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Processed  
Products  
Branch

# Grading Manual for Peanut Butter

**Effective July, 1983**

This manual is designed for Processed Products Branch personnel of the U.S. Department of Agriculture. Its purpose is to give background information and guidelines to assist in the uniform application and interpretation of U.S. grade standards, other similar specifications and special procedures.

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TABLE OF CONTENTS

	Page
SAMPLING PROCEDURES .....	3
NONQUALITY INSPECTION PROCEDURES .....	3
SUGGESTED ORDER FOR LOT GRADING OF A SAMPLE .....	4
SUGGESTED ORDER FOR ON-LINE GRADING OF A SAMPLE UNIT .....	5
SPECIAL ON-LINE SITUATIONS .....	9
TECHNICAL SECTION .....	10

## SAMPLING PROCEDURES

1. LOT (Stationary lot.)

FOLLOW Regulations (109-A-1)  
Sampling Procedures (120-A-1)  
Condition of Container (125-A-1)  
Foreign Material (172-A-1)

2. ON-LINE (Moving Lot).

FOLLOW Regulations (109-A-1)  
In Process (On-Line) Sampling Acceptance and  
Segregation Procedures for Quality Factors (120-A-4)  
In Plant Inspection (160-A-6; 162-A-1)  
Condition of Container (125-A-1)  
Foreign Material (172-A-1)

## NONQUALITY PROCEDURES

1. Time Sampling (120-A-5)
2. Net Weight (128-A-10)
3. Fill of Container (128-A-40) (FOLLOW (130-A-1))
4. General Inspection Procedures (130-A-1)
5. Vacuum (128-A-20)

SUGGESTED ORDER FOR LOT GRADING OF A SAMPLE

THIS MANUAL HAS NO SEPARATE LOT INSPECTION PROCEDURE.  
FOR LOT GRADING, CHECK THE CONSISTENCY (STEP 7) FIRST, THEN  
CONTINUE AS SHOWN FOR ON-LINE INSPECTION (STEPS 1 THROUGH 6).

## SUGGESTED ORDER FOR ON-LINE GRADING OF A SAMPLE UNIT

1. **Analyze the sample unit for salt content.**

FOLLOW FILE CODE 135-A-19

### **Record.**

2. **Analyze** the sample unit for **Water Insoluble Inorganic Residue (WIIR), Light Filth and Heavy Filth.**

NOTE: ALSO SEE TEXTURE.

It is not practical to run a WIIR on every sample unit. If No. 1 peanuts are being used and the history of plant operations indicate WIIR's of less than 5 mg can be anticipated, 1 determination per 8 hour shift is sufficient. If WIIR's are running above 5 mg, go to 1 determination for every eight (8) quality samples with a minimum of 2 per 8 hour shift. If WIIR's are close to the upper grade limit, a WIIR should be run for every four (4) quality samples, with a minimum of 3 per 8 hour shift. See pages 14 through 17 of this manual for the procedures for running WIIR. Light filth and heavy filth are run on the residue and the decanted material obtained in the BASIC STEPS of the WIIR determination. See pages 17 through 19 of this manual for the procedure for running light filth or heavy filth. The sampling rates for light filth and heavy filth are specified in File Code 172-A-1.

3. **Evaluate the color** of the sample unit. With a spatula, place a smear of peanut butter (about 1/2 inch wide and about 2 inches long) on white paper. Spread the smear to about the area and depth of the peanut butter color standards. A wide spatula with a groove the correct width and depth is an invaluable aid in getting the peanut butter to the correct size and depth to evaluate the color using the plastic color comparators. With a small spatula, remove the sheen from the top of the prepared sample. Select the two color standards that most nearly match the color of the peanut butter. Place the color standards on each side of

- the prepared sample and, using the Macbeth Examolite or other approved lighting source, **classify** and **record** the color designation and **assign** score points for the factor of color.
4. **Evaluate** the sample unit for **dark particles**. Using Inspection Aid No. 95, as directed in the instructions included on the aid, **evaluate** the sample for defects by comparing with the USDA Photographic Guides Illustrating Degree of Dark Particle Allowance in Peanut Butter. Record the score for the factor of defects.

#### SUGGESTED ORDER FOR ON-LINE GRADING OF A SAMPLE UNIT (continuation)

5. **Determine** the **texture** of the sample unit. Generally texture can be determined by spreading a subsample on a paper towel or on a grading tray, and observing the size of the peanut particles. In borderline situations the texture should be determined as outlined on page 19 of this manual.
6. **Evaluate** the sample unit for **flavor and odor**. The flavor and odor must be evaluated quickly. The first impression is the best because the taste and smell sensations are quickly, fully satisfied. Often further flavor and odor evaluations of the sample fail to give reliable results. Good flavor is the result of properly roasted peanuts (neither under roasted nor over roasted) blended with the right proportion of additives (salt, sugar, honey, dextrose, etc.) for the particular type, style, and texture of peanut butter being evaluated. Good flavor in light brown, non-stabilized, medium texture "old fashioned" peanut butter can not be used as a guide for evaluating the flavor of a dark brown, stabilized, smooth texture peanut butter containing all the permitted additives. The flavor should be evaluated based on the ideal for the particular style, type, and texture. The degree of roast has a great influence on flavor, odor and color. Peanut butter with good color could be expected to have better flavor than peanut butter with less than good color. The aroma of peanut butter should be that of freshly roasted and ground peanuts. The aroma must be free from musty, rancid, moldy, or any other objectionable odor. **Record** the flavor score.
7. **Evaluate** the sample unit for **consistency**. Consistency refers to the spreadability of the product and to the amount of oil separation in either stabilized or nonstabilized type peanut butter. Peanut butter should set 24 to 48 hours after packaging and reach a temperature between 70°F and 80° (21°C and 27°C) before consistency is evaluated.

Upon opening a container of peanut butter, carefully check the surface for the presence of free oil -- both in stabilized and nonstabilized types. One normally expects to find a slight amount of free oil in nonstabilized peanut butter, but not in stabilized peanut butter.

SUGGESTED ORDER FOR ON-LINE GRADING OF A SAMPLE UNIT (continuation)

**THE NATURAL GLOSS OF THE PRODUCT IS NOT CONSIDERED "FREE OIL".**

For stabilized peanut butter, it has been administratively determined that any free oil that may be present in:

**U.S. Grade A** - cannot be poured off or collected, and does not flow when container is tilted.

**U.S. Grade B** - can be poured, and/or flows when the container is tilted, and/when collectable -- such collectable oil does not exceed 1 cubic centimeter (ml) per pound of product.

Check through the entire sample to be sure there are no pockets of oil below the surface. The bottoms of metal containers should also be checked for free oil or excessive dryness.

For non-stabilized peanut butter, slight to moderate mixing to disperse the separated oil should be possible in 30 to 35 seconds.

Peanut butter must not be abnormally sticky in U.S. "Grade A." Excessive stickiness can be corrected by adjusting the fineness of grind, cooling time, or by altering the percentages of added ingredients.

Since peanut butter is used primarily as a spread for bread, the consistency should be such that it spreads easily without appreciable tearing or breaking of fresh bread in U.S. "Grade A."

Consistency may be checked by drawing the flat side of a table knife (blade about 3/4 inches wide) through the peanut butter. The blade should be inserted approximately 2 1/2 inches into the peanut butter and held at an approximate 45° angle. If there is more than a slight resistance to drawing the knife through the peanut butter or the product is so thin that the path collapses within about 3 seconds, the peanut butter should not be graded above U.S. "Grade B."

Peanut butter may also lack U.S. "Grade A" consistency because it hasn't set properly. Product with a gelatin like consistency is the result of a poor set. This may not be evident upon opening the container but can develop a short time after the surface of the product is disturbed. After the sample can has been opened:

#### SUGGESTED ORDER FOR ON-LINE GRADING OF A SAMPLE UNIT (continuation)

- a. Perform a 45° angle cut thru the product.
- b. On samples that are borderline "Soft" or "Thin", proceed as follows:
  1. Using a table knife, remove portions of the product from the can. (Follow normal procedure in spreading product on 5-6 slices of bread.)
  2. Perform another 45° angle cut through the product. If the product has developed a gelatin like condition that is more than slightly noticeable or if the knife path collapses within about 3 seconds, the peanut butter should not be graded above U.S. "Grade B."

#### SPECIAL ON-LINE SITUATIONS

##### **Government Contracts.**

In addition to the grade determination, the inspector will have to check other requirements (such as markings) when Government contracts are being run. Check with your supervisor for specific contract requirements. Generally, each code (maximum 500 cases) should be analyzed for the presence of aflatoxin. A representative sample should be composited from all the sample units representing a code. Your supervisor can advise where the analysis will be performed. (Also see File Code 147-A-22).

Peanut Butter  
July, 1983

TECHNICAL SECTION

PEANUT BUTTER

## TECHNICAL SECTION

The technical inspection procedures for peanut butter provide the types of analyses required by the U.S. Standards for Grades of Peanut Butter. The procedures, as presented, are sufficiently comprehensive to give results that are comparable to the Official Methods of Analysis of the Association of Official Analytical Chemists.

Since the described procedures incorporate corrosive, explosive, and/or cumulatively toxic chemicals, particular attention to standard laboratory safety measures is imperative during the conduct of any, or all, of the described procedures. All analyses should be conducted under a suitable laboratory fume hood. If proper ventilation and/or a suitable laboratory fume hood is not available, a safety mask approved by OSHA should be used. Smoking and uncontrolled open flames shall not be permitted.

NOTE:           **THESE PROCEDURES MAY BE USED IN APPROVED  
LABORATORIES ONLY. IF IN DOUBT CONSULT YOUR  
SUPERVISOR.**

TECHNICAL SECTION (continuation)

TABLE OF CONTENTS

	Page
List of Equipment .....	13
List of Chemicals .....	13
Preparation of Pancreatin Extract .....	14
Methods of Analysis	
Basic steps-WIIR, Light Filth, Heavy Filth, Texture .....	14
Determination of WIIR and Filth .....	16
Salt .....	19
Texture .....	19

TECHNICAL SECTION (continuation)

1. **List of Equipment**

Balance, triple beam, with 0.1 gm precision.  
Balance, analytical, with 0.1 mg precision.  
Boiling Chips  
Beakers, Griffin, low form plastic or Pyrex - 250 ml, 600 ml  
Bottles, wash - 250 ml polyethylene  
Brush, camels hair  
Burner, Bunsen  
Burettes, 100 ml capacity, with 0.1 ml precision.  
Crucibles, Platinum or silica  
Cylinder, graduated, 100 ml graduated in 0.5 ml  
Dish, platinum or silica  
Flask, Erlenmeyer, w/rubber stopper - 250 ml, 500 ml, 2 L  
Flask, vacuum - 500 ml or 1000 ml  
Funnel, Buchner, 15 cm  
Funnel, 60°, short stem, 4 or 5 inch diameter  
Furnace, muffle - 0° to 500° C  
Glass, watch - 3 or 4 inch diameter  
Microscope, wide field - 20X and 30X  
Paper, rapid filter - ashless 15 cm  
pH meter

Pump, acid, calibrated to 0.1 ml  
Rods, stirring, plastic (or glass w/policeman)  
Sieves, U.S. Standard 20, 30, and 40 mesh, fine series, 8 inch  
Thermometer, 0 to 100°C  
Vacuum source  
Water bath  
Wildman trapflask

2. **List of Chemical (Unless noted, all chemicals should be reagent grade.)**

Acid, Hydrochloric, HCl  
Chloroform, CHCl<sub>3</sub>  
Ether, petroleum  
Formaldehyde, HCHO  
Kerosene, commercial  
Pancreatin, Merck, U.S.P. (keep refrigerated at 10°C or 50°F)

TECHNICAL SECTION (continuation)

Sodium phosphate, tribasic, Na<sub>3</sub>PO<sub>4</sub>·12H<sub>2</sub>O (5%)

3. **Preparation of Pancreatin Extract**

a. Standard Procedure

- i. Mix 5 grams of pancreatin with 100 ml of warm water (not over 40°C or 104°F) for 10 minutes in a blender: or allow to stand for 30 minutes with intermittent stirring.
- ii. Filter solution through 4 inches of loosely packed cotton in a 60° funnel.
- iii. Repeat filtering, using the same cotton. (If filtering is very slow, cotton may be changed.)
- iv. Filter with suction through a fast filter paper in a Buchner funnel.

NOTE: IF FILTERING IS SLOW, POUR THROUGH A SLIGHTLY COMPRESSED COTTON PLUG IN A 60° FUNNEL. REPEAT IF NECESSARY UNTIL RAPID FILTRATION THROUGH PAPER IS OBTAINED.

b. Alternate Procedure

Mix 10 grams of pancreatin with 100 ml of warm water, allow to stand for 2 1/2 hours and proceed as indicated for the standard pancreatin extract.

4. **WATER INSOLUBLE INORGANIC RESIDUE (WIIR), LIGHT FILTH, HEAVY FILTH, TEXTURE**

NOTE: CHLORIDE FREE, DISTILLED WATER (ONLY) SHOULD BE USED IN THESE ANALYSES.

METHODS OF ANALYSIS

a. Basic steps - WIIR, Light Filth, Heavy Filth, Texture

Steps 1 through 19 are common to the WIIR, light filth, heavy filth, and texture.

NOTE: STEP 12: THE DECANTED PETROLEUM ETHER FROM THE PREVIOUS STEPS IS TO BE DISCARDED.

TECHNICAL SECTION (continuation)

- (1) Weigh 100 grams of subsample into a tared 250 ml beaker.
- (2) Add 10 ml of petroleum ether and mix **thoroughly**.
- (3) Gradually add approximately 140 ml of petroleum ether, mixing continually.
- (4) Cover and allow to settle for 25 minutes.
- (5) Float off light tissue by **carefully** decanting about 100 ml of the petroleum ether layer.
- (6) Add approximately 125 ml of petroleum ether to the residue in the beaker, washing down the sides of the beaker with a stream of petroleum ether from the wash bottle, mix thoroughly.
- (7) Cover and let settle for 15 minutes.
- (8) Float off light tissue by **carefully** decanting about 100 ml of the petroleum ether layer.
- (9) Add approximately 125 ml of petroleum ether to the residue, washing down the sides of the beaker with a stream of petroleum ether from the **wash bottle**, mix **thoroughly**.
- (10) Cover and allow to settle for 10 minutes.

- (11) Float off light tissue by carefully decanting about 100 ml of the petroleum ether layer.
- (12) Discard all decanted petroleum ether, saving only the residue remaining in the beaker.
- (13) Evaporate the remaining petroleum ether from the residue in the beaker using a water bath. (The evaporation may be accomplished in a fume hood by allowing the air flow to pass over the residue in the beaker).
- (14) Add 100 ml of chloroform ( $\text{CHCl}_3$ ), washing down the sides of the beaker with a stream of chloroform from the wash bottle, mix **thoroughly**.
- (15) Cover and allow to settle for 20 minutes, stirring the **top** layer several times while settling to dislodge any heavy filth trapped in the crust.
- (16) Without disturbing the heavy residue at the bottom of the beaker - decant the  $\text{CHCl}_3$  and the floating peanut tissue into a clean beaker and **SAVE**.
- (17) Repeat steps 14, 15, and 16 using  $\text{CHCl}_3$ .
- (18) Repeat steps 14, 15, and 16 making sure all particles are washed from the sides of the beaker.
- (19) Save all decanted peanut tissue for later light filth or texture determination.

All the residue in the beaker is used for the determination of heavy filth and WIIR.

#### TECHNICAL SECTION (continuation)

- (20) **Heavy filth**-Examine the residue in the beaker (from step 19 of the basic steps) for obvious contamination by sand, rodent excreta, or other heavy filth.

#### b. **WIIR**

#### METHOD I

- (1) Wash the residue thoroughly several times with hot water. Carefully decant the hot water and discard.
- (2) Dry the residue in the beaker on a hot plate or by standing in air.
- (3) Transfer the dried residue to a tared crucible with the aid of a camels hair brush.

- (4) Ignite and dry in a muffle furnace at 500° to 550°C. (932° - 1022°F) for one hour.
- (5) Weigh to the nearest 0.1 mg (0.0001 g) and round to nearest mg (0.001 g).

#### METHOD II

- (1) Add 50 ml of dilute HCl (1+35) to the residue in the beaker. Add 90 ml hot water, stir thoroughly and allow to stand 30 minutes.

NOTE: ONE PART HCl TO 35 PARTS WATER.

- (2) With the aid of a stream of hot water transfer the residue from the beaker to an ashless filter paper using a Buchner funnel and a vacuum source.
- (3) Wash the filter paper **thoroughly** with **hot water**.
- (4) Transfer the filter paper to a tared crucible.
- (5) Ignite and dry in a muffle furnace at 500°-550°C. (932° - 1022°F) for one hour.

TECHNICAL SECTION (continuation)

- (6) Weigh to the nearest 0.1 mg (0.0001 g) and round to nearest mg (0.001 g).

#### TECHNICAL SECTION (continuation)

- c. **LIGHT FILTH** - Light filth is run on the decanted peanut tissue from steps 14 through 18 of the basic steps.

NOTE: ALL TEMPERATURES STARTING WITH STEP 4 IN THIS PROCEDURE ARE OF A CRITICAL NATURE. SUFFICIENT MARGINS HAVE BEEN ALLOWED FOR MINOR FLUCTUATIONS. IF TEMPERATURE EXCEEDS 40°C (104°F) AT ANY POINT, DISCARD AND START OVER.

- (1) Filter the decanted peanut tissue (from step 19 of the basic steps) through a rapid filter paper.

- (2) Transfer all collected residue to a hard surface paper. Save the filter paper for later washing.
- (3) Break up any caked or lumpy peanut material and dry. [Overnight at room temperature or for 1 hour in an oven at 80°C (176°F.)]
- (4) Transfer the dry residue to a 600 ml beaker.
- (5) Rinse the filter paper (saved from step 2) with cold water and add the washings to the beaker.
- (6) Add 300 - 400 ml of cold water and stir until smooth.
- (7) Add freshly prepared, filtered, aqueous pancreatin extract and mix. (Total volume of extract prepared as shown on page 22 is required for this step.)
- (8) Adjust to pH 8.0 with Na<sub>3</sub>PO<sub>4</sub> solution (5%), and set aside for 15 minutes.
- (9) Re-adjust to pH 8.0 and set aside for 45 minutes.
- (10) Re-adjust to pH 8.0 and proceed.
- (11) Add 5 drops of formaldehyde, U.S.P.
- (12) Digest for 16 to 18 hours in a warm oven 30° - 37°C (86°F - 99°F).

TECHNICAL SECTION (continuation)

NOTE: DIGESTION MAY BE ACCOMPLISHED IN 2 1/2 HOURS BY USING THE ALTERNATE PANCREATIN EXTRACT ON PAGE 11 AND DIGESTING AT 37° - 39°C (99°F - 102°F).

- (13) Cool to room temperature and transfer the digested material to a 2 liter Wildman trapflask.
- (14) Add sufficient deaired water to bring the volume to 800 or 900 ml.

- (15) Add 35 ml of kerosene, agitate vigorously without breaking the surface or incorporating air into the mixture.
- (16) Add sufficient deaerated water to raise the kerosene level into the neck of the flask.
- (17) Allow to stand for 30 minutes.
- (18) Trap off the kerosene into a beaker.
- (19) Add 25 ml of kerosene to the flask, agitate vigorously without breaking the surface or incorporating air into the product. Allow to stand for 10 minutes.
- (20) Trap off the kerosene layer into the beaker used in the step 18.
- (21) Filter the kerosene fraction through a ruled, fast filter paper.
- (22) Examine microscopically using a widefield scope at 20X for scanning and at 30X for identification of light filth.

**d. SALT**

Salt determination procedures - Volhard, and Potentiometric Methods -- Follow File Code 135-A-19.

**e. TEXTURE**

This procedure should be used when there is a question about the texture of a sample.  
(Borderline situation).

**TECHNICAL SECTION (continuation)**

- (1) Pour all of the decanted material from steps 14, 15, 16, 17, and 18 of the basic steps through a nest of sieves, having as US number 20 on top, a US number 30 in the middle, and a US number 40 on the bottom.
- (2) Allow to dry in the open air for 5 to 10 minutes.
- (3) Shake moderately, allowing the dry peanut residue to pass through the sieves.

Classify the texture using the following guidelines.

- Smooth texture - All the dried peanut residue passes through the US number 20 sieve. Not more than one half gram is retained on the US number 30 sieve.
- Medium texture - More than one half gram of the dried peanut residue is retained on the US number 30 sieve, with not more than one half gram being retained on the US number 20 sieve.
- Chunky or - More than one half gram of the dried peanut residue is retained  
Crunchy texture on the US number 20 sieve.