when young and also when fully developed, is hardy to frost. The young plants will stand the average spring frosts when set out early and in the fall the plants developed to maturity will survive the average frost until severe weather occurs. The subjection of the young plants to continual spring frost may tend toward premature seeding, as discussed in a later paragraph.

Cabbage thrives to the best advantage in a relatively cool, moist climate. It has been shown that there is a close correlation between the rainfall occurring during the summer and fall months and the yield of cabbage in the field. The young plants will stand considerable warm weather during their early growth but during the period of development toward maturity the weather should preferably be comparatively cool and moist. There may be an exception to this necessity in the growing of those varieties that come to a state of maturity during August and September. In view of the fact that the average rainfall throughout Oregon is low during the summer months, the ability of the soil in which cabbage is grown to hold moisture well may be of greater importance than the climatic conditions which may prevail. Following the first fall rains, however, the crop makes its greatest growth and development toward solidity. Some varieties of cabbage are more hardy than others and will stand a great deal of cold, as shown by the variety Green Savoy, which can be harvested after the Ball head varieties may be injured by frost.

Soils

In view of the fact that the cabbage crop contains a high per centage of water, it is necessary that the crop be grown on a soil which holds moisture well during the dry period unless there is a possibility of irrigation. The soil must be well drained and yet a good deal of the late cabbage grown in the state is produced on lands of a fairly heavy type which have good moisture holding capacity. A well fertilized clay or silt loam which is well supplied with organic matter

should produce cabbage having a heavy tonnage per acre and a good texture. Soils which are high in organic matter usually produce good cabbage, but it is not advisable to grow the crop on light soil unless it can be irrigated. In view of the possibility of club root, a disease of cabbage, it is not deemed wise to grow cabbage continuously on the same land but rather to have a rotation of crops. Cabbage lands should preferably be either neutral or slightly alkaline as this crop removes considerable lime from the soil and will not grow well in land that is acid.

Varieties and Strains

For the late crop of cabbage, the Ball Head type is most widely grown. The type of plant suitable for marketing should have a short stem and a head of spherical form but slightly flattened at the apex, medium size, and good solidity. There should be a tight over-lapping of the head leaves and the outer leaves of the plant should be thick and tough.

There are various strains of the Ball Head type. Among widely grown strains are the Oregon Ball Head, Penn State Ball Head, Reed Bros. Short Stemmed Danish, and various strains in the hands of individual growers. These strains may vary considerably in type, solidity and yield in spite of the fact that all of them are called Danish Ball Head. In a test of some of these individual strains, the per cent of heads not marketable varied from 0 to 48 per cent, the tonnage per acre varying from 8.7 to 17.88, thus showing the possible wide variation in strains of cabbage of the same name and variety. Cabbage growers should make tests of various strains, and in view of the fact that the seed retains its vitality for several years, a pre-season test can be made and the seed of the best producing strains saved for future planting.

An excellent variety for the late fall or early winter when frosts are prevalent is the Green Savoy, which is unusually hardy. For a late summer or fall crop Copenhagen Market and Glory are excellent and they are also widely used for kraut making.

Seeds and Plant Growing

The amount of seed needed for an acre of plants will be about $\frac{1}{4}$ pound. It is better to have an excess of plants than not to have enough, and for this reason ample seed should be obtained and planted. Various things may tend to reduce the stand of plants in the seed bed, such as dry weather or insects, and for this reason a surplus lot of plants is to be desired rather than a shortage. Having more plants than one actually needs also makes possible a careful selection of the best plants when preparing to transplant to the field.

The cost of seed is no item if one can obtain the best. For example, one might pay \$5.00 for half a pound of seed of a better strain whereas a cheaper seed might cost but \$2.50. It is quite possible that the difference between these strains might run into several tons per acre, with an added value to the crop amounting to several hundred per cent times the cost of the seed of the better strains.

Seed for the late crop is usually sown about 6 to 7 weeks before the time of transplanting; the growth of the plants depending to considerable extent upon the kind of weather occurring during that period. If transplanting is to be done the latter part of June, which is desirable before the soil becomes too dry, then seeding must be done during the first or second week of May. If irrigation is

available it may not be necessary to set the plants as early as in unirrigated sections. The district with its particular fall weather conditions, earliness of frosts, etc. will also determine the time of transplanting plants.

There are two general methods of sowing the seed: first, broadcast, and second, in rows. The latter method is more common and gives a better distribution of the plants and opportunity for weeding and cultivating. Those who sow broadcast sow thinly in narrow beds, which are often covered with cheese cloth screens to prevent the young plants from being infested by maggots. If the seeding is in rows, the maggot is controlled by using a solution of corrosive sublimate, making several applications during the plant growing period. If one is sowing broadcast the seed may be coated lightly with ordinary flour, which will make it much easier to distribute the seed uniformly over the bed. It can then be covered lightly with a quarter of an inch or so of screened soil. If the seeding is in rows it should be drilled in lightly with a seed drill so that the plants will stand in the row about half an inch apart. A crowding of the plants in the rows causes a restricted growth of roots and there will be a less stocky stem and top.

Cultivation of the seed bed will be mainly for the purpose of eliminating weeds. There may be some other insects present on the young plants which must be controlled, such as lice and green worms, but a dusting or two with a complete garden dust will prevent such insects from attacking the plants.

The seed bed should be located on land which preferably has not grown cabbage before, so as to obviate the possibility of the young plants being affected with club-root.

Soil Fertilization

A 10-ton crop of cabbage removes about 90% water, 60 to 80 pounds of nitrogen, 20 to 24 pounds of phosphorus and 80 to 90 pounds of potash. It is evident that both the nitrogen and potash are important ingredients in the crop and that the crop also has a high moisture content. The supply of organic matter is important because of the necessary moisture holding capacity of the soil. This must be provided by rotted manure or by decomposed green manures. A good many soils in which cabbage is commercially raised are naturally high in organic matter. The crop also removes about 80 to 100 pounds of lime, so that unless the soil shows neutrality or slight alkalinity, it would be wise to supply a ton of limestone or so per acre.

As indicated by the removal of plant food by the crop, it is important to use in a commercial fertilizer a moderately high percentage of nitrogen and potash. A fertilizer having a ratio of 1-2-2, 1-2-3 or 1-2-4 would probably be satisfactory for cabbage land. Such a ratio would occur in a fertilizer analyzing 4-10-10, 5-10-10 or 5-10-20. A thousand pounds of such fertilizer applied during the spring and lightly harrowed into the soil should prove of value to the plants of the late cabbage crop. Inasmuch as the roots of cabbage plants quickly meet between the rows, it would appear that broadcasting of fertilizer is an economical method of application.

Transplanting Plants

There are indications from experimental data that it pays to grade plants that are to be used for setting in the field. It is also desirable that late cabbage plants should be hardened somewhat before they go into the field by reducing the moisture during the last week or so of their growth in the seed bed. Such

hardening will automatically take place as the weather becomes warmer and drier or, if the plants are being grown under irrigation, water should be eliminated from them during the latter part of their growth.

It is desirable to transplant plants into the field before the weather becomes too warm and dry and the soil has lost valuable moisture. Late setting of plants may also cause the heads to be less solid throughout than otherwise. Early July may be the last date for the setting of plants, although the time will be dependent to a great extent upon the district in which the plants are being grown and the rainfall of the season. The distances of growing plants will be dependent very largely upon the varietal type and the size of heads desired for market. An average distance of transplanting is 3 feet by 24 inches, with about 7,200 plants set to an acre. Close planting would be 36 by 18 inches while wide planting would be 3 1/2 feet by 3 feet. Some growers who wish to raise extremely large cabbage for kraut use about 4800 plants per acre.

There are three methods of setting plants: first, by horse drawn machine planters, operated by three men; hand transplanters, such as the Masters; and third, setting the plants with a spade. Plants that are going into the field should be looked over carefully for maggots on the roots or lice on the tops. If these are at all prevalent, the plants should be dipped in a solution of Blackleaf 40. If the weather is quite dry at the time of transplanting, part of the foliage of the plants should be removed.

Cultivation

The main object of cultivating cabbage is to eliminate weeds. The root system is one that grows rapidly and soon meets in the center of the rows. The roots for the most part are shallow and deep cultivation will undoubtedly destroy many roots that are comparatively shallow. Scraping the soil for weeds has proven to be as equally valuable as stirring the soil and it will not cause moisture to be lost by exposing soil to evaporation of moisture.

The crop is one which runs high in water content and the yield is decidedly reduced if the drouth is long and severe; therefore, irrigation is of value in cabbage growing in not only increasing the yield of marketable heads but also the solidity and grade of the same.

Insects and Diseases

There are several pests attacking cabbage, some of which may do the crop a great deal of harm and considerably reduce the tonnage per acre as well as the quality of the heads. It is virtually impossible to grow a good crop of cabbage without some dusting or spraying for some of the pests mentioned below.

Cabbage worms. These are the green worms hatching out from eggs laid by the white butterfly with black spots on its wing tips. These white butterflies are common insects over a cabbage field and it is not long after egg-laying before the young green worms are doing damage to the tender heart leaves of the plants. If the young plants are dusted or sprayed soon after they are put out, they will be obnoxious to the butterflies as they fly over the field for egg laying. To prevent worm injury, therefore, the plants should be dusted or sprayed a week or ten days after they have first been transplanted. Repetitions of this work should be done to keep the plants free from worms and lice. The "All in One" or complete garden dust

is useful for this purpose. See Extension Bulletin 496. The dusting or spraying for green worms may have to be continued almost up to the time that the heads are ready to be harvested. There is no danger in using the arsenical poisonings for the worms even when the head is almost fully formed.

Aphis or green lice are also very troublesome on cabbage, but may be prevented from occurring in large numbers by an early dusting or spraying with a complete garden dust or a standard solution of Blackleaf 40. The operator must be careful to dust or spray the undersides of the leaves on which aphis are often to be found.

The cabbage maggot is one of the more difficult insects of cabbage to be controlled. It may do damage to young plants in the seed bed and for the late crop is more liable to be found in the seed bed than later on in the field. Bulletin 496 also gives information on the control of the maggot.

Flea beetles are sometimes very numerous and harmful, as in 1937. Rotenone dust is a useful controlling material.

Club-root is a fungous disease which lives in the soil and enters the roots of the cabbage plant, causing swellings, which are thickest near the primary root. The effect of this disease is to seriously handicap the root action of the plant and thereby reduce the size and grade of the heads.

Harvesting and Preparation for Market

The general demand of the market is for solid heads of cabbage which are four to six pounds in weight. The two most important characters of cabbage are solidity and size, together with freedom from blemish and injury by worms and lice. Cabbage for market and for kraut should be solid all the way through, having no open air spaces.

Heads should be graded for size. Oregon State standards for cabbage call for small Danish cabbage under three pounds, medium from 3 to 6 pounds, and large over 6 pounds.

Containers. Where cabbage was formerly sold in large 200 to 225 pound crates, the present tendency is for the crop to be sold in crates of the standard lettuce crate type with a gross weight of about 80 to 90 pounds. Such a crate makes easier handling as well as in car loading, and retailing.

Storage. Cabbage is not a very economical crop to be stored because of the fact that it takes up considerable room in storage, is apt to shrink considerably, and seldom during the storage period brings a high price. Some cabbage is stored satisfactorily out of doors on well drained land, by burying the cabbage in rows with the head leaves protecting the heads and soil used as the material insulating the plants from freezing. In the eastern part of the United States, cabbage is stored in specially constructed houses and the cabbage placed on racks or in bins. The successful storage of cabbage in western Oregon is dependent very largely upon the seasonal rainfall and general temperature conditions prevailing. Uniformly cool temperatures about 36° F. or lower are suitable for cabbage storage with comparatively little rainfall.

Yields

Yields of cabbage will depend very largely upon soil moisture conditions and the care that has been given the crop. It is necessary that cabbage land yield at least 6 to 8 tons before expenses for growing are paid. The average yields run from 10 to 16 tons per acre. The average value of cabbage will be from \$15 to \$30 per ton, dependent considerably upon the season of the year and the scarcity of the crop. Kraut cabbage may sell for even less than the lower of the two figures.

Additional literature on cabbage culture and marketing is as follows: U.S.D.A. Circular No. 252, Commercial Cabbage Culture; U.S.D.A. Circular No. 35, Commercial Production of Sauerkraut. These may be obtained from the Superintendent of Documents, Washington, D. C. for 10¢ each. O.S.C. Extension Bulletin 496 can be obtained from the county agent's office or from the Extension Service, Corvallis, Oregon.