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Marketing and
Regulatory
Programs

Frozen Lima Beans

Agricultural
Marketing
Service

Inspection Instructions

Specialty
Crops
Program

September 2016

Specialty
Crops
Inspection
Division

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These instructions contain information and guidelines to help personnel of the U.S. Department of Agriculture's (USDA) Specialty Crops Inspection (SCI) Division uniformly apply and interpret U.S. grade standards, other similar specifications, and special procedures.

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Inspection instructions are issued by USDA after careful consideration of all data and views submitted. The Department welcomes suggestions for improving the inspection instructions in future revisions.

Comments may be submitted to:

Director, Specialty Crops Inspection Division
Specialty Crops Program
USDA, Agricultural Marketing Service
1400 Independence Avenue, SW, STOP 0240
Washington, DC 20250

These instructions replace the Grading Manual for Frozen Lima Beans dated March 1977, and include, but not limited to, all previous correspondence, memos, inspection instructions, or procedures.

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INSPECTION INSTRUCTIONS FOR FROZEN LIMA BEANS

SECTION	PAGE No.
GENERAL	1
PRODUCT DESCRIPTION	1
PRODUCTION FLOW	2
INSPECTION AND GRADING	3
EQUIPMENT, INSPECTION AIDS, AND INSTRUCTIONS.....	3
SAMPLE UNIT SIZE.....	3
LOT INSPECTION.....	4
IN-PLANT, ON-LINE INSPECTION.....	4
WEIGHT	5
NET WEIGHT.....	5
VARIETIES.....	5
SIMILAR VARIETAL CHARACTERISTICS	6
QUALITY FACTORS	7
COLOR	7
DEFECTS	8
AGGREGATE PIECES OF BEANS	8
BLEMISHED.....	9
DEFECT ACTION LEVELS	9
HARMLESS EXTRANEOUS VEGETABLE MATERIAL (HEVM).....	9
HARMFUL PLANT MATERIAL.....	9
LIGHT DISCOLORATION	9
SERIOUSLY BLEMISHED	10
SHRIVELED BEANS	10
SOLANACEOUS PLANTS	11
INSPECTION AID FOR DEFECTS	12
SCORING DEFECTS (ON-LINE INSPECTION)	13
TENDERNESS AND MATURITY	14
FLAVOR	14
APPENDIX I – INSPECTION AID 7	15

GENERAL

The [United States Standards for Grades of Frozen Lima Beans](#) is a Variables Standard. In a variables standard the number of defective sample units (deviants) allowed for a given sample size is referred to as the acceptance number (or the deviant rate). Variables standards use acceptance numbers of 0 deviants in 3, 1 deviant in 6, 2 deviants in 13, 3 deviants in 21, and 4 deviants in 29 samples. Sampling plans and deviant rates for frozen lima beans are provided in the [AIM Sampling manual](#).

The grade of frozen lima beans may be determined by considering, in conjunction with the requirements of the respective grade, the respective ratings for the factors of color, and defects.

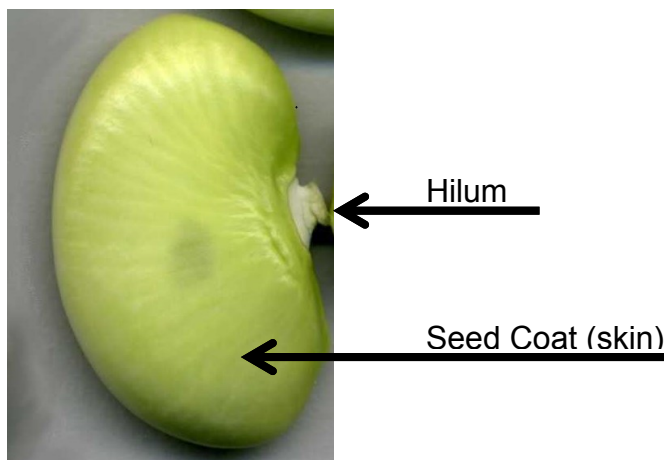
The relative importance of each scoring factor is expressed numerically on the scale of 100. The maximum number of points that may be given each factor is:

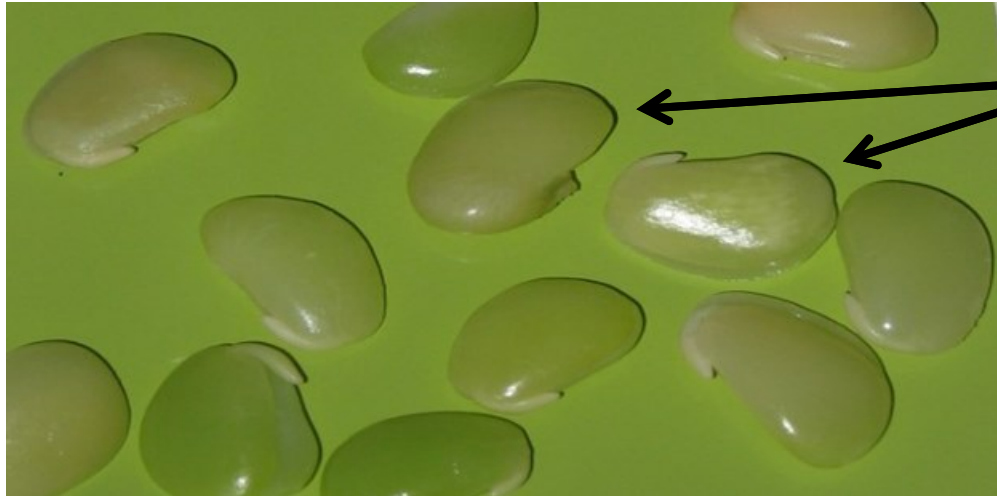
Factors	Points
Color	60
Defects	40
Total Score	100

PRODUCT DESCRIPTION

The [U.S. Standards for Grades of Frozen Lima Beans](#) cover only the product prepared from the succulent seed of the lima bean plant. Soaked lima beans are not permitted. Lima beans that are held in tanks of water with the intent of improving the quality of the beans are considered soaked lima beans. Transportation of shelled lima beans in water from the harvesting site to the processing site is not considered soaking; nor is holding shelled lima beans in tanks of water while the beans are waiting to be processed.

Lima Bean Components

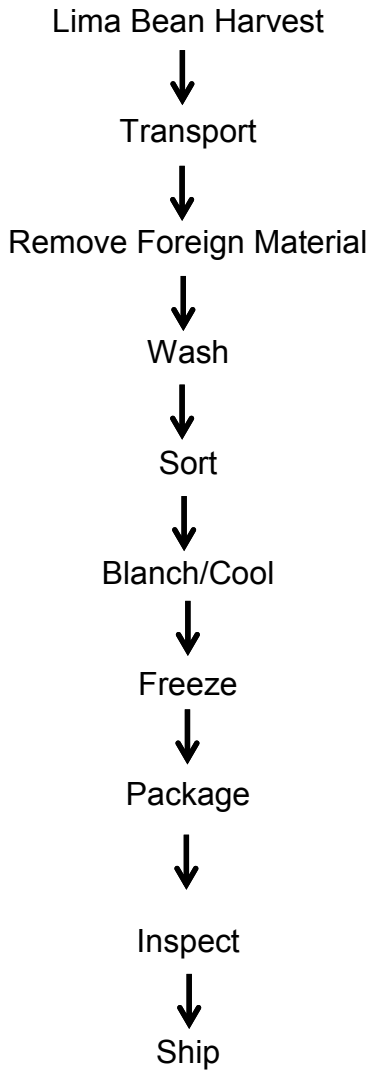




Cotyledon

(Two Cotyledon per bean)

PRODUCTION FLOW



Inspection Instructions for Frozen Lima Beans (September 2016)

INSPECTION AND GRADING

EQUIPMENT, INSPECTION AIDS, AND INSTRUCTIONS

- [U.S. Standards for Grades of Frozen Lima Beans](#)
- [Inspection Aid 106 Universal Sizer](#)
- [Inspection Aid 7 Frozen Lima Bean Color Guide – Appendix I](#)
- [Color Standards for Frozen Lima Beans](#)
- AIM Inspection Series Manuals
 - [Condition of Food Container manual](#);
 - [Foreign Material Manual](#);
 - [General Procedures Manual](#);
 - [Safety Manual](#);
 - [Sampling Manual](#);
 - [Sanitation Manual](#); and
 - [Technical Procedures Manual](#)
- [FDA Food Defect Action Level](#) - *Though not specifically identified in the DALs, MPM-V104 provides instructions for green and wax beans, lima (butter) beans, peas, cowpeas, black-eyed peas, field peas in frozen and canned (fresh and canned dry) styles. Please refer to the [FDA Macro-Analytical Procedures Manual for MPM-V104](#).*
- Scale, Ruler or inspection aid for square areas, pencil or pen,
- Trays – white, shallow laboratory trays for 16-ounce containers and smaller, deep, large sized trays for 2-1/2 pounds or larger,
- Stainless steel covered cooking utensil and source of heat for cooking, fork,
- SC 364-87E Score Sheet for Frozen Lima Beans

SAMPLE UNIT SIZE

Uniformity in the preparation and performance of sampling procedures are a fundamental part of Division services. The [AIM Sampling Manual](#) sections on Sampling Procedure and Sampling Rate (Table II) provide guidance on the procedures used in sampling frozen lima beans. Lot size and container size determine sampling rates.

Arranging Samples and Recording Code Marks and Label Information

Arrange containers to aid the evaluation of data. Generally, code marks that are identical are grouped together; normally in ascending numerical order from left to right if the marks so indicate. Any continuity with respect to individual lots must be retained. Refer to the [AIM General Procedures Manual](#) for additional score sheet completion procedures.

LOT INSPECTION

Use the entire contents of the container. When sampling large containers, the sampling rate is contained in the Regulations, 7 CFR 52.38 (which may be found at the following internet address:

<http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR>).

Record inspection results on SC 364-87E, score sheet for frozen lima beans.

IN-PLANT, ON-LINE INSPECTION

Select a 30-ounce sample unit (3-10 oz. packages; or 30-oz. from large containers such as tote bins or institutional packages).

- Select 200 beans at random from the 30-ounce sample. Weigh. Use this weight to substitute for a count in subsequent sample units. Then count and weigh only every sixth sample unit. Use 200 beans to determine the following:
 - Color; and
 - All defects, other harmless extraneous vegetable material (HEVM), and seriously blemished beans.

Return the 200 beans to the 30-ounce sample unit.

- Use 30-ounces to determine:
 - HEVM;
 - Prerequisite quality factors; and
 - Seriously blemished beans

Seriously blemished beans are based on percent, by count. Use the count/weight relationship established to estimate the bean count in 30-ounces.

Example:

200 beans weigh 2.5 ounces, 30-ounces contains approximately 2,400 beans.

Twelve (12) seriously blemished beans found in this 30-ounce sample would equal 1/2 of 1 percent.

WEIGHT

NET WEIGHT

Processed foods are commonly packed to meet a prescribed net weight or content, and are labeled accordingly. This net weight or content may be specified in a purchase specification or contract. In-depth instructions on performing net weights may be found in the [AIM Technical Procedures Manual](#).

VARIETIES

Frozen lima beans must be classified by varietal type because of the different grade criteria for each type. The U.S. standards classify frozen lima beans into three types:

- Thin-seeded,



- Thick-seeded Baby Potato (no image available), and
- Thick-seeded



- Size comparison image

Thick-seeded



Thin-seeded

Images courtesy of Emmalea Garver Ernest, Associate Scientist, Extension Vegetable & Fruit Program, University of Delaware October 19, 2007

Baby limas (thin seed) are in the 15-18 mm range when succulent and 5-6 mm thick. Thick seed limas are in the range of 19-25 mm long and 15+ mm thick.

One industry practice is to screen small sieve size beans from thick-seeded varietal types and label the products as “Baby.” Under these circumstances, inspection must be accomplished with the information that the inspector can verify.

Butter peas, commonly grown in the South, have been determined by the FDA to be lima beans. Speckled butter beans are lima beans but should be graded under the U.S. Standards for Grades of Frozen Speckled Butter Beans.

SIMILAR VARIETAL CHARACTERISTICS

Easily noticeable mixtures of lima bean varietal types are Substandard. However, mixtures of thin-seeded and thick-seeded Baby Potato lima beans are not easily noticeable. Do not classify them Substandard. Allow 10 percent, by count, of lima beans in the sample unit to be of distinctly different color characteristics, except for speckled butter beans. Under the factor of color, score any color variations that are caused by dissimilar varieties.

Speckled butter beans sometimes occur in green lima beans. Allow two (2) speckled butter beans in any single sample unit. If this allowance is exceeded, the grade is Substandard.

QUALITY FACTORS

COLOR

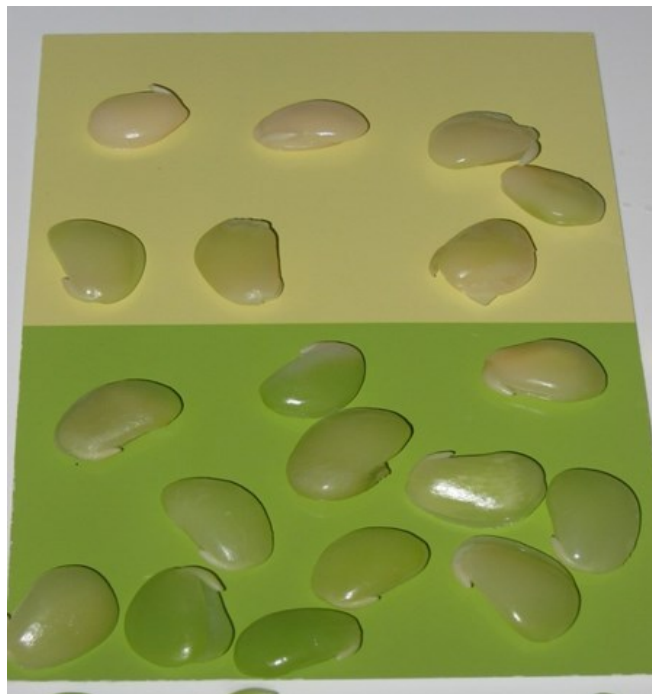
Evaluation of color involves the following determinations:

- Percentage of green lima beans and white lima beans; and
- Overall brightness of the sample unit and any other condition that affects the entire sample unit, such as off-color.

Each individual lima bean is only one of three color classes:

- Green;
- Pale-green (less than green but not white); or
- White.

Example of thawed lima beans spread out on the frozen lima bean color standard. This image is not to be used for color comparison purposes.



Inspection Instructions for Frozen Lima Beans (September 2016)

Color limits are fixed by the [USDA Frozen Lima Bean Color Standards](#). Instructions and a scoring guide accompany the standards. When calculating the percent green, remember to add the percent white and the percent less than green to determine the percent green or,

100 percent – (percent white + percent less than green) = percent green.

The U.S. standards require removing skins from thin-seeded lima beans before classifying color. Thick-seeded and thick-seeded Baby Potato lima beans are classified for color with the skins on the beans.

Color scores are determined using Inspection Aid 7 Frozen Lima Bean Guide for Color Scores. [Inspection Aid 7](#) is attached as Appendix I of this document.

Exercise care when using the color standards. Clean surfaces with a soft nonabrasive cloth using warm water and a mild soap solution and dry with a soft cloth. Avoid prolonged immersion in water. Store the standards in their envelope, away from heat and light, when not in use.

DEFECTS

AGGREGATE PIECES OF BEANS

Outlined in the U.S. standards, the allowance for pieces is in the [inspection aid for defects](#) within these instructions. The percent, by count, of pieces of beans in the sample is determined by dividing the total number of pieces of beans by the total number of beans and pieces of beans, and multiplying the quotient by 100.



BLEMISHED

Brown, black, or other discoloration; pathological injury; or any other defect that materially affects the appearance or eating quality of the beans. Classify small-diameter insect damage with discoloration as “blemished.”



DEFECT ACTION LEVELS

Though not specifically identified in the U.S. Food and Drug Administration’s (FDA) Defect Action Levels, Macroanalytical Procedures Manual (MPM)-V104 provides instructions for green and wax beans, lima (butter) beans, peas, cowpeas, black-eyed peas, field peas in frozen and canned (fresh and canned dry) styles. Please refer to the FDA web site for MPM-V104 at the following address:

<http://www.fda.gov/food/foodscienceresearch/laboratorymethods/macroanalyticalproceduresmanualmpm/default.htm>.

HARMLESS EXTRANEEOUS VEGETABLE MATERIAL (HEVM)

Predominantly flat or predominantly cylindrical, green, tender vegetable material, such as pieces of pods or leaves and stems of the lima bean plant; and predominantly spherical vegetable material, such as seeds from other plants.

HARMFUL PLANT MATERIAL

Consider harmful plant material, such as puncture vine and foxtail seedheads, under guidelines in the AIM Foreign Material Manual.

LIGHT DISCOLORATION

Discolored hilum, downy mildew, or other light, scald-like discoloration of the skin of the beans. This condition may also be caused by the friction of the lima beans rubbing together during harvesting. Holding lima beans too long in storage prior to processing may contribute to light discoloration. Follow the guide in the [inspection aid for defects](#) in this manual.

SERIOUSLY BLEMISHED

Worm damage, large-diameter insect damage with discoloration, water-damage (moldy or decayed), or any other defect that seriously affects the appearance or eating quality of the beans. Ordinarily, these defects are serious enough to remove before eating.



SHRIVELED BEANS

The cotyledons before, and after cooking are dry, and very tough or hard.



INSPECTION AID FOR DEFECTS

KINDS OF DEFECT	DEFECTS PERMISSIBLE IN SCORE				
Harmless extraneous vegetable material for: Each 30 ounces net Predominantly flat pieces, aggregate area <i>and</i> Predominantly cylindrical pieces, aggregate length <i>or</i> <u>Each 30 ounces net</u> Predominantly spherical piece not more than ¼ inch in diameter	40	39	38	37	36
	3/16 None	3/8 3/4	3/8 1-1/2	9/16 1-1/2	9/16 sq. in. 1-1/2 inch
	None	None	None	1 piece	1 piece
	1	3	5	5	5
	None	None	½ of 1	1	1
Pieces of beans (percent by count)					
Shriveled and sprouted beans (percent by count)					
Blemished beans (percent by count) including seriously blemished (percent by count)	½ of 1 including 0	1 including 0	1 including 0	1 including ½ of 1	2 including ½ of 1
Discolored hilum and other light discoloration too slight to score as blemishes (percent by count)	5	10	15	15	15
Harmless extraneous vegetable material for: Each 30 ounces net Predominantly flat pieces, aggregate area <i>and</i> Predominantly cylindrical pieces, aggregate length <i>or</i> <u>Each 30 ounces net</u> Predominantly spherical piece not more than ¼ inch in diameter	¹ 35	¹ 34	¹ 33	¹ 32	
	3/4 1-1/2	3/4 1-7/8	1-1/8 2-1/4	1-1/8 sq. in. 2-1/4 inch	
	1 piece	1 piece	2 pieces	2 piece	
	6	8	10	10	
	1	2	4	4	
Pieces of beans (percent by count)					
Shriveled and sprouted beans (percent by count)					
Blemished beans (percent by count) including seriously blemished (percent by count)	2 Including ½ of 1	2 Including ½ of 1	2 Including 1	3 Including 1	
Discolored hilum and other light discoloration too slight to score as blemishes (percent by count)	20	25	30	35	
Harmless extraneous vegetable material for: Each 30 ounces net Predominantly flat piece, aggregate area <i>and</i> Predominantly cylindrical pieces, aggregate length <i>or</i> <u>Each 30 ounces net</u> Predominantly spherical piece not more than ¼ inch in diameter	² 31	² 30	² 29	² 28	
	1-1/2 2-5/8	1-7/8 2-5/8	2-1/4 3	2-1/4 sq. in. 3 inch	
	2 piece	2 piece	3 piece	3 piece	
	12	15	15	15	
	5	6	7	8	
Pieces of beans (percent by count)					
Shriveled and sprouted beans (percent by count)					
Blemished beans (percent by count) including seriously blemished (percent by count)	3 including 1	3 including 1	4 including 1-1/2	4 including 2	
Discolored hilum and other light discoloration too slight to score as blemishes (percent by count)	40	60	80	100	

¹ Partial limiting rule, (applicable to shriveled, sprouted and blemished beans only).

² Limiting rule

SCORING DEFECTS (ON-LINE INSPECTION)

Follow the [inspection aid for defects](#) provided with these instructions. Since the inspection aid and the sample unit are standardized for 30 ounces, the score point value to be given for defects is determined by the most offending defect in the sample unit. Score HEVM on the basis of the sample unit, not on the sample average.

Example:

30-Ounces

Sample unit number	1	2	3	4	5	6
HEVM { Flat Cylindrical Spherical	3/8 in ²		3/8 in ²			
	3/4 in					
	1				2	
Pieces of bean	1%	1%		3%	1%	2%
Blemished		2%		1/2%	1%	2%
Seriously Blemished		1/2%				1/2%
Score points	37	36	39	39	33	36
	<i>HEVM (Spherical) most offending.</i>	<i>Blemished most offending.</i>	<i>HEVM (Flat) most offending.</i>	<i>Pieces of beans most offending.</i>	<i>HEVM (Spherical) most offending.</i>	<i>Blemished most offending.</i>

TENDERNESS AND MATURITY

Variations in the processing and cooking of frozen lima beans affect cotyledon texture. Tenderness, to some degree, can be cooked into lima beans. Follow the USDA lima bean cooking procedure located in the [AIM Technical Procedures manual](#), section on frozen and refrigerated product cooking procedures.

Make a tentative evaluation of tenderness and maturity on the thawed sample unit. Use the cooked sample unit for the final evaluation. Tenderness is a prerequisite quality factor and is classified as follows:

- Tender: The lima beans are succulent and tender for eating without material starchiness.
- Reasonably tender: The lima beans are slightly firm and mealy, or slightly dry.
- Fairly tender: The lima beans are definitely mealy or firm and dry, but are not excessively mealy, firm, or dry.
- Substandard: The lima beans are excessively dry, crumbly, or hard.

FLAVOR

Flavor may be affected by maturity, delayed processing, inadequate blanching, or the presence of dirty cotyledons. An earthy taste may accompany units that have dirt around the hilum or attached to the cotyledons. Water-damaged lima beans may taste musty. Flavor is a prerequisite quality factor and is classified as follows:

- Grades A – Good, characteristic flavor and odor.
- Grades C – Fairly good flavor that may lack a desirable flavor but is not objectionable.
- Substandard – Objectionable but edible.

Classify an inedible sample unit as worse-than-a-deviant. (See [AIM Sampling Manual](#))

APPENDIX I – INSPECTION AID 7

FROZEN LIMA BEANS – GUIDE FOR COLOR SCORES

THIN SEEDED TYPE (WITH SKINS REMOVED)-THICK SEEDED BABY POTATO TYPE (WITH SKINS ON)

PERCENT WHITE BY COUNT													
GRADE	GREEN % BY COUNT	0	1	2	3	4-9	10-15	16-25	26-35	36-50	51-65	66-80	81-100
A ³	100	60											
	99	60	58										
	98	59	57	56									
	97	58	56	55	54								
	96	57	56	53	53	52							
	95	56	55	53	53	52							
	94	55	55	53	53	52							
B ⁴	91-92	53	53	53	53	52							
	89-90	53	53	53	53	52	52						
	85-88	52	52	52	52	51	51						
	80-84	51	51	51	51	50	50	49					
	65-79	50	50	50	50	49	49	48	48				
C ⁴	50-64	47	47	47	47	47	46	46	46	46			
	35-49	46	46	45	45	45	44	44	44	44	44		
	20-34	45	45	45	45	44	44	44	43	43	43	43	
	0-19	44	44	44	44	43	43	43	43	42	42	42	42

THICK SEEDED TYPE (WITH SKINS ON)

PERCENT WHITE BY COUNT													
GRADE	GREEN % BY COUNT	0	1	2	3	4-5	6-10	11-20	21-35	36-50	51-65	66-80	81-100
A ³	99-100	60	58										
	97-98	59	56	53									
	95-96	58	56	53	52	50							
	93-94	57	55	53	52	50	47						
	90-92	56	54	52	52	50	47						
	85-89	55	54	52	52	50	47	45					
B ⁴	80-84	53	53	52	51	49	47	45					
	75-79	53	52	51	50	49	47	45	41				
	70-74	52	51	51	50	49	47	44	41				
	65-69	51	50	50	49	48	46	44	41				
	60-64	50	49	49	48	48	46	44	41	40			
C ⁴	55-59	47	47	47	47	46	45	43	41	40			
	50-54	47	47	47	46	46	44	43	41	40			
	35-49	46	46	46	45	45	44	42	40	40	38		
	20-34	45	45	45	44	44	43	42	40	39	37	36	
	0-19	44	44	43	43	43	42	42	39	38	36	34	32

³ **GRADE A** – Color must be bright and typical

⁴ **GRADE B and C** – Color must be typical

SUBSTANDARD – Score 0 to 41 points if the sample as a whole is definitely off-color, (whether or not due to discolored beans scored as major defects) or thick-seeded type containing more than 20 percent white beans.