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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
FRUIT AND VEGETABLE DIVISION
FRESH PRODUCTS STANDARDIZATION AND INSPECTION BRANCH

SHIPPING POINT INSPECTION

OF

FRESH SHELLED LIMA BEANS FOR PROCESSING

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1/ The only change in this reissue of February 1958 is in the name of the Organization.

1944

1945

1946

1947

1948

1949

1950

1951

1952

1953

TABLE OF CONTENTS

	<u>Paragraph Numbers</u>
INTRODUCTION	1
VARIETIES	2
HARVESTING AND VINING	3-- 8
SAMPLING	9- 16
Method of Sampling	12- 15
Size of Sample	16
INSPECTION EQUIPMENT	17- 18
INSPECTION PROCEDURE	19- 37
Determining Percentage of Foreign Material	19- 20
Methods of Inspection	21
Blanching	22- 24
Maturity and Color	25- 26
Inspection on Unblanched Basis	27
Thumb Thumb Nail Test	28
Other Defects	29- 37
Decay	30
Discoloration	31
Shriveling	32- 33
Heating Injury	34
Freezing Injury	35
Insect Damage	36
Mechanical Injury	37
INSPECTION MEMORANDUM	38- 55
Carefulness in Recording Data	39
Correcting and Voiding Memoranda	40
Memorandum Number	41
Names of Place, Processor, Grower and Date	42- 44
Products Inspected and Number of Containers	45
Distribution of Memorandum Copies	46
Procedure in Reporting Second Inspections	47- 50
Signature on Memorandum	51
Care of Memoranda	52- 54
Results of Inspection Confidential	55

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INTRODUCTION

(1)

The Western States are the most important in the production of lima beans for processing, although considerable quantities are produced in the Middle Atlantic States. During 1952, 56,900 tons of shelled lima beans were produced for processing. Frozen lima beans are fast becoming popular with consumers and no doubt production of this item will continue to increase.

VARIETIES

(2)

The all green varieties are the most popular for processing because of the importance of good green color in making a high grade finished product. Probably most of these strains have been developed from the Henderson Bush variety, which, for a number of years, has been an important canning variety. The name "Thorough-green" has been given to a strain which is proving popular in many sections. The Baby Potato and Fordhook varieties have been used to some extent for processing in some localities.

HARVESTING AND VINING

(3)

Ordinarily lima beans are harvested by a 2-row vine cutter which is also used for harvesting peas. Often the cutter bars on the viner are not sharpened so that the vines are really pulled instead of cut. This was reported to be an advantage by one large canner because the vines from the two rows tend to be dragged into one windrow. In some sections hay-loaders are used for loading the vines on trucks for hauling to the viners.

It is always a problem to know when to harvest lima beans in order to get the greatest tonnage of immature beans. Usually vines having beans

(4)

1/ This handbook supersedes "Shipping Point Inspection Handbook for Fresh Shelled Lima Beans for Processing", dated May 1946.

ready for use will have pods in all stages of development and also blossoms at the tips. Growers allow the first developed beans to become mature with the view to getting a greater tonnage of immature beans from pods which develop later. The aim, of course, is to get as big a tonnage as possible of immature usable beans.

- (5) Regular pean viners with certain adjustments and attachments are used for shelling lima beans. A dirt reel is usually attached to the front of the viner for screening out dirt and clods. The viner is equipped with larger screens than are used for vining peas and usually it is necessary to increase the speed in order to break open the tougher pods of lima beans. All viners work on the principle of whirling the vines against a rotating blade which breaks open the pods and shakes the beans free. The beans, being heavier, fall to the bottom and the vines continue through the viner. In the newer type viners, the beans fall onto an endless belt which carries them into a box or bin at the end of the unit. In the older type viners, the beans fall into boxes which are placed alongside of the unit.
- (6) Some processors in Pennsylvania and other Middle Atlantic producing States use a tandem viner, also called long and short viner, for shelling lima beans. The vines are first put through the short viner which is regulated to shell the more mature beans which are kept separate. The vines are then elevated to the long viner for shelling of the immature beans. Of course there is some overlapping in the maturity of the beans from each viner. One large processor, who operates several viners in various sections, reported that on the average about 20 percent of the beans are shelled in the short viner and about 80 percent in the long viner. The percentages obtained on any lot however, are dependent upon the stage of maturity at which the beans are harvested.
- (7) Portable viners are being used in increasingly larger numbers in some areas. These viners do the harvesting and threshing operations and also distribute the vines on the ground. The threshed beans are collected for hauling to the processing plant.
- (8) Processors aim to hold the time elapsed between shelling and processing to a minimum as the quality of shelled immature lima beans deteriorates rapidly after shelling.

(9)

SAMPLING

Since the value of a load of beans is based upon the results of the inspection, it is imperative that samples be as representative as it is possible to obtain. An inspection is worthless unless the sample, upon which the inspection is made, is reasonably representative of the beans in the lot.

In sampling, inspectors will have to be guided somewhat by the type of vining equipment used and the circumstances under which the samples are to be taken. If the inspector is located at a processing plant, he may have to take care of the inspection of samples from several viners. In such cases, it will be necessary to make arrangements for others at the viners to take the samples, probably employees of the processor. Such procedure is satisfactory under such circumstances but the inspector should give instructions in the proper methods of sampling to such employees and give as much supervision as possible. In case any dissatisfaction develops on the part of growers or the processor as to the methods employed by a sampler, he should immediately report the facts to his supervisor.

(10)

Some processors have groups of viners located at one station, in which cases the volume of inspection will be sufficient to warrant locating the inspector at a vining station. In such an instance, the inspector is in better position to give close supervision to the sampling.

(11)

Method of Sampling. Since vining equipment differs in various parts of the country, it is not possible to establish a uniform method of taking samples. At stations where single viners are in use, some processors may furnish metal or canvas troughs about the length of the viner and open at one end for taking samples. Such troughs are usually equipped with handles in the center for holding the trough. When troughs are available, they should be held alongside the viner two or preferably three times during the vining of a load. The sample is, of course, more representative if beans are caught from the top, center, and bottom of the load. To empty the trough, the open end is placed over the opening in a container, then the opposite end is lifted allowing the beans to flow into it. This forms the basis of the sample. If the beans cannot be inspected immediately, or if they are to be taken to another point for inspection, they should be placed in a tin, preferably with a push-in lid, to prevent drying out. A slip or ticket showing the name or lot number of the grower and time of sampling should also be inserted so as to maintain identity of the sample. If possible, the number of containers of shelled beans in the lot should be shown on the ticket.

(12)

At viners, where sampling troughs are not available, handfuls of shelled beans should be taken from each container from the load and placed in another suitable container. If the viner is of the newer type where the beans fall on an endless belt, sample selection is made easy by simply catching several cupfuls from the top, the center, and the bottom of the load. In both instances the beans should then be thoroughly mixed, after which the official sample should be drawn.

(13)

(14) At stations where tandem viners are employed, generally only the beans from the long viner are inspected. Beans from the short viner, if inspected, are kept separate from those from the long viner. In some instances, beans from both the long and short viner are inspected together. In such cases, the sample should be obtained by taking handfuls of beans from containers filled from both the long and short viners. The ratio should be about 4 handfuls from containers filled from the long viner to 1 handful from the short viner or approximately in the ratio in which the beans come from each of the viners. The sample should then be mixed well before drawing the official sample.

(15) When the inspection is made at the vining station or at portable viners, as is required by Delaware State law, it is generally the policy to assign several viners to one inspector. The inspector travels from one viner to another. During each visit to the viner, he draws a sample by taking a cupful of beans from filled boxes or containers. At times it may be necessary to have a member of the vining crew set aside a number of boxes so the inspector may obtain beans for inspection from each load vined. Beans should be taken from the top, center and bottom of the boxes. During each visit to the viner or vining station, the inspector usually analyzes three 4 ounce samples separately. The results of these three analyzes are totaled and the average is reported on the certificate.

(16) Size of Sample. The size of the sample depends upon the method of inspection. Below are listed the minimum size samples. The supervisor or the contract between the grower and processor may prescribe larger samples.

1. The sample consists of the beans taken from the openings of the viner or from the filled boxes. The weight of such sample, when inspecting on a blanched basis, should be 2 to 3 pounds. When inspecting unblanched beans, the weight of the sample should be 20 ounces.

2. The percentage of foreign material is usually determined from the entire sample. When determining the percentage of foreign material in unblanched beans, it will be necessary to use a 2 to 3 pound sample.

3. The official sample for inspection, using the blanching method, is 1/2 or 1-pound. Often, time does not permit the analysis of the 1-pound sample. The 2 or 3-pound sample is thoroughly mixed after which approximately a 1/2 or 1-pound sample is blanching. After blanching, exactly a 1/2 or 1-pound sample should be analyzed.

4. When inspecting beans which have not been blanching, the official sample should be at least 4-ounces. The 20-ounce sample should be thoroughly mixed, after which the 4-ounce sample should be taken for analysis.

INSPECTION EQUIPMENT

(17)

The following equipment should be provided for the inspection of lima beans for processing:

1. Work table or bench.
2. Scales or balances for weighing samples.
3. Shallow pan fitted with suitable screens to speed up separation of foreign material. Perforations in screens should be of such size that beans will not pass through.
4. Containers for samples and separates.
5. Slide rule.
6. Scratch pads.
7. Inspection memoranda.

In localities where the beans are blanched prior to inspection, the following additional equipment is needed. (18)

1. Blanching equipment. Either a live steam pipe with valve control connected to drum or vat of water, or electric hot plate.
2. Cooling vat or bucket.
3. Several blanching tins. No. 2 or No. 2-1/2 tin cans, well perforated and fitted with wire handles may be used.
4. Available water supply.
5. Paper towels or several cloth towels.

INSPECTION PROCEDURE

(19)

Determining Percentage of Foreign Material. Presence of foreign material in shelled lima beans has no bearing on the grade of the beans. Most contracts make some provision for the handling of foreign material. Unless the contract calls for the determination of foreign material, the inspector simply obtains the sample of beans and proceeds with the inspection for grade.

- (20) In the determination of the percentage of foreign material, the first step should be to weigh the sample and record the weight. Using the pan and screen provided, dump the sample on the screen and shake the pan back and forth. This operation will remove most of the foreign matter. Larger pieces remaining on the screen should then be picked off and added to those in the pan. When the separation is complete, weigh the material and calculate the percentage. The percentage should then be shown on the inspection memoranda either under "Remarks" or in some other vacant space which is satisfactory to the applicant.
- (21) Methods of Inspection. The inspection procedure provides that beans may be inspected either on a blanched or unblanched basis. Procedure for both methods are discussed in this handbook.
- (22) Blanching. Usually there will not be time for the inspector to classify the beans in a 2 or 3-pound sample such as was used for determination of the percentage of foreign material. Experience has shown that accurate results may be obtained by using smaller samples providing the beans have been thoroughly mixed. It is suggested, therefore, that one pound samples of blanched beans be used for the grade classification where time permits. If use of this size sample slows up inspection too much, one-half pound samples may be used.
- (23) Blanching consists of placing approximately a one-pound or a half-pound sample of the beans in hot water at a temperature of 200° F. for 5 minutes. It is believed that satisfactory results are obtained by 5 minutes blanching. If the inspector is located at a processing plant, the blanching process is made simpler by connecting a live steam pipe with valve control to a vat of water. The valve can then be regulated to keep a fairly constant temperature of the water. The beans to be blanched are then placed in a mesh container such as a well-perforated No. 2 tin for 1/2-pound samples, or No. 2-1/2 tin for 1-pound samples, and immersed in the water for exactly 5 minutes. When inspectors are located at vining stations where live steam is not available, electric hot plates may be used for heating the water to the required temperature. Since these are not usually large enough to heat a large amount of water, it is best to have the water boiling before immersing the sample, as the sample quickly reduces the temperature.
- (24) After blanching, the beans are immediately cooled by immersing in a container of cold water. This prevents further cooking of the beans and places them in condition for classifying as to grade.
- (25) Maturity and Color. Each individual bean in the sample should be examined carefully before classifying it as to grade. No. 1 beans must have a green color and be at least fairly tender, which means that they are not hard, tough, or rubbery. Distinguishing between fairly tender beans and those which have passed this stage is the most difficult determination in properly classifying lima beans. Some training and experience will

be necessary before the inspector becomes adept at drawing the line correctly. No trouble will be experienced with beans which are definitely on the immature side. Such beans will not have reached their maximum size, will be good green color, succulent, and yield readily to pressure between the thumb and finger. Such beans which are free from defects are definitely U. S. No. 1 grade. Likewise, beans which are full grown, hard, and becoming white are definitely U. S. No. 2 beans for maturity. The borderline stage is between these two extremes. Such beans do not yield readily to pressure between thumb and finger but still there is not enough starch development to consider them hard, tough or rubbery. The color of such beans may have become pale or yellowish green color. The borderline bean will break when pressure is applied at both ends. If the edges are sharp and the cross section indicates considerable starch development, such a bean is not considered fairly tender. On the other hand, if the edges of the broken surface are not sharp and starch formation is not very evident, such a bean should be considered fairly tender.

It must be remembered that the cotyledons of U. S. No. 1 beans must have a green color characteristic of a tender or fairly tender bean for the variety. Color, however, is not a reliable index of a fairly tender or immature bean, especially on the all green strains. Some of the latter may possess fairly good green color but have passed the stage when they can be considered fairly tender.

Inspection on Unblanched Basis. In areas where the inspection is made at the vining station or at portable viners, it is not feasible to blanch the sample prior to inspection. Comparable results can be obtained by inspecting the beans on an unblanched basis.

The Thumb Nail Test. The thumb nail test is an accurate test for determining maturity which is recommended for use in areas where blanching equipment is not available. By bringing the thumb nail lengthwise across beans which are definitely immature, it can be observed how easily the skin can be removed. Likewise, with beans that are hard and rubbery, using the same procedure, it may be observed how difficult it is to remove the skin. When considerable pressure is used, the thumb nail will still slide across the bean and not remove the skin. Such beans are definitely U. S. No. 2 for maturity. The borderline stage is between these two extremes. Using the procedure listed above, beans are classed as having passed the stage of being fairly tender when the skin peels instead of slips. Likewise, if the skin slips instead of peels, such beans are still fairly tender.

- (29) Other Defects. U. S. No. 1 beans must be free from decay and free from injury by any means. Split and broken beans incident to proper harvesting and vining operations shall not be considered as injury in the U. S. No. 1 grade. U. S. No. 2 beans must be free from decay and free from damage by any means. Split and broken beans incident to proper harvesting and vining operations shall not be considered as damage in the U. S. No. 2 grade.
- (30) Decay. Pods of beans in contact with the soil often develop decay during a spell of wet weather. Often the decay affects some of the bean seeds. All such beans should be placed in the cull classification.
- (31) Discoloration. Discoloration, which will probably be the most prevalent defect in most lots of beans, is generally caused by contact of the pods with the soil. Some portion of the pod may disintegrate and if the beans themselves do not decay they may be stained or spotted with various degrees of discoloration. Beans showing small, inconspicuous light brownish spots should not be scored against U. S. No. 1 grade. A little greater degree of light discoloration may be permitted on U. S. No. 2 beans, but any beans affected by discoloration which materially affects the appearance of the beans should be classed as culls. Beans showing dark brown or black discoloration, which is not very minute, will in most instances have the appearance materially damaged and should be classed as culls.
- (32) Shriveling. Beans that are hard and slightly shriveled as evidenced by slight wrinkling of the skin should be placed in the U. S. No. 2 classification.
- (33) Badly shriveled beans as evidenced by wrinkling of the skin and small size should be placed in the cull classification. During the process of blanching, mechanical damage to the skin may cause the skin to shrivel. Such beans usually should not be scored as injured or damaged by shriveling.
- (34) Heating Injury. Sometimes beans are left on the loads or in a pile too long before vining and heat develops. If the heating is prolonged, some of the beans may become damaged, the injury of which is evidenced by a greasy appearance of the bean and softening of the flesh. Such beans are considered damaged for processing purposes and should be classed as culls.
- (35) Freezing Injury. Late in the fall low temperatures may damage unharvested beans even though they are protected by a rather thick pod. If the injury is more than very slight on affected beans and processing quality is affected, such beans should be considered culls.

Insect Damage. Beans which show worm holes or any other insect injury are definitely damaged and should not be passed as meeting requirements of either grade. (36)

Mechanical Injury. Any mechanical injury or damage to beans, which is thought to be incident to proper harvesting and vining operations, should not be scored against either grade. In some areas, the grower has control of the harvesting and vining operations, and since the amount of mechanical damage can be increased by improper harvesting and vining operations, mechanical damage in excess of that considered incident to proper harvesting and vining should be scored against both grades. (37)

INSPECTION MEMORANDUM (38)

After all the beans have been graded, the beans in each classification should be weighed and the percentage of U. S. No. 1's, U. S. No. 2's and Culls calculated to the nearest whole percent. Weights should be recorded in whole and tenth ounces, otherwise there may be considerable error in dealing with a total sample of only 4, 8 or 16 ounces. Percentages, however, should be figured to the nearest whole percent. Both the weights and percentages should be recorded on the inspection memorandum as illustrated below:

	WT. OUNCES:	PERCENT
U. S. No. 1	12.3	77
U. S. No. 2	3.2	20
Culls	0.5	3
Total	16.0	100

Carefulness in Recording Data. All data recorded during the process of the inspection should be clear, complete, neat in appearance and easily legible. All computations should be checked carefully for errors. Inspectors will be held responsible for figures being legible on the last carbon of the memorandum. (39)

Correcting and Voiding Memoranda. If corrections are not conspicuous, minor mistakes which would not affect the credibility of the memorandum, if presented in court, may be changed by crossing out the part in error and inserting the correct information. No corrections should be made on any memorandum unless the inspector has all copies in his possession so that all corrections may be made at the same time. Whenever an error has been discovered and the inspector does not have all copies of the memorandum, he should issue a new one upon which the following statement should be made: (40)

"This memorandum supersedes memorandum No. _____." No attempt should be made to erase errors on memoranda. All corrections should be initialed.

- (41) Memorandum Number. Memoranda are numbered serially and every one should be accounted for. If a memorandum must be discarded because of a mistake, write "Cancelled" across the original and each copy and leave them in the pad.
- (42) Names of Place, Processor, Grower and Date. The name of the place where the inspections are to be made, and the name of the processor should be stamped or written on a large number of memoranda before the inspection work begins.
- (43) The grower's name and the date and time of inspection should be filled in at the time of making the inspection. However, there is no objection to dating a number of memoranda at one time provided no more are dated than will be used the same day. When a grower delivers several loads in a day, the time of inspection serves as an identifying mark. In cases where viner units are located at out-lying points, show also the time of vining which will indicate the time of sample selections. This is important, particularly in the case of heated beans or in variations of different loads from the same grower.
- (44) The date entered on the memorandum shall be the date upon which the inspection is actually made, which may not necessarily be the day the beans are delivered.
- (45) Products Inspected and Number of Containers. Under this heading indicate the name of the product "Lima Beans" and if the processor furnishes the name of the variety, it should also be shown - as "Thoroughgreen Lima Beans." If the shelled beans are delivered in containers from a vining station, the number of containers should be recorded in the space provided on the memorandum.
- (46) Distribution of Memorandum Copies. The original memorandum is issued to the applicant or party who requests inspection, which is usually the processor. One copy is given to the grower, and another copy is retained for office records.
- (47) Procedure in Reporting Second Inspections. Second inspections may be requested when the accuracy of the original report has been questioned. Always mark the time of second inspections on the memorandum.

If the second inspection is made within a reasonable time after the first inspection, the results of both inspections should be averaged and a new memorandum issued. The following statement should be written on the memorandum: "This memorandum supersedes memorandum No. _____." (48)

If a considerable period of time has elapsed after the first inspection was made, and the second inspection shows a considerably higher percentage of U. S. No. 2 beans because of overmaturity than was reported on the original memorandum, a new memorandum based only upon the results of the second inspection should be issued. This memorandum should be marked "Second Inspection." If, however, the second inspection shows decidedly more U. S. No. 1 beans than was reported after the first inspection, it is obvious that either an error was made or that the sample was not representative of the lot. If it is evident that the original sample of beans was not representative of the lot, the results of both inspections should be averaged. If it is apparent that an error was made, then only the results of the second inspection should be reported on a new memorandum. In either case, the following statement should be written on the memorandum: "This memorandum supersedes memorandum No. _____." (49)

The interpretation of a "reasonable length of time" between inspections is governed not only by the actual elapsed time, but by weather conditions and the effect of ventilation or lack of ventilation on the beans. For example, the effect on maturity would be greater on a hot day than on a cool one. (50)

Signature on Memorandum. The inspector shall sign the memorandum with his full name, or initials and his last name. Nicknames should never be used. This warning is given because some new inspectors have signed only their initials or simply their last name on the memorandum. Legally, either of these signatures would be worthless. (51)

Care of Memoranda. Inspectors should take necessary precautions to prevent blank memoranda from falling into the hands of persons who have no right to use them. No person may lawfully sign them except one who has been duly licensed by a Federal Supervisor. (52)

Each inspector will be held responsible for the return of all unused memoranda to his Supervisor at the close of the season. (53)

During the inspection season, copies of completed memoranda shall be kept in numerical order where they readily may be made available whenever any financially interested party or Supervising Inspector desires to see them. These shall be sent to the Supervisor at the close of the season. (54)

(55)

Results of Inspection Confidential. Inspectors must not give out information to growers or to competitive processors concerning the results of inspections of individual grower's lots or the general quality of beans delivered to the plant. Statements in which comparisons are made of quality of various growers' lots sometimes prove very embarrassing.

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