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GROWING AND MARKETING GREEN PEAS

BY

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Horticulturist (Vegetable Crops)

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Proportion of the Business

Within the last few years the growing of green peas has assumed considerable proportions in the state of Oregon and the West in general, chiefly in the production of this vegetable for manufacture--canning and freezing.

The following statistics of acreage, tonnage, pack, etc., in the United States as a whole and the West in particular, denote actual trends during the past few years.

The U.S.D.A. Crops News Service divides the crop into two main classes: (1) production for fresh shipment, and (2) peas for manufacture.

Production for Fresh Shipment

A ten year average for the entire U. S., from 1927 to 1936, gives the acreage of peas for shipment as 91,550 acres. In 1937 the acreage was 117,440 and in 1938, 103,300 acres.

In 1938 the number of cars of peas shipped from growing sections was 6,465 as opposed to 8,458 in 1936 and 9,122 in 1933, a rather evident decrease in 5 years.

In the West the fresh market acreage in Oregon over a ten-year average from 1927 to 1936 was 560 acres. In 1937 the acreage was stated at 1000 and in 1938, 800. There were 96 cars of peas shipped from Oregon in 1933, 109 in 1935, and only 18 in 1938. From the state of Washington there were 1,087 cars shipped in 1933, 1,038 cars in 1936, and only 507 cars in 1938. The ten-year (1927-1936) average acreage of shipping peas in Washington was 3,340 acres. In 1937 the acreage was 5,200 and in 1938, 4,200.

Production for Manufacture

By far the largest acreage of peas is in the production of this crop for manufacture. During the ten-year period 1927-1936 in the U. S., an average of 236,040 acres was devoted to this purpose. In 1937 the U. S. total acreage of peas for manufacture was estimated to be 334,820, and in 1938, 312,620.

A ten-year average yield of peas per acre for manufacture, for the U. S., was estimated at 1,555 pounds; for 1937, 1,602 pounds; and for 1938, 1,908 pounds.

The national canned pack of peas was estimated in 1938 to be 25,039,025 cases, of which 10,400,640 cases were Alaskas, and the remaining 14,638,385 cases were Sweets. In 1939 the U. S. pack was composed of 5,649,803 cases of Alaskas and 10,677,969 cases of Sweets.

The Western pack of peas in 1908 was 88,510 cases. Thirty years later, in 1938, the total Western pack was 6,116,061 cases.

In 1932 Oregon packed about 1,720 cases of peas, but the pack in 1937 was 52 cases short of a million. In 1920 Washington packed 400 cases of peas and in 1938, 3,574,137 cases. Of the total pack by Oregon and Washington in 1938 of 4,855,894 cases, only 130,000 cases were Alaskas. It has been estimated that the total pack for Oregon and Washington for the year 1939 was 3,389,560 cases.

In addition to the above there were approximately 17,000,000 pounds of peas grown in the West for freezing in 1938, as against 11,000,000 pounds in 1937.

The acreage of peas for manufacture in Oregon in 1938 was estimated at 20,450 acres, with an average yield per acre of 1,690 pounds. The estimates for Washington in 1938 were 27,260 acres, with a per acre yield of 1,890 pounds. A ten-year average yield in Washington state is estimated at 2,250 pounds.

Taking the statistics for both canning and freezing peas, Oregon packed 34,560,000 lbs. in 1938 and 30,456,000 lbs. in 1939. Washington packed 52,920,000 lbs. in 1938 and 46,000,000 lbs. in 1939.

Almost 11,000,000 lbs. of peas were frozen-packed by Oregon-Washington in 1937 whereas but 1,750,000 lbs. were packed three years previously. The frozen pea pack for the U. S. in 1938 was stated to be 34,084,191 lbs. or 40% of the entire frozen pack of all vegetables. The frozen pack of peas showed about a 45% increase in 1938 over the 26 million pounds of 1937.

Influence of Climatic Conditions on Yield and Quality of Peas

In the growing of green peas of good quality, there is no more important factor than that of the temperatures prevailing during the growing and harvesting seasons, a period usually representing 75 to 85 days. In the development of the pods and peas, moderately cool temperatures such as prevail in certain sections of the northwestern states contribute very markedly to the large size of the pods and the fine quality of the peas. There is a threefold effect of the temperature under which the peas are growing: first, on the rapidity of growth from seed to harvest; second, on the extent of vine growth, size and number of pods and total yield; and third, on the quality of the peas themselves.

It is a well known fact that two lots of peas which are sown several days apart under similar soil and cultural conditions may blossom only a few days apart and are, in many cases, ready for harvest at practically the same time. Furthermore, the later plantings usually yield less than the early ones unless they are on higher elevations.

A study of the temperature records in relation to yields indicates a definite relation between moderate temperatures and high yields or between high temperatures and low yields. In other words, as the temperature rises the yields fall rapidly. The lowest yields are most likely to occur in seasons of high and of rapidly increasing temperatures. When the temperature remains fairly moderate and equable the yields hold up fairly well over a wide range of planting dates.

Most of the loss in yield accompanying high temperatures is occasioned by lessened vine growth and decrease in the number of pods set per plant. There is, therefore, a close relation between high temperatures and yields for the period from blossoming to harvest.

Some of the conclusions in regard to temperature in relation to yields are as follows: first, as the date of planting is delayed the mean temperature during which the crop grows and ripens increases; second, the higher the temperature the less is the time required for the pea pods to attain a given stage of development wherein they are ready for harvesting; third, the higher the mean temperature during growth the lower is the weight of the plants, the weight and number of pods and peas per plant; fourth, the main effect of high temperature appears to be the limitation of plant size, pod bearing area, and the number of blossoms.

Another important effect of temperature upon green peas is that influencing the chemical composition and the quality of the peas at and following the time of harvest.

There is a current opinion among canners and growers, as well as shippers of fresh peas that peas harvested relatively late during the hot weather as the result of late planting are inherently of a lower quality than those which are planted earlier and reach harvest under cooler weather. Many believe that the high temperatures under which peas sometimes must develop cause the peas to be harder and more starchy and less sweet and thus of lower quality than earlier-sown peas which are harvested at apparently the same stage of maturity. As a matter of fact, the actual facts show that late-maturing peas resulting from late plantings do not necessarily contain higher starch and lower sugar content than that of early-maturing peas if the crop is harvested at the proper stage of maturity. The lower quality peas often secured from late-maturing plants are probably the result of such a rapid rate of maturing and high temperature conditions that the peas are not harvested at the stage at which it is best to pick them. It is very evident that with higher temperatures prevailing, the crop approaches maturity so rapidly that although harvest is begun at the proper stage of development, some peas often will have passed beyond that point before the harvesting of a large acreage is completed. Unexpectedly high temperatures, therefore, may be responsible for the comparatively low quality of the peas.

In the development and maturing process in peas, there is: first, a rapid decrease of sucrose, total soluble nitrogen and nitrogenous substances; secondly, an increase in starch and insoluble nitrogen; third, low sugar and high starch contents are characteristic of peas of low quality whether as a characteristic of a variety or the result of delayed harvest; fourth, an increase in crude fiber.

Peas stored unshelled have a higher percentage of sugars than those shelled. There is also a lessened percentage increase in crude fiber in unshelled in comparison with shelled peas.

Starch is higher in the unshelled peas than in the shelled due, no doubt, to translocation and condensation of sugars.

There is much evidence to indicate that the temperature conditions prevailing in the coastal counties bordering bodies of fresh or salt water furnish the most favorable climatic conditions for the growing of peas. Where the plants have the advantage of growing under cool, moist atmosphere and moderate temperatures, the pods grow to a fine size with an unusually excellent quality of peas.

Soil Conditions

Soils for peas must be of at least average, if not better than average fertility and moisture holding capacity if a good yield is to be obtained. The yield of pods is determined to a great extent by the vigor and growth of the vines. Usually the larger the vine growth, the greater the number of pods harvested. Some growers may have ideal climatic conditions for peas but fail to capitalize on them to the fullest extent because of soil that is impoverished.

While peas are grown on a great many different kinds of soil, for an early crop a sandy or silt loam is desired so that the pea seed can be planted early, but for a main crop a soil of slightly heavier nature which is more retentive of moisture is desirable.

The land should be mellow and well drained. The crop grows rapidly, in approximately 75-85 days from seed to harvest, so that roots must penetrate the soil well to be able to provide a good vine growth.

For canning and freezing peas where the crop is harvested all at one time, it is particularly desirable to have land of an even character, tho' it may vary in altitude or elevation which in canning areas is useful in lengthening the period of harvesting.

Soil Fertilization

Land for peas should be well supplied with organic matter furnished by applications of rotted manure or by the turning under of soil improvement crops. In a market garden, methods of soil fertilization will be different from those used for the extensive fields where peas are grown for canning or freezing. Under the latter conditions it is customary to have a rotation of one crop or two crops of peas between grain crops, or three crops of peas in five years. In the market garden, peas constitute an early crop that is followed later on by a fall maturing crop, such as late cabbage or cauliflower, lettuce or spinach.

Where manure is used, possibly no further application of fertilizing materials is made. However, when the land is not manured, commercial fertilizers may be applied in conjunction with the use of a soil improvement crop. In using commercial fertilizers, it is important to consider the analysis of the fertilizer used, the placement of it and the number of pounds applied per acre.

Experiments conducted in regard to the method of placing fertilizer have shown in general the inadvisability of drilling the fertilizer in with the pea seed at the time of planting, unless the seed and fertilizer are separated by one, two, or three inches of soil. Experiments at the Wisconsin Experiment Station have shown that 250 pounds of a 2-12-6 fertilizer applied at seeding time gave a greater yield than 500 pounds of the same analysis broadcasted. In

experimental trials with the placement of fertilizer for canning peas in Maryland, the placement of a 4-8-5 fertilizer one and a half inches from the rows gave significant increases in yield over the same fertilizer placed two and a half to three and a half inches from the row. In these experiments it was not deemed advisable to use any higher concentration of a nitrogen fertilizer than four per cent.

At the Michigan Experiment Station fertilizer applied in a separate band one-half inch out from the seed row in one trial and two inches out in another, increased the yield but when the fertilizer was applied in a single band in contact with the seed there was a decrease as a result of the contact application. Based upon the results of this experiment it was advised that fertilizer should not be placed in direct contact with the seed of peas.

As opposed to these experiments, however, in the state of Wisconsin, a 2-12-6 fertilizer applied with the seed has given better yields than where the same fertilizer was drilled along side of the seed. The experiments in fertilizer placement at the Geneva Experiment Station at New York, however, have definitely shown the inadvisability of applying fertilizer in the seed row, especially during a period when there was a scarcity of rain. Neither should the fertilizer be directly above the seed. On the other hand, placement of fertilizer up to 2-1/2 inches to the side and 1 inch lower than the seed proved to be an early stimulus to this quick growing, early maturing crop. A distance three and one-half inches from the row was considered too far away.

Special equipment is now available for proper placement of fertilizer.

200-300 lbs. per acre of a fertilizer applied by row placement would be a reasonable amount. A fertilizer containing 4 per cent nitrogen, 10-12 per cent phosphoric acid and 4-6 per cent potash might be a reasonable analysis.

Market gardeners frequently make a practice of side-dressing pea rows with a nitrogen fertilizer, such as nitrate of soda or calcium nitrate or with an ammoniated phosphorus fertilizer while the plants are small, and preferably during a rain. The fertilizer should be put on about two inches from the row and 2 inches below the soil surface.

Extension Bulletin 524 - Fertilizers for Vegetable Crops - discusses various kinds of fertilizers and gives suggestions for fertilizing land for peas.

Varieties

Pea varieties are chosen according to their adaptability for open marketing, canning or freezing. For market gardens, growers use widely Worlds Record, Thomas Laxton, Improved Gradus, Stratagem and Alderman. These varieties automatically divide themselves into dwarf, semi-dwarf, and tall, as well as varying in season of maturity. For production of peas for an open market, one can use various varieties differing in season to continue harvestings or make several successive plantings of one kind.

Canning pea varieties must concentrate the majority of their pods in a marketable stage at one time, a character which many of the market garden varieties

do not possess. The most widely grown variety of peas for canning is Perfection, with minor acreages of Surprise, Alaska, Early Wales, Climax, Chief, Early Wales, Climax, Chief, Early Sweet, Wisconsin Merit, and Famous.

As indicated in previous statistics, the Alaska variety is grown but little in western areas. Surprise also seems to be passing out.

For freezing, many of the market garden varieties are used, such as Improved Gradus, Thomas Laxton, Stratagem and Alderman, as well as Glacier and Teton. Extensive tests with freezing varieties of peas are being made and the approved varietal list will no doubt be constantly changing.

Seeds and Seeding

Inoculation of pea seed is important, particularly if the crop is being planted on land that has not previously grown peas. Some growers have the opinion that it pays to inoculate seed every year regardless of whether there has been a rotation between crops of peas or not. Inoculating material is inexpensive and the small investment is more than paid back by the advantages obtained which result in better yields of higher quality peas. At the present time in canning areas inoculation of the seed is preferred to any other treatment. It is desirable to plant inoculated seed just as soon as possible after it has been treated.

In starting peas on new land, the land is sometimes inoculated with soil that has previously grown crops of peas, the soil from old pea land being spread over the new pea land.

Some dusts have been found to be beneficial in treating seed for prevention of rot which may occur during the cool, wet spring months. Sufficient evidence has been obtained in trials at the Oregon Experiment Station and elsewhere to show the effectiveness of Semesan or red copper oxide in improving the stands of pea plants, particularly of market garden varieties, during wet seasons. If red copper oxide is used, 1-1/2 ozs. of graphite should be added to each 2-1/2 ozs. of red copper oxide per bushel of seed in order to reduce friction in the seed drill. A mimeographed circular on pea seed treatment and manner of application is available for those interested. (Station Circular of Information No. 90).

In case the seed is inoculated no seed treatments with copper or mercury compounds can be given as these would nullify the value of the inoculant.

The amount of seed to be used per acre will be dependent very largely upon the method of growing the crop and the variety used. For market garden operations where the peas are grown at a distance of 30 inches or more between the rows, approximately 60 pounds upward of seed is used per acre. Plants produce more pods of better quality where there are not more than six to eight plants per linear foot of row. The size of pea seed varies with the variety but seed as a whole runs from 1300-1600 per lb.

All canning peas are seeded by sowing the seed with a commercial drill with rows 5 to 7 inches apart, using from 2 1/4 to 4 bushels per acre. In some areas where the soils are heavier with plenty of moisture available, the amount of seed sown is as much as 250 pounds per acre, but the general average of most canning areas will run about 135 pounds. Seed treatment may be a factor in reducing the the amount of seed necessarily planted.

There is a tendency in some sections, where freezing varieties of peas are being grown, to plant the seed in single rows at distances of 20 to 22 inches apart or in double rows at 24 inches apart, using 2 to 2 1/2 bushels of seed per acre.

In general, pea seed should be sown just as soon as the ground is ready for the seeding. In planting seed of canning peas the temperature of the soil should be at least 45° F. Seeding dates vary according to differences in elevations which permit a longer harvesting season where canning peas are grown. In certain parts of the state, such as the coastal counties where the market is to be supplied during the latter part of the summer and early fall, plantings are often delayed until May and June.

Maintenance

Insect Control. The most important feature in the care of a pea area is the control of two insects, weevils and lice or aphids. Extension Circular No. 126 fully discusses the control of the pea weevil by the use of three quarters of one per cent Rotenone dust, and recommendations regarding the fumigation of seed peas with carbon bisulfide are given in Extension Bulletin No. 523.

The control of lice is important not alone because of their sucking the tissues of vine and pod but also because they spread mosaic, which disease has done an increasing amount of damage to vines and pods in the past few years. Peas should be dusted or sprayed early for lice control with application of nicotine sulfate at necessary intervals. See Extension Bulletin No. 523, Vegetable Garden Insect Control, for materials recommended.

Disease Control. Mosaic. This is a virus disease transmitted by aphids. Rarely is mosaic present in the absence of pea aphids. When mosaic is present plants are dwarfed, leaves are mottled, twisted, curled, and spotted, and pods are malformed. If aphids are under control there is less danger of mosaic injury.

One analysis of cull peas showed the percentage of culls due to the following troubles: mosaic 47%; powdery mildew 22%; downy mildew 7%; cladosporium .1%; mechanical injury 22%.

Powdery mildew is a fungus disease causing a white, powdery-like dust coating on leaves, petioles, stems, and pods. The leaves are yellowed and malformed and there may be black spots and blotches on the pods late in season. The use of fine dusting sulphur will control this disease.

Downy mildew is a fungus disease characterized by localized yellow to brown spots on the upper surface of leaflets and appendages at the base of the leaf stalks. Corresponding areas on the lower surface may become covered with a whitish or downy growth which changes to a gray color. On the pods pale green spots of various shapes and sizes occur. These pod spots constitute the most serious blemish of the peas grown for the open market.

Fungicides in general do not offer satisfactory control. Bordeaux mixture and red copper oxide are most promising. There is no proof that the disease is transmitted by the seed. The disease overwinters on debris in the soil and therefore sanitation and rotation of crops are suggested.

Pod Proliferation. In some pods of peas there is a white, cotton-like substance on the inside of the pod cavity. This is said to be a proliferation of the cells of the pod lining which may fill the cavity but does not affect the seed. It is presumed that this abnormal growth apparently arises due to fluctuations in climatic conditions. It also may be associated with downy mildew infections of the pod and mechanical injuries to the pod.

Staking and Training

In the growing of tall varieties of peas in the market garden it is necessary to stake and train the vines, but this is not done when the crop is grown extensively for freezing. For this purpose, stakes, not larger than 1" x 2" and seven to eight feet long, are set five feet apart in the row. From 1700 to 2300 stakes are usually put up per acre. The stakes are used to support twine, the first row of twine being put on when peas are about eight inches above the ground or before they fall or bend over. Other strings spaced 6 to 7 inches from the lower ones are added as the vines grow. It is important that the tying operation be done carefully for poor work may result in the vines going down. Four to six ply cotton twine may be used for this purpose and about 6 lbs. of string is used per acre.

Harvesting

Because of the rapidity with which peas pass from an immature stage to an over mature condition it is necessary to pay close attention to the development of the pods. Particularly is this true in periods of warm weather. Open market pods are picked continuously by hand and therefore can easily be harvested at the most desirable stage of development. Canning and freezing peas, however, are harvested in the single operation of cutting the vines and threshing the peas, and therefore the maturity determinations must be very carefully made. To determine the optimum time for harvesting such peas a tenderometer is often used, registering the resistance the peas offer to the delicate instrument.

According to Cambell, (Frozen Pack Laboratories, U.S.D.A., Seattle, Washington), tenderometer readings between 80 and 90 represent very tender peas, between 90 and 100 tender, between 100 and 110 somewhat tough and between 110 to 120 very tough. In spite of deviations from these general values there is a definite tendency for the judged score for tenderness to parallel the tenderometer readings, the judged scores decreasing (4 very tender, 3 tender, 2 somewhat tough and 1 very tough) as the tenderometer values increase.

The tenderometer readings, moreover, vary with the variety which is being examined.

Peas respire readily when not removed to a cool place after being picked. The pods themselves carry considerable field heat if harvested during periods of warm weather and this heat should be removed as quickly as possible by pre-cooling them. This may be done in various ways such as putting the peas into a cool storage place, or putting them into a car with fans operating over ice, or reducing temperature of the car before loading.

In the matter of maintaining quality and reducing deterioration in peas for canning, it is desirable to have no more than a few hours elapsing from the

swath cut to the canning of the peas. Shelled peas deteriorate more quickly than unshelled, so if there is any necessary delay in handling the peas they should be left unshelled.

Grades of Peas

Copies of "Oregon Standards for Fresh Peas" are obtainable from the State Department of Agriculture at Salem, Oregon. U. S. No. 1 grade requires peas to be fresh, tender, of uniform maturity, free from decay, mildew and insect or mechanical injury, with the customary 10% tolerance or 5% allowed for defects causing serious damage. Likewise there are standards for canned and frozen peas, copies of which can be obtained from the State Department of Agriculture or the United States Department of Agriculture at Washington, D. C.

Yields and Production Costs

Yields of green peas vary greatly and are determined mainly by the variety grown, the vigor of the vines, prevalence of insects or disease, the district where the crop is produced, and the seasonal conditions prevailing during the growth period and harvesting time. Dwarf varieties usually produce a smaller tonnage than the tall kinds. Yield vary from one to six tons per acre. One grower producing a crop of pole peas for the open market grew 400 hampers of 30 pounds apiece, or six tons, from seven-ninths of an acre. Six pickings were made on this area, the picking cost being approximately \$78. Thirty pound bushel tubs or hampers constitute the leading shipping package. Cars should be fully iced for the proper arrival of peas at destination as peas heat readily.

Yields of canning peas vary from 1800 to 4000 lbs. of shelled peas per acre. A normal canned pea yield is from 93 to 94 cases of 24 No. 2 cans per gross ton of shelled peas received.

Prices on market peas range from 10 to 12 cents per pound early in the season to 3 or 4 cents when the supply is plentiful. The contract prices on peas for canning or freezing are from 2 1/4 - 4 cents per pound. As a by-product, the vines are worth 50¢ per ton.

The cost of growing canning peas up to their delivery into the shelled pea boxes is about \$30.00 per acre.

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