

INSPECTION OF KHORASAN

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1. PURPOSE

This directive establishes inspection procedures for the factor analysis of Khorasan seed under the Agricultural Marketing Act of 1946, as amended (AMA).

2. REPLACEMENT HIGHLIGHTS

This directive is revised to establish an approximate sample size for the GAC2500-UGMA and Perten AM5200-A, and to make other minor editorial changes. This directive supersedes FGIS Program Directive 9180.60, dated 6/22/09.

3. BACKGROUND

While assisting Kamut producers to obtain crop insurance coverage, the Federal Grain Inspection Service (FGIS) worked with the Federal Crop Insurance Corporation to develop inspection procedures for the factor analysis of this organically grown wheat-like grain. FGIS used the name of Kamut in establishing the procedures. However, Kamut is not the name of the commodity, but is a registered trademark owned by Kamut International, Ltd (KI). The name Kamut is used to market a grain that has certain guaranteed quality attributes as specified by KI. The common name of the grain is Khorasan wheat. It was first identified as *Triticum Polonicum*, but further examination has shown that this variety of wheat is actually *Triticum Turanicum*.

For 2004, the Federal Crop Insurance Corporation modified its wheat crop insurance provisions to include the term Khorasan into the crop definition and to create a separate definition of Khorasan, which reads: “the common name for a variety of wheat *Triticum Turanicum* that is marketed under trademarks such as Kamut. Khorasan is considered to be spring wheat for the purpose of this policy.”

4. GENERAL INFORMATION

There are no classes, subclasses, or grades in Khorasan seed. Inspection of Khorasan seed is on a factor only basis. The factors analyzed are: kind of grain, test weight, moisture, dockage, shrunken and broken kernels, infestation, heating, odor, bird dropping, other animal filth, broken glass, castor beans, cockleburs, crotalaria seeds, smut, ergot, garlic, treated, stones, temperature, unknown foreign substances, heat-damaged kernels, damaged kernels, and foreign material.

5. STANDARD ABBREVIATIONS

Use the following abbreviations in the analysis of Khorasan seed:

Khorasan seed	KHOR	Cockleburs	CBUR
Moisture	M	Crotalaria	CROT
Dockage	DKG	Garlic bulblets	GARB
Test weight per bushel	TW	Unknown foreign substance	FSUB
Damaged kernels (total)	DKT	Odor	ODOR
Heat-damaged kernels	HT	Musty	MUST
Shrunken and broken kernels	SHBN	Sour	SOUR
Foreign material	FM	Commercially objectionable	COFO
Infested	INF	foreign odor	
Heating	HTG	Smutty	SMUT
Bird excreta	BRDX	Stones	STON
Animal filth	ANFL	Treated	TRET
Castor beans	CSTB		

6. BASIS OF DETERMINATION

TABLE 1
(How Factors are Determined)

Lot as a Whole	Before the Removal of Dockage	Before the Removal of Dockage	After the Removal of Dockage and Shrunken and Broken Kernels
Heating	Garlicky	Ergot	Damaged kernels (total)
Infested	Heating	Kind of grain	Foreign material
Odor	Infested	Odor	Heat-damaged kernels
	Kind of Grain	Shrunken & broken kernels	
	Moisture	Smut	
	Odor	Stones	
	Odor (smut)	Test weight	
	Other unusual conditions	Treated	

7. DEFINITION OF KHORASAN SEED

Khorasan (Triticum Turanicum) consists of 50.0 percent or more of whole Khorasan seed before the removal of dockage.

Whole kernels are kernels with three-fourths or more of the kernel present.

Basis of Determination. A visual appraisal of the sample is sufficient to determine if it meets the definition of Khorasan seed. However, if analysis is necessary, make the determination after the removal of dockage on a portion of approximately 50 grams.

8. INFESTATION

Khorasan seed that is infested with live weevils or other live insects injurious to stored grain according to procedures prescribed in FGIS instructions.

The presence of any live weevil or other live insect injurious to stored grain indicates the probability of infestation and warns you to examine carefully the Khorasan seed to determine if it is infested. In such cases, examine the work and file sample before reaching a conclusion as to whether the Khorasan seed is infested. Do not examine the file sample if the work portion is insect free.

Live weevils include rice weevils, granary weevils, maize weevils, cowpea weevils, and lesser grain borers. Other live insects injurious to stored grain include grain beetles, grain moths, and larvae. (See Grain Inspection Handbook, Book II, Chapter 1, Section 1.2, for visual references of insects commonly found in grain.)

Basis of Determination. Determine infestation on the lot as a whole and/or the sample as a whole. For insect tolerances, see Table 2.

TABLE 2

INSECT INFESTATION
Samples meeting or exceeding any one of these tolerances are infested: 2 lw, or 1 lw + 1 oli, or 2 oli
I. 1,000-gram Representative Sample ¹ (+ file sample if needed) - Submitted Samples - Probed Lots - D/T Sampled Landcarriers
II. Lot as a Whole (stationary) - Probed Lots (at time of sampling)
III. Online sample (In-motion) ² - Railcars Under Cu-Sum - Subsamples for Sacked Grain Lots - Components for Bargelots ³
¹ Examine work portion and file sample if necessary. Do not examine file sample if work portion is insect free. ² Minimum sampling rate is 500 grams per 2,000 bushels. ³ Minimum component size is 10,000 bushels. key: lw = live weevil oli = other live insects injurious to stored grain

Certification. When applicable, record the word “infested” on the work record and the certificate.

9. HEATING

Khorasan developing a high temperature from excessive respiration is considered heating. Heating Khorasan, in its final stages, will usually have a sour or musty odor. Do not confuse Khorasan that is heating with Khorasan that is warm and moist because of storage in bins, railcars, or other containers during hot weather.

Basis of Determination. Determine heating on evidence obtained at the time of sampling.

Certification. When applicable, record heating on the work record and certificate.

10. ODOR

Basis of Determination. Determine odor on evidence obtained at the time of sampling or on the sample either before or after the removal of dockage.

TABLE 3

ODOR CLASSIFICATION EXAMPLES		
Sour	Musty	Commercially Objectionable Foreign Odors
Boot Fermenting Insect (acrid) Pigpen	Ground Insect Moldy	Animal hides Decaying animal & vegetable matter Fertilizer Fumigant Insecticide Oil products Skunk Smoke Strong weed

Commercially Objectionable Foreign Odors. are odors, except smut and garlic odors, foreign to grain, which render it unfit for normal usage.

Fumigant or insecticide odors are commercially objectionable foreign odors if the odors linger and do not dissipate. When a sample of Khorasan contains a fumigant or insecticide odor that prevents a determination as to whether any other odor(s) exists, apply the following guidelines:

- a. Original Inspections. Allow the work portion to aerate in an open container for 4 hours, or less, if the odor dissipates in less time.
- b. Reinspections, Appeal, and Board Appeal Inspections. Allow unworked file samples and new samples to aerate in an open container for 4 hours or less if the odor dissipates in less time. The 4-hour aeration requirement does not apply when the original work portion was aerated and retained as the final file.

Consider the sample as having a commercially objectionable foreign odor if the fumigant or insecticide odor persists based on the above criteria.

Final Determination. The inspector(s) is responsible for making the final determination for all odors. When possible use a consensus of experienced inspectors, on samples containing marginal odors. The consensus approach is not required if no odor or a distinct odor is detected.

Certification. If present, record the words “Musty”, “Sour”, or “Commercially Objectionable Foreign Odor” on the work record and the certificate.

11. ANIMAL FILTH, GLASS, AND UNKNOWN FOREIGN SUBSTANCES

Basis of Determination. Determine animal filth, glass, and unknown foreign substances on the basis of the samples as a whole (1-1/8 to 1-1/4 quarts).

Certification. Record the number of pieces of animal filth, glass, and unknown foreign substances on the work record and the certificate. Record count factors to the nearest whole number.

12. GARLIC BULBLETS

Basis of Determination. Determine the number of garlic bulblets on the sample before the removal of dockage (approximately 1,000 grams), except in those cases where the garlic bulblet count is in excess of 10 green bulblets. When garlic bulblets are in excess of 10 green bulblets, use a portion of 250 grams. After determining the count of bulblets on the 250-gram portion, multiply the count by 4 to obtain the equivalent number of bulblets in 1,000 grams. Reference Image: [Garlic](#).

Characteristics of Bulblets.

- a. Green garlic bulblets are bulblets, which have retained all of their husks intact.
- b. Dry or partly dry garlic bulblets are bulblets, which have lost all or part of their husks. Consider bulblets with cracked husks as dry.

Note: Three dry or partly dry garlic bulblets are equal to one green bulblet.

Garlic bulblets function as dockage or foreign material.

Certification. Record the number of garlic bulblets in whole and decimals to the nearest hundredth percent, on the work record and the certificate. (i.e. $1/3=0.33$, $2/3= 0.67$)

13. MOISTURE

Water content in grain as determined by the GAC2500-UGMA and Perten AM 5200-A moisture instruments using the approved calibration for Durum Wheat (See FGIS Directive 9180.61).

Basis of Determination. Determine moisture on a portion of approximately 650 grams before the removal of dockage.

The procedures for performing a moisture determination are described in the Moisture Handbook.

Certification. Record the percentage of moisture on the work record and the certificate to the nearest tenth percent.

14. DOCKAGE

All matter other than Khorasan that you can remove from the original sample by use of an approved device according to procedures prescribed in FGIS instructions. Also, underdeveloped, shriveled, and small pieces of Khorasan kernels removed in properly separating the material other than Khorasan and that you cannot recover by properly rescreening or recleaning.

Basis of Determination. Determine dockage on a portion of 1,000 to 1,050 grams of the original sample.

When determining dockage, check the material that passes over the riddle for threshed or unthreshed kernels and sprouted kernels of Khorasan.

Threshed and sprouted kernels that pass over the riddle are not considered dockage. Return all such kernels to the dockage-free sample. Threshed kernels of Khorasan are kernels with either no glumes attached, or not more than one glume attached.

Unthreshed kernels that pass over the riddle are considered dockage. Unthreshed kernels are kernels with more than one glume attached. Reference Image: [Threshed & Unthreshed Kernels](#).

a. Procedure for determining dockage with the Carter Dockage Tester.

Set up the Carter dockage tester as follows:

- (1) Air control at Number 4.
- (2) Feed control at Number 6.
- (3) Number 25 riddle in the riddle carriage. If the predominating grain is Khorasan use the No. 25 riddle. If kernels are approximately the size of Durum wheat kernels use the No. 25 riddle; otherwise use the No. 2 riddle.
- (4) No sieve in the top sieve carriage.
- (5) Number 2 sieve in the middle sieve carriage.
- (6) Number 2 in the bottom sieve carriage.

Start the Carter Dockage Tester and pour sample into the feed hopper.

b. Dockage consists of:

- (1) Material removed by the aspirator (air collection pan).
- (2) Material over the riddle, except for threshed and sprouted kernels. Threshed kernels have one or no glume attached. Reference Image: [Threshed & Unthreshed Kernels](#). Place threshed and sprouted kernels in the cleaned Khorasan (over middle sieve).
- (3) Material that passed over the bottom sieve except when the material consists of less than 50 percent, by weight, of wheat kernels. When 50 percent or more of wheat kernels are found, return the material to the cleaned wheat.
- (4) Material that passed through the Number 2 sieve (bottom collection pan).

To avoid repeating operations, check the dockage for garlic bulblets, infestation, and other factors (except stones).

Certification. Record the word “Dockage” and the percentage to the nearest tenth percent on the work record and the certificate. If the dockage is less than one-tenth percent, report as “Dockage 0.0 percent.”

15. TEST WEIGHT

The weight per Winchester bushel (2,150.42 cubic inches) as determined using an approved device according to procedures prescribed in FGIS instructions.

Basis of Determination. Determine test weight on a dockage-free portion of sufficient quantity to overflow the kettle.

The procedures for performing the test weight determination and available services are described in Book II, Chapter 1, Section 1.11.

Certification. Record test weight results on the work record as displayed on the electronic scale or in whole and tenth pounds to the nearest tenth pound. Record the test weight on the certificate in whole and tenth pounds to the nearest tenth pound. If requested, convert the pounds per bushel (lbs./bu) result to kilograms per hectoliter (kg/hl) using the following formulas: for Khorasan seed, $[1.292 \times \text{lbs./bu}] + 0.630 = \text{kg/hl}$.

16. PROCESSING THE WORK SAMPLE

At this point, you have performed all tests required before the removal of dockage. You have determined the percentage of dockage, test weighed the sample, and examined it for certain criteria. Now you are ready to divide the work sample into fractional portions for other determinations required after the removal of dockage. The following chart and Table 4 illustrate how you will divide the sample into fractional parts using the Boerner divider.

DIVIDING THE WORK SAMPLE

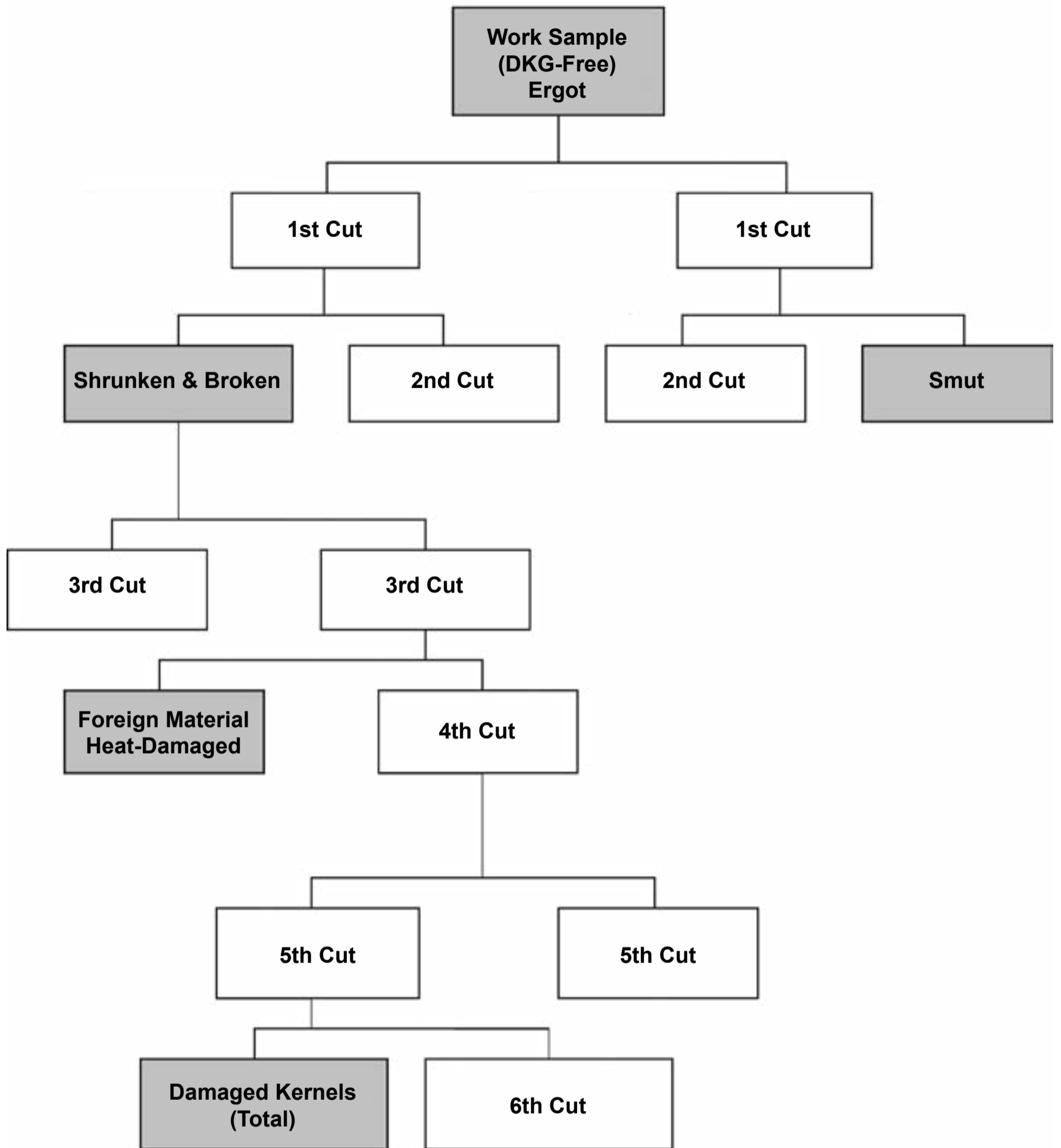


TABLE 4

APPROXIMATE ANALYTICAL PORTION SIZES	
Factors	Grams
Ergot	1,000
Shrunken & broken kernels	250
Smut	250
Class	15
Damaged kernels (total)	15
Foreign material	50
Heat-damaged kernels	50

17. ERGOTY KHORASAN

Khorasan that contains more than 0.05 percent of ergot.

Ergot is a hard, reddish-brown or black grain-like mass of certain parasitic fungi that replaces the kernels of Khorasan. Reference Image: [Ergot](#).

Basis of Determination. Determine ergot on a dockage-free portion of 1,000 grams. Ergot applies in the determination of ergot and it functions as foreign material.

Certification. Upon request, record the percentage of ergot to the nearest hundredth percent on the work record and the certificate.

18. LIGHT SMUTTY AND SMUTTY KHORASAN

Light Smutty. *Khorasan that has an unmistakable odor of smut, or which contains, in a 250-gram portion, smut balls, portions of smut balls, or spores of smut in excess of a quantity equal to 5 smut balls, but not in excess of a quantity equal to 30 smut balls of average size.*

Smutty. *Khorasan that contains, in a 250-gram portion, smut balls, portions of smut balls, or spores of smut in excess of a quantity equal to 30 smut balls of average size.*

Basis of Determination. Determine “Light smutty” on the sample as a whole (odor only) or on a dockage-free portion of 250 grams. Determine “Smutty” on a dockage-free portion of 250 grams. Smut balls apply in the determination of “Light smutty” or “Smutty” but also function as foreign material.

Certification. If present, record the word “Smutty” on the work record and certificate. Upon request, show the odor (in the case of light smutty) or the number of smut balls.

19. TREATED KHORASAN

Khorasan that has been scoured, limed, washed, sulfured, or treated in such a manner that the true quality is not reflected.

Basis of Determination. Determine treated on the basis of the dockage-free work sample. If at the time of sampling, odor or other conditions indicate that the Khorasan has been treated, place a portion of the sample in an airtight container for examination in the laboratory.

Three qualities are associated with natural, untreated Khorasan:

- a. A natural, live, healthy feeling;
- b. A bright, attractive appearance; and
- c. A natural Khorasan odor.

Any artificial or mechanical process that impairs or conceals the true quality of Khorasan, causes Khorasan to grade treated. Such processes include:

Scoured or Washed. Khorasan which has been scoured or washed, in whole or in part, so that the true quality of the Khorasan is not reflected, and which meets one or more of the following conditions, is considered treated and graded as scoured or washed.

- a. Presents a blistered and/or abraded bran coat appearance as a result of treatment;
- b. Has a so-called laundry odor or wet smut odor;
- c. A dull, lifeless appearance or feeling; or
- d. Has the appearance of having been scoured for the purpose of increasing the test weight per bushel.

Sulfured Khorasan. Khorasan that in whole or in part, has been bleached with any bleaching agent is considered treated (sulfured).

Limed Khorasan. The presence of lime in a sample of Khorasan (that has not been scoured) is considered as evidence that the lime was added to cover up some defect in the Khorasan. Consider such Khorasan as treated (limed).

Treatment for Infestation. Khorasan, which has been treated to exterminate live weevils or other live insects, is not considered treated unless the Khorasan has the characteristics of treated Khorasan as described above.

Certification. When applicable, record "Treated", along with the type of treatment on the work record and certificate.

20. SHRUNKEN AND BROKEN KERNELS

All matter that passes through a 0.064 x 3/8 oblong-hole sieve after sieving according to procedures prescribed in FGIS instructions.

Basis of Determination. Determine shrunken and broken kernels on a dockage-free portion of 250 grams using one of the following methods:

a. Mechanical Sieving Method.

- (1) Mount the sieve and the bottom pan on the mechanical sieve shaker.
- (2) Set the stroke counter for 30 strokes.
- (3) Follow the procedure described in Book II, Chapter 1, Section 1.13, "Mechanical Sieve Shaker."
- (4) Consider all material passing through the sieve as shrunken and broken kernels. Return the material lodged in the perforations to the Khorasan remaining on top of the sieve.

b. Hand Sieving Method.

- (1) Mount the sieve on a bottom pan.
- (2) Place the 250-gram portion in the center of the sieve.
- (3) Hold the sieve level in both hands with elbows close to the body and the sieve perforations parallel to the direction of movement.
- (4) In a steady motion, move the sieve from left to right approximately 10 inches and then return from right to left.
- (5) Repeat this operation 30 times.
- (6) Consider all material passing through the sieve as shrunken and broken kernels. Return the material lodged in the perforations to the Khorasan remaining on top of the sieve.

Determine shrunken and broken kernels prior to analyzing the sample for heat-damaged kernels, damaged kernels, foreign material, and contrasting classes.

Certification. Record the percentage of shrunken and broken kernels on the work record and certificate to the nearest tenth percent.

21. DAMAGED KERNELS

Kernels, pieces of Khorasan seeds, and other grains that are badly ground-damaged, badly weather-damaged, diseased, frost-damaged, germ-damaged, heat-damaged, insect-bored, mold-damaged, sprout-damaged, or otherwise materially damaged.

Basis of Determination. Determine damaged kernels on a dockage-free and shrunken and broken-free portion of 15 grams.

Types of Khorasan damage.

- a. Black Tip Fungus. Kernels affected by black tip fungus to the extent that the fungus growth is on the germ and extends into the crease of the kernel. Reference Image: [Black Tip Damage](#) (ILP: W-1.0).
- b. Heat-Damaged Kernels. Kernels materially discolored and damaged by heat. It is necessary, in most cases, to cut the kernels and make a cross-section analysis to determine if the color is reddish-brown, mahogany, or creamy. Reference Image: [Heat Damage](#) (ILP: W-6.0 (Durum) and ILP: W-6.1(Other Than Durum)).
- c. Blight or Scab. Kernels with a dull, lifeless, and chalky appearance resulting from disease. The germ and crease may also have a moldy appearance. Kernels which are not damaged enough to function as scab damage should be examined further for moldy germs and creases. Reference Image: [Scab Damage](#) (ILP:W-2.0).
- d. Frost-Damaged Kernels (Blistered). Kernels with distinct frost blisters extending around the back of the kernel and into the crease. Reference Image: [Frost Damage - Blistered](#) (ILP:W-3.0).
- e. Frost-Damaged Kernels (Candied). Kernels that have a distinctly wax-like or candied appearance. Frost-damaged (candied) kernels can be greenish, greenish-yellow, brownish, or blackish in color. They frequently have dark stripes showing through the sides of the kernels. Reference Image: [Frost Damage - Candied](#) (ILP: W-3.1).
- f. Frost-Damaged Kernels (Flaked). Kernels that have a slightly flaked-off bran coat due to frost. Evidence of frost must be present. Do not confuse flaked-by-frost with kernels which have had the bran coat rubbed off because of handling. Reference Image: [Frost Damage - Flaked](#) (ILP: W-3.3).
- g. Frost-Damaged Kernels (Discolored Black or Brown). Kernels which are discolored black or brown and/or have a bleached or blistered appearance with dark lines showing through both sides. Reference Image: [Frost Damage - Discolored Black/Brown](#) (ILP:W-3.2).
- h. Germ-Damaged Kernels (Mold). Kernels which have mold in the germ. The bran coat covering the germ should be removed carefully as scraping the bran coat too deep could remove the mold. Reference Image: [Mold Damage](#) (ILP W-4.1).

- i. Green Damage (Immature). Kernels which are intense green (immature) and without any yellow appearance. Reference Image: [Green Damage](#) (ILP: W-5.0).
- j. Mold-like Substance. Whole kernels of Khorasan which are 50 percent or more covered and pieces of kernels which are discolored and covered with a mold-like substance.
- k. Other Damage. Kernels with cracks, breaks, or chews and which contain mold or fungus. Reference Image: [Other Damage](#) (ILP: W-7.0).
- l. Sprout-Damaged Kernels. Kernels with the germ end broken open from germination exhibiting sprout or from which the sprouts have been broken off. Reference Image: [Sprout Damage](#) (ILP: W-8.0).
- m. Insect-Bored Kernels. Kernels that have been bored or tunneled by insects. Reference Image: [Weevil or Insect-Bored](#) (ILP: W-9.0).
- n. Germ-Damaged Kernels (Sick). Kernels damaged as a result of heat but are not materially discolored. Sick kernels should be scraped very carefully to avoid the loss of discoloration and/or popping or removal of the germ. Reference Image: [Germ Damage - Scraped](#) (ILP: W-4.0) and Reference Image: [Germ Damage - Bleach Method](#) (ILP: W-4.2).

Bleach Method. The bleaching procedure that uses the S/J mixer may be used as an alternate method for determining germ-damaged Khorasan.¹ Prior to bleaching, remove all types of damaged kernels, except germ-damaged, from the representative portion and calculate the percentage. The portion, minus the other types of damaged kernels, can now be bleached. After bleaching, weigh the bleached portion, remove the germ-damaged kernels, and calculate the percentage.

Bleach Procedure.

- a. Place 15 grams (13.5 to 16.5) of Khorasan in the mixing jar. If the amount of other damage present in the original 15-gram portion reduces the weight of the sample to be bleached below 13.5 grams, an additional 15-gram portion must be analyzed for germ damage. It is not necessary to remove the other damaged kernels from the second portion before bleaching.
- b. Add 15 grams of potassium hydroxide (KOH) pellets.
- c. Add 20 ml of bleach.
- d. Set stirring head on jar, place jar on mixer, and mix for 3 minutes.

¹ For equipment and materials, see Book II, Section 1.17 of the Grain Inspection Handbook.

- e. Pour the Khorasan from the mixing jar into the tea strainer and rinse with warm tap water to remove the KOH bleach solution.
- f. After rinsing, lightly tap the tea strainer against the edge of the sink to remove the excess water. Gently press the bottom of the tea strainer on a dry paper towel to remove any additional water.
- g. Place the Khorasan on the dryer sieve and dry for 1 to 1-1/2 minutes or until the kernels are not tacky when picked up with a pair of tweezers.
- h. Remove the Khorasan from the drying sieve and weigh. The kernels with germ damage should now be readily apparent. If not, it is permissible to carefully lift the bran coat from over the germ area to examine for damage.

Any deviation from the previously described procedures may result in improperly bleached Khorasan and could produce a hazardous condition. Further,

- Wear safety equipment while the bleach operation is in progress and clean thoroughly the lab area once bleaching is complete.
- Neutralize spills with vinegar before wiping the liquid up.
- Avoid mixing the KOH bleach solution used in this test with chemical reagents or waste solutions associated with other tests.
- Dispose of the KOH bleach solution by washing the solution down the sink drain with large quantities of water.

Computing Damaged Kernels. Obtain the percentage of total damaged kernels by adding the percentage of germ-damaged kernels and other damaged kernels. Add the results, as shown in the following example, in hundredths (disregard thousandths) and round the sum to the nearest tenth percent.

STEP 1. $\frac{\text{Weight of other type damaged kernels}}{\text{weight of sample before bleaching}} \times 100 = \text{percentage of other type damaged kernels.}$

STEP 2. $100 \text{ percent} - \text{percentage of other type damaged kernels} \times 100 = \text{change of base factor.}$

STEP 3. $\frac{\text{Weight of germ-damaged portion}}{\text{weight of damaged portion after bleaching}} \times 100 = \text{percentage of germ-damaged kernels.}$

STEP 4. $\text{Percentage of germ-damaged kernels} \times \text{change of base factor} = \text{adjusted percentage of germ-damaged kernels.}$

STEP 5. $\text{Percentage of other damaged kernels} + \text{adjusted percentage of germ-damaged kernels} = \text{percentage of damaged kernels.}$

Example:

Original weight of damaged portion	=	16.10 grams
Weight of other type damaged kernels	=	2.40 grams
Sample weight before bleaching	=	13.70 grams
Sample weight after bleaching	=	11.95 grams
Weight of germ-damaged kernels	=	4.33 grams

STEP 1. $(2.40 / 16.10) \times 100 = 14.90$ percent of other type damaged kernels.

STEP 2. $(100 \text{ percent} - 14.90 \text{ percent}) / 100 \text{ percent} = 0.85$ change of base factor.

STEP 3. $(4.33 / 11.95) \times 100 = 36.23$ percent of germ-damaged kernels.

STEP 4. $0.85 \times 36.23 = 30.79$ adjusted percentage of germ-damaged kernels.

STEP 5. $14.90 + 30.79 = 45.69$ (rounded to 45.7) percent damaged kernels.

Certification. Record the percentage of damaged kernels on the work record and certificate to the nearest tenth percent. If an applicant requests that the number of insect-damaged kernels be reported on the certificate, use the approved statements in Book IV, Chapter 3, Section 3.5.

22. HEAT-DAMAGED KERNELS

Kernels, pieces of Khorasan kernels, and other grains that are materially discolored and damaged by heat that remain in the sample after the removal of dockage and shrunken and broken kernels.

Basis of Determination. Determine heat-damaged kernels on a dockage-free and shrunken, and broken-free portion of 50 grams. Reference Image: [Heat Damage](#) (ILP: W-6.0 (Durum) and ILP: W-6.1 (Other Than Durum)).

Certification. Record the percentage of heat-damaged kernels on the work record and certificate to the nearest tenth percent.

23. FOREIGN MATERIAL

All matter other than Khorasan that remains in the sample after the removal of dockage and shrunken and broken kernels.

Basis of Determination. Determine foreign material on a dockage-free and shrunken and broken-free portion of 50 grams.

Other grains including wheat, oat groats, hull-less oats, glumes on threshed or unthreshed kernels, and all matter other than Khorasan, are considered foreign material and removed from the portion. Remove the glumes from the kernels of Khorasan and add to the foreign material.

Certification. Record the percentage of foreign material on the work record and certificate to the nearest tenth percent.

24. DEFECTS

Damaged kernels, foreign material, and shrunken and broken kernels.

Basis of Determination. Determine defects on the sum of damaged kernels, foreign material, and shrunken and broken kernels.

A percentage for defects cannot be shown when only one or two of the factors defined as defects have been determined.

Certification. Record the percentage of defects on the work record and certificate to the nearest tenth percent.

When the percentages for damaged kernels, and shrunken and broken kernels, and foreign material are added together and the total exceeds 100 percent, adjust the percentage of defects by adjusting damaged kernels (total).

25. QUESTIONS

If you have any questions concerning this directive, please contact the Policies, Procedures, and Market Analysis Branch (PPMAB), at (202) 720-0228.