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Appendices

The following documents are intended for internal use. CFIA staff can access these documents using the internal tools noted below.

- Appendix 5.1: Customizing Inspection and Grading Report (CFIA/ACIA 0989) and a Completed Example [RDIMS # 2823369]
- Appendix 5.2: Inspection Report (CFIA/ACIA 0992) Example [RDIMS # 2205517]
- Appendix 5.3: Pfund Honey Colour Grader Instructions [RDIMS # 2205569]
- Appendix 5.4: Lovibond Instructions [RDIMS # 2205406]

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5.1 Objectives

To provide inspection staff with the knowledge and skills to verify that honey marketed and traded in Canada, meets the requirements of the *Honey Regulations* (HR) for grade and colour classification as declared on the container.

5.2 Scope

These procedures apply to prepackaged and bulk honey for which grades are prescribed in the HR. This includes honey imported into Canada and honey prepared or packed by federally registered honey establishments.

The procedures are also to be used when an inspection is requested pursuant to section 38 of the HR.

5.3 References, Forms and Equipment

5.3.1 References

Acts and Regulations

- *Honey Regulations (HR)*
- *Canada Agricultural Products Act (CAPA)*
- CFIA Fees Notice, Part 7- Honey Fees

5.3.2 Forms/Reports

The following CFIA/ACIA forms and reports are required for grading and are available on the internal Forms Catalogue.

- Inspector's Report (CFIA/ACIA 0992)
- Inspection and Grading Report (CFIA/ACIA 0989) [RDIMS # 2509473]
- Receipt for Samples Taken (CFIA/ACIA 4168)

5.3.3 Equipment

- | | |
|--|--|
| • Colour Comparitor or Classifier | • Mixing Spoons |
| • Refractometer | • Scale |
| • Thermometer | • Sample Containers |
| • 60 and 80 Mesh Screens | • Glass Beakers |
| • Non scratch tissues (e.g., Kimwipes) | • White or Light Blue Paper |
| • Sampling Augers or Triers | • Heating Source (microwave, hot water bath) |
| • Sampling Spoons (12 to 14 in. long) | |

5.4 Sample Selection for Grade Verification

5.4.1 Number of Samples

Refer to Table 5.1 to determine the number of samples based on the inspection lot size and the container size.

Table 5.1: Single Sampling Plan and Acceptance Numbers for Honey Grade and Colour Classification									
Container Size	Inspection Lot Size (Number of Containers)								
Any type of container of 250g or less	5,400 or less	5,401 to 21,600	21,601 to 62,400	62,401 to 112,000	112,001 to 174,000	174,001 to 240,000	240,001 to 360,000	360,001 to 480,000	over 480,000
Any type of container over 250g but not over 1.0 kg	3,600 or less	3,601 to 14,400	14,401 to 48,000	48,001 to 96,000	96,001 to 156,000	156,001 to 228,000	228,001 to 300,000	300,001 to 420,000	over 420,000
Any type of container over 1.0 kg but not over 5.0 kg	1,800 or less	1,801 to 8,400	8,401 to 18,000	18,001 to 36,000	36,001 to 60,000	60,001 to 96,000	96,001 to 132,000	132,001 to 168,000	over 168,000
Any type of container over 5.0 kg but not over 50 kg	200 or less	201 to 800	801 to 1,600	1,601 to 3,200	3,201 to 8,000	8,001 to 16,000	16,001 to 24,000	24,001 to 32,000	over 32,000
Any type of container over 50 kg	25 or less	26 to 80	81 to 200	201 to 400	401 to 800	801 to 1,200	1,201 to 2,000	2,001 to 3,200	over 3,200
Single Sampling Plan									
Sample Size	3	6	13	21	29	38	48	60	72
Acceptance Number ¹	0	1	2	3	4	5	6	7	8

¹ If the number of samples which are non-compliant for one or more of the evaluated tasks is:
 ≤ the acceptance number prescribed for the sample size, the lot is accepted; or
 > the acceptance number prescribed for the sample size, the lot is rejected.

5.4.2 Sample Size

When sampling for grade and colour, follow the procedures in Sampling - Chapter 2 of this manual and use the table below to determine the size (amount) for each sample to be evaluated.

Table 5.2: Required Sample Sizes	
Size of Container	Sample Size
500 g or less	the whole container
larger than 500 g but less than 15 kg	250 g from each container being sampled
more than 15 kg	approx. 250 g from each container *

* In this case the site of sampling should be approximately 10 -15 cm (4 - 6 inches) from the side of the container and extended into the honey to a depth of approximately 15 cm (6 inches).

5.5 Grading Requirements

Table III of Schedule I of the *HR* sets out the three grades for honey packed in a registered establishment: Canada No. 1, Canada No. 2 and Canada No. 3. However, if domestic honey does not meet the requirements of one of these grades, then “substandard” can be applied to the label providing the honey is sound, wholesome and fit for human consumption as set out in section 7 of the Regulations.

Table I and II of Schedule I of the *HR* set out the colour classifications for prepackaged and bulk honey respectively.

A grade and colour must be declared on all imported honey. The requirements are the same as for domestic honey except that the word ‘Canada’ is replaced by “Grade”; e.g., Grade No. 1.

Several factors are assessed when determining the grade of honey. These include:

- fill/net quantity screen
- aroma/odour
- flavour
- clarity (for liquid honey only)
- texture (for creamed/granulated honey only)
- colour classification
- moisture content
- presence of particulate matter/foreign material

5.6 Customizing the Inspection and Grading Report

Sample assessment begins with recording the declared label and tombstone information onto the Inspection and Grading Report (CFIA/ACIA 0989). This is a multi-commodity form which requires customization for honey inspection and grading. All information accessed during the grade verification needs to be recorded in the appropriate columns on the inspection and grading form.

For honey, only the following headings are completed:

- code (e.g., lot number)
- declared size
- fill/net quantity screen

- flavour
- texture (for creamed/granulated honey only)
- colour (in mm)
- clarity (for liquid honey only)
- defects (particulate matter / foreign material)
- food safety
- other tests (e.g., moisture content)

For an example of a completed customized form, See Appendix 5.1.

5.7 Procedures for Grade Verification

Grade verification involves a step-by-step approach involving the following steps:

- determining container fill level and net quantity screening
- evaluating particulate matter
- determining clarity (liquid)
- evaluating aroma/odour
- evaluating flavour
- evaluating texture (creamed/granulated)
- determining colour
- determining moisture
- evaluating foreign material

The order of the evaluation steps differ slightly for liquid and creamed/granulated honey.

- For liquid honey the fill level, suspended particulate matter and clarity can be assessed first in conjunction with each other; followed by the evaluation of the aroma/odour and the other assessment criteria.
- The type of packaging used for creamed/granulated honey will determine the order of the evaluation process. For creamed/granulated honey in a clear container; first view the fill and examine for suspended particulate matter. Next open the container and evaluate the aroma/odour, examine the surface for foreign material and then separate the sample for foreign material screening, another sample for texture, flavour, colour and moisture.
- If the creamed/granulated honey is packed in an opaque container, first open the container and evaluate the aroma/odour, view the fill, examine the surface for foreign material and then carry out the other steps.

5.7.1 Determining Container Fill Level and Net Quantity Screening

The container should be a standard container size with honey filled at or near the top of the container.

The fill level of the honey is evaluated, by holding the honey upright and looking at the level of fill in the container to determine if the honey is at or near the top of the container. If the container appears not to hold the required quantity, a net weight screening can be conducted.

This involves taking the gross (e.g., product and container including the label) and tare weights (e.g., weight of the container and label) and then determining the net weight. Determine the net weight for each selected sample and refer to Table 5.1 to determine if the lot is in compliance. If

the lot is not compliant, use the Net Quantity Verification Tool to verify the declared net quantity of the entire lot.

5.7.2 Evaluating Particulate Matter (Visual Examination)

To evaluate the presence of suspended particulate matter, hold the container of honey upright against a bright light source, equivalent to at least 540 lux (200 watt) or brighter.

With the light source behind the honey, you should be able to observe if the honey contains any particulate matter. You are usually looking for black flakes that may be suspended within the honey. To view the whole container, rotate the container and look for particles.

5.7.3 Determining Clarity (Liquid)

The clarity of liquid honey can be evaluated in conjunction with 5.7.1 and 5.7.2. Clarity of liquid honey is the transparency and clearness of the honey.

Examine the honey using a bright light source, equivalent to at least 540 lux (200 watt) or brighter, behind the container to observe the presence of crystals or foreign material that may be present. This procedure is referred to as candling of the product. As you look through the honey, it should be free from air bubbles, pollen grains, crystals and other fine particulate matter. It should look bright and clear.

Only honey that is marked “liquid” is inspected for this grade factor. This colour evaluation is separate from the colour determined by colour classification (see section 5.7.7).



No. 1: “clear bright, uniform in colour and free from visible crystals”

No. 2: “colour may be dull and cloudy or turbid or slightly uneven and shows not more than slight signs of crystallization in the form of a light suspension or minor sedimentation of crystals”.

5.7.4 Evaluating Aroma/Odour

The evaluation of aroma and odour is best done when the container is first opened.

Open the container and raise it to your nose. The smell should be sweet and characteristic of honey. Different floral sources may have different aromas and odours but they are characteristic for the honey that is derived from those plants. If you find a burnt or smoky, a chemical or even a fermented smell this is not characteristic of honey and indicates an off-odour.

5.7.5 Evaluating Flavour

To evaluate the flavour of honey, take a 5 -10 gram sample (1-2 teaspoons) and place it in your mouth. The taste should be characteristic of honey which will vary depending on the floral source.

It should be free of objectionable flavours, for example burnt taste (caused by caramelizing), fermented, smoky, chemical or other off-flavours.

As a general rule the lighter the honey the milder the flavour. Clover honey is white and mild while buckwheat honey is dark and stronger flavoured. However, honey may be a blend of several flavours. Fermented flavours are considered a grade defect. The presence of any fermented flavours would cause the honey to be marked “substandard”.

5.7.6 Evaluating Texture (Creamed/Granulated)

The texture of creamed/granulated honey can be evaluated by taking and placing a spoonful of honey (approximately 5 to 10 grams or 1-2 teaspoons) in your mouth.

Creamed honey should have a smooth and fine texture, with complete uniform granulation. This means there should be no grittiness or sandy mouth feel. If the texture of the honey is medium course or gritty, you should also find that the granulation is complete and fairly uniform. However, if the texture is extremely course or gritty this would indicate that the granulation is complete but not uniform.

Only honey that is marked “creamed” or otherwise marked to indicate that the contents are granulated is inspected for this grade factor.



No. 1: “Smooth fine texture” means that the honey melts readily when placed on the tongue and does not feel gritty when rubbed against the roof of the mouth.

“Complete and uniform granulation” means that there is no visible separation of liquid from the crystals and the honey is sufficiently well set so that the honey will not pour from the container.

No. 2: “Medium course or gritty” means that some grittiness may be felt or observed, but not extremely coarse or gritty.

“Complete and fairly uniform granulation” means that there may be slight signs of separation at the surface and the set may be soft to allow the honey to move in the container but it should not be freely fluid.

5.7.7 Determining Colour

Colour is determined while the honey is in the liquid form. To liquefy granulated or creamed honey, melt a part of the sample in a suitable container using a hot water bath over low heat or in the microwave. Heating should be stopped as soon as the melting is complete as high temperatures or prolonged heating will darken the honey leading to an inaccurate colour determination.

There are a number of colour comparators which can be used to determine the colour of honey, the most common include the Pfund colour grader, Lovibond 2000 Comparator or Jack’s Scale Honey Colour Grader. Refer to Appendices 5.3, 5.4 or manufacturer manuals for instructions on using these instruments.

Schedule I of the HR sets out the colour classifications for prepackaged and bulk honey and these are presented in Tables 5.3 and 5.4, respectively. Colour is determined while the honey is in the liquid form.

Table 5.3 Prepackaged Honey*		
Class	Designation on Honey Classifier	Reading on Pfund Honey Grader
"White"	not darker than White	not more than 30 millimetres
"Golden"	darker than White but not darker than Golden	more than 30 millimetres but not more than 50 millimetres
"Amber"	darker than Golden but not darker than Amber	more than 50 millimetres but not more than 85 millimetres
"Dark"	darker than Amber	more than 85 millimetres

*Source: *Honey Regulations*

Table 5.4 Honey Packed In Bulk Containers*		
Class	Designation on Honey Classifier	Reading on Pfund Honey Grader
"Extra White"	not darker than Extra White	not more than 13 millimetres
"White"	darker than Extra White but not darker than White	more than 13 millimetres but not more than 30 millimetres
"Golden"	darker than White but not darker than Golden	more than 30 millimetres but not more than 50 millimetres
"Light Amber"	darker than Golden but not darker than Amber	more than 50 millimetres but not more than 85 millimetres
"Dark Amber"	darker than Amber but not darker than Dark	more than 85 millimetres but not more than 114 millimetres
"Dark"	darker than Dark	more than 114 millimetres

*Source: *Honey Regulations*

5.7.8 Determining the Moisture Content

The moisture content of honey or conversely the soluble solids content, is determined by measuring the refractive index of honey using a refractometer. The refractometer measures the amount of refraction (or distortion) as light passes through a honey sample. The amount of refraction shows how much solid and fluid is present. It is important to note that the refractive index of honey is different from that of a sucrose solution at the same concentration, therefore the refractometer reading needs to be converted to percent moisture using a moisture chart. Newer electronic instruments can provide a direct reading of the moisture content without having to do any further conversions. Refer to the manufacturer instructions.

The *Honey Regulations* prescribe maximum moisture content for the three grades of honey as seen in Table 5.5.

Table 5.5 Moisture Requirements		
Grade	Maximum % Moisture	
	When Marked as Pasteurized (not applicable for imported honey)	When Not Marked as Pasteurized
Canada No. 1 / Grade No. 1	18.6	17.8
Canada No. 2 / Grade No. 2	20.0	18.6
Canada No. 3 / Grade No. 3	20.0	20.0

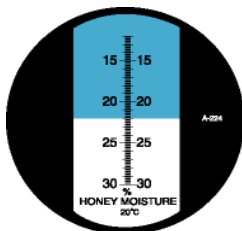
Follow these procedures to determine the moisture content of honey:

1. Make sure that your refractometer is properly calibrated. Refer to the instructions provided with your instrument.
2. Bring the sample to room temperature (20°C). If the sample is not at 20°C, make the necessary temperature corrections using the correction factors provided at the bottom of Table 5.6. If the honey is too hot, you will not have a sharp line to make a clear reading.
3. If the honey is creamed or granulated, melt a **portion** of the sample. **Do not heat the complete sample as texture is determined when honey is in the granulated state.**
4. Stir the sample well before placing it on the refractometer prism.
5. Place a small amount (e.g., a drop or two) of the sample onto the prism.
6. Wait 30 seconds before taking the reading.
7. If you are using a refractometer that does not read the % moisture directly, use the conversion information in Table 5.6 to determine the percent moisture.

5.7.8.1 Using a Refractometer

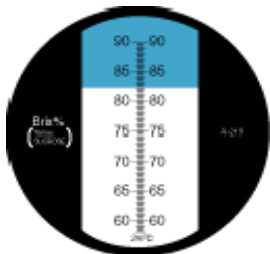
Refractometers can be equipped with a variety of scales depending upon the application as illustrated in the following examples.

A honey refractometer may allow you to read the moisture content of the honey directly from the scale:



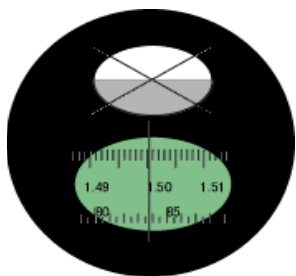
Read the moisture content at the boundary where the blue and white lines meet. In this example, the honey contains 22% moisture.

Other types of refractometers can measure the ° (degree) Brix, % (percent) Brix or soluble solids content. Note that ° (degree) Brix and % Brix have the same meaning; however ° Brix is the correct term.



In this example, the % Brix value is equal to 82 % Brix. Using the information in Table 5.6 a Brix value of 82 is equal to approximately 16.4% moisture.

An Abbe Refractometer measures both the refractive index (top scale) and the °Brix value (bottom scale). This is illustrated in the following example.



Using the conversions in Table 5.6, a refractive index of 1.5 is equal to a moisture content of 14.6%. Similarly, the °Brix scale could be used. A °Brix value of 83.97 is equal to a moisture content of 14.6%.

The moisture or conversely the soluble solids in honey, is determined by measuring the refractive index of honey using a refractometer. The refractive index of honey is different from that of a sucrose solution at the same concentration and therefore a moisture chart is required to determine the moisture of honey. Table 5.6, honey Conversion Table is an example of this type of chart.

Table 5.6 Honey Conversion Table – °Brix, Specific Gravity and % Moisture Relationships*							
% Moisture	Specific Gravity (20 °C)	°Brix at 20°C (Refractometer 0 - 90 range)	Refractive Index at 20 °C	% Moisture	Specific Gravity (20 °C)	°Brix at 20 °C (Refractometer 0 - 90 range)	Refractive Index at 20 °C
13	1.4525	85.66	1.5041	17	1.4239	81.45	1.494
13.2	1.451	85.45	1.5035	17.2	1.4225	81.25	1.4935
13.4	1.4495	85.24	1.503	17.4	1.4212	81.04	1.493
13.6	1.4481	85.03	1.5025	17.6	1.4197	80.83	1.4925
13.8	1.4466	84.82	1.502	17.8	1.4184	80.63	1.492
14	1.4453	84.61	1.5015	18	1.4171	80.42	1.4915
14.2	1.4438	84.39	1.501	18.2	1.4156	80.21	1.491
14.4	1.4428	84.18	1.5005	18.4	1.4143	80.01	1.4905
14.6	1.4409	83.97	1.5	18.6	1.4129	79.8	1.49
14.8	1.4395	83.76	1.4995	18.8	1.4115	79.59	1.4895
15	1.4381	83.55	1.499	19	1.4101	79.39	1.489
15.2	1.4367	83.34	1.4985	19.2	1.4087	79.18	1.4885
15.4	1.4352	83.13	1.498	19.4	1.4074	78.97	1.488
15.6	1.4338	82.92	1.4975	19.6	1.406	78.77	1.4876
15.8	1.4324	82.71	1.497	19.8	1.4046	78.56	1.4871
16	1.431	82.5	1.4965	20	1.4033	78.35	1.4866
16.2	1.4295	82.29	1.496	20.2	1.402	78.15	1.4862
16.4	1.4282	82.08	1.4955	20.4	1.4006	77.94	1.4858
16.6	1.4267	81.87	1.495	20.6	1.3992	77.74	1.4853
16.8	1.4254	81.66	1.4945	20.8	1.3979	77.53	1.4849

* Data from the table compiled by H.D. Chetaway. National Research Laboratories - Ottawa.
Temperature corrections are as follows: Specific Gravity = .0006 per °C or .00033 per °F; °Brix value = .09 per °C or .05 per °F; Refractive Index = .00023 per °C or .00013 per °F. If the temperature is above 20°C, add the correction; if it is below 20°C subtract the correction.

5.7.9 Foreign Material

- The presence of foreign material in honey is determined both by visual examination of the honey and by using 60 and 80 mesh screens.
- Refer to Schedule I Table III of the HR for the grade requirements as they pertain to foreign materials:

•	
•	• No. 1 must be free from any foreign material retained on the 80-mesh screen.
•	• No. 2 must be free from any foreign material retained on the 60-mesh

Follow the steps below to check for the presence of foreign material:

- Select a 25 to 50 g sample of honey, preferably from the top of the container.
- Dilute the sample with 250 to 500 ml of clean warm water in a clean beaker. The addition of the water is done to facilitate the passing of the honey through the screens. If the tap water contains particles of corrosion it may be necessary to strain the water. To avoid melting any particles of wax, the water should not be over 46°C (115°F).
- Filter the honey by gently pouring it first through the 60-mesh screen and then through the 80-mesh. These screens can be stacked one on top of the other with a collection pan.
- Hold the screen to the light and visually look for any foreign material that may have been captured.
- Rub a finger gently across the screen to assess for the presence of wax particles. Wax is light in colour and is not easily seen. Or you may invert and gently tap the screen over white or blue paper and examine the paper for the presence of particles.

5.7.10 Water Insoluble Solids

Wax is a major source of water insoluble solids. Schedule I Table III of the HR describes the allowances for water insoluble solids for Canada No. 1, Canada No. 2 and Canada No. 3 grade honey. If wax appears to be a problem, collect the samples and contact the area Honey Program officer for further instructions for submitting a sample to the lab.

5.8 Non-Satisfactory Inspections

To determine whether the lot passes or fails the inspection the acceptance number at the bottom of Table 5.1 is used. For example, if three samples are graded each sample must meet all of the requirements of the grade declared in order for the “lot” to pass. Or if six samples are required to represent the “lot”, one sample may be out of grade (one or more factors) and “lot” will still pass.

If you determine that the product does not meet the colour or grade classification as declared on the package, take product action (e.g., detained). Some suggested corrective measures taken by the company may include:

- re-labelling;
- repacking or reprocessing;
- removal from the country;
- disposal

"Sub-standard" is not a grade name. It is merely the mark that may be applied to a domestic product when it fails to meet the lowest prescribed grade, but is still fit for human consumption.

If the product is produced in another area/district, refer the issue through the Issue Management System (IMS) for follow up.

5.9 File Maintenance

After you have conducted your grade verification, provide the regulated party with a copy of the:

- Inspection and Grading Report (CFIA/ACIA 0989)
- Inspector's Report (CFIA/ACIA 0992)

Retain the following in the regulated party's file:

- Inspection and Grading Report (CFIA/ACIA 0989)
- Inspector's Report (CFIA/ACIA 0992)
- Request for Corrective Action Plan, if required
- Follow up activities

All documents should be retained as outlined in the Subject Classification Plan.