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Processed
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Branch

Extracted Honey Grading Manual

Extracted Honey
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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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PURPOSE AND SCOPE

These instructions are designed to assist in the proper interpretation and uniform application of the United States Standards for Grades of Extracted Honey. They also provide some basic information concerning the commercial production and marketing of honey.

I. KINDS AND SOURCES OF HONEY

A. Definition.

The definition of honey, as given in Dr. E. F. Phillip's "The Hive and the Honey Bee," is as follows:

"Honey is an aromatic, viscid sweet material derived from the nectar of plants through the collection by honey bees, modified by them for food into a dense liquid and finally stored by them in their combs; of acid reaction, liquid in its original condition, but usually becoming crystalline on standing, consisting chiefly of two simple sugars, dextrose and levulose, with occasionally more complex carbohydrates, with levulose usually predominant, and always containing mineral material, plant coloring materials, several enzymes, and pollen grains."

Honey may contain small amounts of sweet substance exuded from the leaves and other parts of ash, fir, vetch, cotton, and some other plants, which is included in the above definition. The definition does not include fruit juices or sugarcane sap gathered by bees, or sugar syrup fed to bees.

Considerable honeydew is gathered by bees. This is not honey, but is a sweet substance gathered from the bodies of aphids or plant lice and is found in moderate quantities in many parts of the country. In appearance and flavor, it resembles blackstrap molasses.

Many honeys contain a small admixture of honeydew. Such honey is used commercially for baking only. Pure honeydew contains 5 to 10 percent of dextrin as compared with less than 1 percent in most honeys. Analysis for dextrin content can thus be used in some cases as a test for the presence of honeydew in honey. If much honeydew is contained, it can usually be detected by the molasses-like taste.

B. Floral Sources.

Bees obtain honey and pollen from hundreds of different species of plants in the United States. Legumes, including white and sweet clover, alfalfa, and alsike clover constitute the most important group of honey plants. Honey from this group generally has a mild, desirable flavor, but granulates

I. KINDS AND SOURCES OF HONEY

B. Floral Sources. (continuation)

readily. Red clover is an important farm crop in the East and Midwest and produces an abundance of nectar. It is relatively unimportant except from second cutting red clover as a source of honey because the corolla tubes are normally so long that bees can seldom reach the nectar. Other legumes include mesquite, lima bean, locust, vetch, and cowpea.

C. Geographical Areas and Floral Sources.

Some of the more important honey floral plants in each area are discussed below.

1. Northeastern States. New York and Pennsylvania are the principal honey producing states of this area which includes the New England states. The clovers, principally white and alsike, are the most important sources of nectar. Cultivated buckwheat is an important source in portions of New York and Pennsylvania, where it produces a dark, rather strong-flavored honey and is objectionable to some people, but liked by persons who are used to it. Numerous other sources, such as goldenrod, aster, sweet clover, fruit bloom, and basswood (linden) are of lesser importance for the area as a whole, but may be important locally.

2. East Central and North Central States. These represent a continuance of the "clover belt" which extends across the northern half of the country from New England to the Rocky Mountains. Throughout the area, white and alsike clovers are the most important sources of nectar. Sweet clover is relatively more important in this area than in the Northeastern states, especially in the western portions. Raspberry (produced from the wild raspberry on cutover timber land in the northerly portions of the area) is a light colored honey of exceptionally fine flavor. Some fireweed honey, so-called because the plant frequently springs up in burnt-over forest areas, is also produced in the northern portions. Fireweed honey has a heavy body and a mild pleasant flavor. It is one of the lightest colored honeys on the market, a high percentage grading water white and is used by

I. KINDS AND SOURCES OF HONEY

C. Geographical Areas and Floral Sources. (continuation)

2. East Central and North Central States.

bottlers for blending with darker honeys to produce the shade desired. Some goldenrod honey is produced in the fall. When pure, the honey is rather light in color and has a rich flavor that many persons find desirable. It is frequently blended by the bees with honey from the wild aster to form a goldenrod-aster honey which has a strong, undesirable flavor when first taken off, but which improves in flavor as the honey ripens. Heartsease or smartweed honey, when pure, is rather light colored, but the flavor is rated by most persons as undesirable. A limited quantity of Spanish needle honey is produced in late summer and has a distinctive flavor appreciated by some persons and disliked by others. Heartsease and Spanish needle honeys are produced in the more southerly portion of the area.

3. South Atlantic States. Because of its extent, from Maryland to Georgia, this area has a great variety of climatic conditions and honey flowers. White clover is the principal floral source for honey in the northern portions of the area including Delaware, Maryland, and Virginia. Limited quantities of basswood and clover-basswood blend honeys are also produced in the white clover area. Farther south, the tupelo gum tree is an important honey source in the Carolinas and Georgia. The flavor of tupelo honey is rated as good and the honey is characterized by the slowness with which it granulates. Tulip poplar honey, a rather dark honey of fair flavor, is produced in important quantities throughout the area from Georgia north. Among the better flavored honeys of the area are sourwood of the southern Appalachians with gallberry and wild vetch important in the Carolinas and Georgia. The ti-ti is a source of honey in the swamp areas from South Carolina west to Louisiana. The honey is of only fair quality.

I. KINDS AND SOURCES OF HONEY

C. Geographical Areas and Floral Sources. (continuation)

4. South Central States. In this area, Kentucky and Tennessee are in the clover belt. White clover is the leading floral source in both states. These states also produce moderate quantities of basswood, black locust, spurwood, tulip poplar, goldenrod, and goldenrod-aster honey. Considerable sweet clover and some white clover honey is produced in the Gulf states. Considerable tupelo honey is also produced in these states with lesser quantities of tulip poplar, sourwood, and holly honey.

5. Florida. The same honey floral plants occur in the northern part of Florida as in Georgia and the Gulf states. Considerable tupelo, ti-ti, partridge pea, chinquapin, and gallberry honey is produced in this portion. Orange honey is important in the central part of the state, while in the southern part, palmetto, black mangrove and manchineel are important honey plants.

6. Texas. With respect to climate and flora, eastern Texas resembles the other Gulf states while the western portion of the state more closely resembles the semi-arid conditions of New Mexico and Arizona. Cotton probably leads other plants in Texas as a source of honey. Considerable alfalfa honey is produced in the northern and western parts of the state. Mesquite, a desert shrub of the legume family, is important in the western and southern portions of the state. It produces a table honey of desirable flavor. Other desert shrubs and trees that produce important quantities of desirable flavored honeys include the catsclaw and huajilla. A considerable quantity of horsemint honey is produced in southern and central Texas. This honey has a strong undesirable flavor for table use. When horsemint honey is blended together in considerable quantity with other honeys, it renders them unsuitable for table use. This blending may be brought about by the bees when these floral sources are available at the same time.

I. KINDS AND SOURCES OF HONEY

C. Geographical Areas and Floral Sources (continuation)

7. Intermountain Areas. This area includes inland states extending from Arizona and New Mexico, north to the Canadian border. Idaho, Arizona, and Montana are the leading producing states of the area. In this area, alfalfa, sweet clover, and blends of the two make up nearly all of the honey produced in these states (other than Arizona). Alfalfa honey in this area is mostly light in color, whereas, at lower altitudes, as in California, it may seldom grade higher for color than extra light amber. The sweet clover-alfalfa blends have a heavy body and a mild flavor. Sweet clover is grown extensively in some parts of the area along roadsides, partly to provide bee pasturage but largely to keep down white top and other poisonous weeds which sometimes cause heavy casualties among sheep. Considerable quantities of section comb honey were formerly produced in the area and some are still produced principally in Colorado. Alfalfa, cotton, and mesquite floral plants provide the bulk of the honey produced in Arizona.

8. Pacific Northwest. This area consists of the states of Washington and Oregon. A variety of honey floral plants are found in this area, including vine maple, sweet and white clover, alfalfa, fireweed, vetch, mint, and fruit bloom. Fireweed is less important than formerly believed because cut-over forest land is no longer as abundant.

9. California. California produces more honey than any other state and much of it consists of the finer honeys produced only in limited quantities elsewhere. Among the most important is orange honey produced in the southern part of the state and in the foothill section on the east side of the San Joaquin Valley. This is one of the best flavored honeys and the greater portion is white or better in color. Sage honey, when pure, is rated among the finest in color, body, and flavor. The black and purple sages possess the special quality of not crystallizing for a long period or not at all. The spring blooming species of sage follows and overlaps the orange bloom and sage produces the finest and lightest colored honey. The later bloom produces a honey in which there is usually a large admixture of wild buckwheat. The latter is a rather dark honey, but not

I. KINDS AND SOURCES OF HONEY

C. Geographical Areas and Floral Sources. (continuation)

9. California.

strong-flavored and the sage-buckwheat blend ranks among the better honeys. A large quantity of alfalfa honey is produced in the Imperial and San Joaquin Valleys. Unlike alfalfa honey produced at the higher elevations of the Intermountain area, sage-buckwheat tends to be rather dark in color, seldom grading lighter than extra light amber. In the southern portion of the San Joaquin Valley, considerable cotton-alfalfa blend and a large amount of almost pure cotton honey is produced. Star thistle honey, a heavy bodied, light colored honey of desirable flavor, is produced in the northern part of California, principally in the Sacramento Valley. This honey has a greenish tinge which disappears after exposure to light. This phenomenon may cause the honey, upon delivery, to differ in appearance from the sample which it represented earlier when graded.

Limited quantities of other honeys are also produced in California. Lima bean honey, a light colored, mild flavored honey, is produced in moderate quantities in some years in Ventura County. Some mesquite honey is produced in the southern part of the state. Almond, peach, prune, and other fruit bloom honey is produced in various deciduous tree fruit areas of the state. Fruit-bloom honey is usually dark in color and strong-flavored. The flow comes early in the Spring and is used by the bees in building up their colonies. It seldom appears on the market.

Lesser quantities of undesirable flavored honeys are produced during some seasons. These undesirable flavored honeys are produced from tamarisk, eucalyptus, mustard, tarweed, and rabbit-brush. Some years these honeys are produced in sufficient volume to appear on the market.

10. Hawaii and Puerto Rico. The algaroba tree, similar to mesquite, is the principal source of honey in Hawaii. Honey from this source is like honey produced from other legumes. It is light in color when pure, has good flavor, and granulates readily. The java plum is another important nectar source. Some honeydew type honey is also produced in the islands by bees. The bees also gather and store a certain amount of sugar cane sap from the cane mills.

I. KINDS AND SOURCES OF HONEY

C. Geographical Areas and Floral Sources. (continuation)

10. Hawaii and Puerto Rico.

Most honey produced in Puerto Rico is dark and strong and not suitable for table use. Campanilla, or bell flower, and logwood, produce light colored, well-flavored honeys when pure. These honeys, particularly the former, are usually produced as an admixture including a darker and stronger flavored honey.

D. Flavor Classification of Honey.

Honey is sometimes classified according to flavor into groups, such as those shown below. There are hundreds of minor floral sources of honey in each group in addition to those named. Only the principal kinds are named below.

1. Group No. 1 - Honeys having a desirable flavor.

Legumes (Leguminosae)
White Clover (Trifolium repens)
Sweet Clover (Melilotus spp.)
Alsike Clover (Trifolium hybridum)
Alfalfa (Medicago sativa)
Mesquite (Prosopis spp.)
Algaroba (Prosopis juliflora)
Lima bean (Phaseolus limensis)
Black locust (Robinia pseudoacacia)
Honey locust (Gleditsia triacanthus)
Vetch (Vicia spp.)
Catsclaw (Acacia gregii)
Huajilla (Acacia spp.)
Orange (Citrus sinensis)
Sage (Silvia spp.)
Raspberry (Rubus spp.)
Basswood (Linden) (Tilia spp.)
Fireweed (Epilobium angustifolium)
Star Thistle (Centaurea solstitialis)
Cotton (Gossypium spp.)
Wild buckwheat (Eriogonum spp.)
Gallberry (Ilex glabra)
Sourwood (Oxydendrum arboreum)
Milkweed (Asclepias spp.)
Tupelo (Nyssa spp.)
Lippis (Lippia spp.)
Brazil Bush
Wild Cherry (Prunus spp.)

I. KINDS AND SOURCES OF HONEY

D. Flavor Classification of Honey. (continuation)

2. Group No. 2 - Honeys having a distinctive flavor. The following kinds of honey tend to be strong flavored. Generally, each kind is liked locally, where produced, but disliked by many persons from other areas.

Aster (Aster spp.)
Cultivated Buckwheat (Fagopyrum Saggittatum)
Heartsease, smartweed (Polygonum spp.)
Horsemint (Monarda spp.)
Tulip poplar (Liriodendron tulipifera)
Spanish Needle (Bidens bipinnate)
Mangrove (Rhisophora mangle)
Manzanita (Arctostaphylos spp.)
Peppermint (Mentha piperita)
Dwarf Palmetto (Sabal minor)
Goldenrod (Solidago spp.)
Dandelion (Taraxacum officinalis)
Ti-ti (Cliftonia spp., Cyrilla spp.)
Fruit Bloom (Prunus spp.), (Amygdalus spp.), (Pyrus spp.)
Rattan Vine (Berchemia scandens)
Thyme (Thymus spp.)
Toyon, Christmas berry, California Holly (Photinia arbutifolia)

I. KINDS AND SOURCES OF HONEY

D. Flavor Classification of Honey. (continuation)

3. Group No. 3 - Honeys least desirable or even unpalatable.

Avocado (Persea americana)
Bitterweed (Helenium tenuifolium)
Boneset (Bupatorium perfoliatum)
Broomweed (Gutierrezia dracunculoides)
Cantaloupe (Cucumis melo)
Carrot (Daucus carota)
Chinquapin (Castanea pumila)
Cactus (Opuntiaceae)
Cucumber (Cucumis sativus)
Creosote Bush (Larrea spp.)
Desert Hollyhock
Dog Fennel, mayweed (Anthemis cotula)
Eucalyptus (Eucalyptus spp.)
Gumweed (Grindelia spp.)
Hoarhound (Marrubium vulgare)
Mescal (Lophophora spp.)
Mountain Misery (Chamaebatia foliolosa)
Mustard (Brassica spp.)
Onion (Allium spp.)
Rabbit Brush (Chrysothanmus spp.)
Snowbush, buckbrush teaweed, wild lilac (Ceanothus spp.)
Sore Eye Poppy
Spikeweed (Centromadia pungens)
Tamarisk, Athel, Salt cedar (Tamarix spp.)
Tarweed (Hemizonia or Parsonia spp.)

II. PRODUCTION OF UNPROCESSED HONEY

A. The Making of Honey.

1. Structure of the Hive.

Swarms of bees which have "gone wild" may take up their abode in a hollow tree, building, or other shelter. Here they build combs in which there is not a sharp demarcation between cells used for storage of honey, pollen, or for brood rearing. In the production of honey for sale or for home use, it is essential that brood cells and honey cells be segregated in the hive.

In a modern hive, brood is restricted to the lower portion of the hive, called the "brood chamber." Honey deposited in the upper stories, called "supers," can be added to in any number required. These supers are sometimes separated from the brood chamber by a "queen excluder." This is a metal or wood and metal screen with openings large enough to permit access to the supers by worker bees carrying honey, but small enough to exclude the queen, whose egg laying activities are thus restricted to the brood chamber. A more populous colony is obtained by means of a "two-story hive" consisting of two brood chambers below the supers.

Rectangular wooden frames are suspended in the brood chamber and supers. A sheet of comb foundation is built into each frame. This foundation is a thin sheet of beeswax stamped in the hexagonal pattern of the honey or worker bee cells. This foundation encourages the bees to build straight combs suitable for easy extraction, provides some of the beeswax needed for comb construction, and permits bees to build comb rapidly over the entire surface during a heavy honey flow instead of building from the side or corners of the foundation only. The width of the frames determines the thickness of the comb. Bees will allow room for passageway between the combs.

Where it is desired to produce section comb honey, square frames of white wood, preferably basswood (linden) with comb foundation of a size to hold a little more than 12 ounces of honey, are placed in the supers. These are wider than the rectangular frames used for honey to be extracted, resulting in thicker combs than those built in the full width super.

II. PRODUCTION OF UNPROCESSED HONEY

A. The Making of Honey. (continuation)

2. Gathering and Storing in the Comb.

Nectar gathered by worker bees may contain 70 percent or more of moisture. This is converted by evaporation into finished honey which usually contains 20 percent or less moisture.

The worker bee gathers nectar from the flower nectaries with her tongue and swallows it into a special honey sac. From this sac it is regurgitated directly into the cells of the comb. Moisture is removed by evaporation, which is speeded up by action of the bees keeping a current of air moving over the surface of the uncapped cells by rapid vibration of their wings. This removal of moisture is referred to by beekeepers as "ripening." The cells are then capped over with wax. In prolonged damp weather, honey may not become sufficiently ripened before capping and may be thin bodied making the honey more liable to ferment.

Bees also gather pollen, which serves as a high-protein food especially useful in rearing the young brood. Pollen grains become mixed with the honey and are the principal cause of cloudy honey. Many flowers, such as most deciduous tree fruits, produce abundant pollen but comparatively little nectar. While other flowers, such as the navel orange, produce nectar, but no pollen.

B. Migratory Colonies.

Some beekeepers, after the flow from one major nectar source is completed, load their colonies on trucks or cars and ship them to another location to take advantage of another nectar flow. While the production per colony is increased by this means, the beekeeper can substantially maintain the same overall production by keeping a slightly larger total number of colonies permanently at the two locations. The cost of maintaining the extra colonies must be balanced against the cost of transporting colonies from one location to another.

The seasonal changing of location of hives is less common than formerly practiced, but is still heavily practiced in some areas. Most southern California commercial beekeepers, for example, after the end of the orange blossoming period, move their colonies to the foothills for the late sage and wild buckwheat flow.

II. PRODUCTION OF UNPROCESSED HONEY

C. Use of Bees in Pollination.

Numerous important crops, including deciduous tree fruits, alfalfa, clover seed, and vegetable seeds, are completely dependent for a crop based on insect pollination. Many insects, other than bees, serve as pollinators. This function has generally been regarded in the past as automatic, requiring no special effort on the part of the grower.

Various factors, however, have made it necessary for growers to give increased attention to the subject of pollination if yields of the crops are to be kept at profitable levels. The cleaning out of fence rows, in many cases, has removed nesting places for native pollinating insects. New insecticides frequently destroy harmful and useful insects alike. This represents one of the most serious problems which beekeepers have when using colonies for pollination purposes. In some areas, large acreages are planted to a single crop allowing the bloom to exceed the capacity of other indigenous insects to pollinate them properly. For some crops in certain areas, the principal function of bee colonies is pollination with the production of honey a secondary consideration.

The pollination of some crops is becoming a matter of great concern to growers of insect-pollinated plants. With the competition of other sweets tending to depress the price of honey, both growers of crops and beekeepers are giving more consideration to mutual arrangements, whereby, the pollinating function and honey production of bees may be made more profitable to both parties.

III. EXTRACTION AND PACKAGING OF UNPROCESSED HONEY

The usual manner to remove honey from the comb is by uncapping the cells and removing by gravity or centrifugal force. However, honey can be extracted by crushing the comb, heating, and straining through a cheesecloth or wire grid. The remaining comb and honey is then reheated sufficiently to melt the comb. This is collected on top as beeswax and removed later when cold. Honey strained such that pollen grains are not removed is considered strained style. Clarity is not a factor for this style. On the other hand, when honey is more finely filtered, such that most pollen grains are removed, the style is considered filtered. The factor of clarity is examined for this style.

NOTE

THE EXTENT OF FILTRATION WILL DETERMINE IF THE HONEY IS "STRAINED" OR "FILTERED" STYLE. PROCESSORS SHOULD DESIGNATE STYLE AT THE TIME OF SAMPLING THE PRODUCT.

For extracting honey, a special house or shed securely screened against flies and bees is necessary. The first step in extracting the honey is slicing off the cell cappings on both sides of the comb with an electrically or steam heated "uncapping" knife.

Honey should not be extracted until well ripened. An indication of well ripened honey is when most of the cells have been capped. Poorly ripened honey, with its high moisture content, is prone to fermentation. Large quantities of honey, with moisture content from 18.6 to 20 percent, are regularly used by packers to blend with honey having a moisture content less than 18.6 percent. This is done to provide a resulting pack of approximately 18.3 percent moisture content.

The centrifugal extractor was invented in 1865 and is now universally used. The combs, after uncapping, are placed in the extractor and spun by hand or electric motor until most of the honey has been removed by centrifugal force. Two types of centrifugal extractors are in common use today: (1) the radial type, which extracts both sides of the comb at the same time; and (2) the reversible frame extractor, which extracts one side at a time. Most large commercial honey producers now use the radial type extractor. After extraction, the honey is filtered or strained through a fine metal screen to remove bits of comb, pollen, if desired, and other particles.

III. EXTRACTION AND PACKAGING OF UNPROCESSED HONEY (continuation)

After extraction, the frames containing the empty combs are stored in honey houses until needed for the next honey crop or returned to the hives to be re-filled immediately with honey by the bees. This necessitates the secretion of less wax by the bees to build new comb, a process that requires the consumption of large quantities of honey by the bees. The replacement of frames with empty comb in the hives saves the time that would be required to build new comb. This is an important factor during a heavy honey flow.

IV. PROCESSING OF EXTRACTED HONEY

A. Heating.

When honey is crystallized in the storage container, heating facilities usually consisting of a hot water bath are necessary. An improvement on this method is a hot room where containers are placed with caps removed and opening faced downward so that the honey will flow out and into a tank as soon as it becomes liquid. The temperature of the hot room may be 180 to 200 degrees F. The temperature of the honey as it leaves the hot room for storage in non-heated storage tanks is around 100 to 110 degrees F. Too prolonged heating and resultant darkening and injury to the flavor of the honey are avoided by this means. Honey exposed to high temperatures should be under continuous agitation, preferably provided with a beneath-surface agitator to prevent caramelization. An additional heating to 125 to 130 degrees F. is performed by some packers in order to facilitate straining.

A third step consists of maintaining the honey at a temperature of 140 degrees F. for 30 minutes to destroy fermentation producing yeasts. This also delays granulation. Flash heating to 160 degrees F. for a very short time in special equipment followed by quick cooling is sometimes practiced instead.

B. Straining.

Many bottlers strain the heated honey through a standard silk or nylon cloth. Two degrees of fineness of cloth are usually used for this purpose. "No. 000 standard bolting cloth" is made with 23 meshes to the inch and has an average opening of .0406 inch. "No. 8 standard bolting cloth" has 86 meshes to the inch and an average opening of .0080 inch. Wire cloth has somewhat less straining effectiveness than silk cloth having the same size openings because particles slip through the meshes of wire cloth somewhat more readily.

IV. PROCESSING OF EXTRACTED HONEY

B. Straining. (continuation)

1. Standard Wire Cloth Sieves.

The National Bureau of Standards has developed standard wire cloth sieves, designated by number or by the average size of the opening in microns (a micron is one-thousandth of a millimeter). The terms "18-mesh," "50-mesh," etc. should not be used since they convey no information as to the size of the openings. Also, the standard sieve number does not correspond exactly to the number of meshes per inch. The U.S. No. 18 standard wire cloth sieve corresponds approximately in straining effectiveness to standard silk cloth having 23 meshes to the inch. U.S. No. 80 sieve corresponds approximately to silk cloth with 86 meshes to the inch.

TABLE I
SPECIFICATIONS FOR SIEVES

Sieve No.	Meshes per lineal inch	Sieve Opening		Permissible Variation-Percent		Wire Diameter	
		Millimeter	inch	Average Opening	Maximum Opening	Millimeter	Inches
18	17.15	1.00	.0394	± 5	± 15	.43 to .62	.0169 to .0244
50	52.36	.297	.0117	± 5	± 25	.170 to .253	.0067 to .0100
80	85.47	.177	.0070	± 6	± 40	.114 to .154	.0045 to .0061

C. Filtering.

Even after straining through a U.S. No. 80 sieve or equivalent, honey may still show cloudiness due to the presence of pollen grains. For perfect clarification, many bottlers filter honey before packing. The most prevalent method involves the addition of diatomaceous earth (usually at the rate of 1/2 of 1 percent) to the honey. The honey is heated to 140 degrees F. and passed through filter paper or canvas. The first honey through the filter is passed through again until a filter cake of diatomaceous earth is built up which effectively removes all pollen grains.

IV. PROCESSING OF EXTRACTED HONEY

D. Pressure Straining.

Under the pressure straining method used by a few bottlers, the honey is forced under pressure through an extremely fine mesh cloth of stainless steel wire. Filtering, as mentioned earlier, helps to prevent granulation, but is believed by some persons to injure the flavor. Pressure straining may be used altrnatively to help preserve the characteristic flavor of honey.

E. Blending.

For packing in glass, a honey of uniform color and appearance is desired. To attain this, the larger bottlers use lighter-colored honeys to blend with some of the darker honeys. Blending is done in a tank from which the honey may be hand filled directly into retail containers or run into automatic fillers. Tall or thin glass containers serve to lighten the apparent color of honey.

F. Filling.

Filling may be done by drawing the honey by hand from the tank into individual retail containers. This is the method used in small establishments. It is also generally used for filling of small plastic pails. In the larger bottling establishments, especially for small size containers, an automatic filler may be used. In conjunction with the filler, capping machinery for application of screw or friction caps or other type of closure may be used.

G. Crystallized Honey Spread.

Creamed honey, or honey spread, consisting of crystallized honey has a smooth consistency because of its extremely fine crystals. This type of honey has grown in popularity in recent years. It is ordinarily sold in retail stores in round cardboard or plastic containers holding one pound. For making this product, a type of honey that crystallizes readily, such as clover honey, is used. Such honey is likely to be crystallized in the can and must be heated to liquefy it. It is then strained and "seeded" by adding variable quantities of crystallized honey depending on the season, type of honey, and percent of moisture. Usually the "seeding" requires 5 to 10 percent of crystallized honey of the degree of fineness of crystals desired. The honey is then poured into retail cartons and stored in a cool room for several days to "set up" or crystallize.

V. INSPECTION PROCEDURES

A. Sampling.

1. Sampling Equipment.

For sampling honey in bulk containers (5 gallons or larger) the following equipment is required:

(a) A box opener for opening shipping cases.

(b) Wrench for opening drums and 5 gallon cans.

(c) A honey sampler "thief" or "trier."

(d) A supply of glass jars, with screw tops, holding approximately 16 ounces.

(e) Pad of sampling certificates.

(f) Towels.

2. Procedure.

(a) Sample Rates. Unless otherwise instructed, the rates specified in the Regulations (File Code 109-A-1) should be observed in sampling honey. Generally, there are two types of situations encountered in sampling this product: One, in which the honey has been completely processed and packed in retail jars or small pails (5 pounds) for direct sale; the other, in which the honey requires further processing to yield a merchantable product. In this latter instance, the honey is stored in bulk containers (5 gallon can or 55 gallon drums) and subsequently blended, strained, heated, and filled into suitable containers for retail trade.

NOTE

TO OBTAIN THE SAMPLE SIZE FROM THE REGULATIONS, IT MAY BE NECESSARY TO CONVERT GALLONS OF HONEY TO POUNDS. FOR THE PURPOSE OF SAMPLING, ONE GALLON OF HONEY WEIGHS APPROXIMATELY 12 POUNDS. WHEN SAMPLING, DRAW A SUFFICIENT AMOUNT OF PRODUCT FOR EACH SAMPLE UNIT REQUIRED TO ASSURE THE RECOMMENDED SAMPLE UNIT SIZES FROM THE GRADE STANDARDS ARE MET.

V. INSPECTION PROCEDURES

A. Sampling. (continuation)

2. Procedure.

(b) Sampling Liquid Honey. A satisfactory trier for liquid or partially crystallized honey is a one inch diameter stainless steel tube with a tight fitting plunger. A piece of plastic or metal dowling 3/4 inch in diameter with a 7/8 inch rubber stopper attached to the end with a flat head screw makes a satisfactory plunger. The tube should be long enough to reach the bottom of the container to be sampled and the plunger should be about 6 inches longer than the tube.

When sampling bulk containers of honey, care should be taken to obtain a representative sample from each of the containers opened for inspection. The sample trier should be inserted through the opening of the container and a core obtained from a diagonal probe to the bottom of the container on the opposite side.

When drawing a sample, the tube is inserted into the bulk container with the plunger positioned flush with the bottom end of the tube. As the tube is drawn out of the container, the plunger is also drawn up the tube. The sample is then put into the sample container.

(c) Sampling Crystallized Honey. A satisfactory sampler for crystallized honey is an instrument similar to a butter trier. It is a spoon constructed by cutting in half longitudinally an even cylindrical stainless steel tube with approximately 1-1/4 inch diameter at one end and approximately 1 inch on the other end. The top portion has a half circle cross section of approximately 1-1/4 inch diameter with a cross bar "T" handle. The tip end has a half circle cross section of approximately 1 inch diameter and has a slightly beveled edge. The leading longitudinal edge and tip are sharpened.

V. INSPECTION PROCEDURES

A. Sampling. (continuation)

2. Procedure.

For sampling containers larger than 60 pounds or 5 gallon cans, it will be necessary to obtain a similar instrument long enough to reach the bottom of the container being sampled.

The trier is pushed directly to the bottom of the container without rotating. When reaching the bottom, the trier is rotated at least once and then removed from the container with the tapered core sample unit. When a clear layer of liquid honey, free of crystals, forms above a solidly crystallized portion, it is recommended to take a sample separately of the liquid portion as well as the crystallized portion and then combine the two portions.

(d) Condition of container should be described on the certificate of sampling. Rust, dirt, soiling, leaking, or any other defect serious enough to detract from the appearance of the lot should be described. If the caps or bungs are tight and the ends of cans on drums are noticeably bulged, there is a possibility that the honey is fermented.

(e) Checking for Fermentation. Immediately upon removing the cap, lid, or bung plug, the sampler should note whether any odor of fermentation is present. This is more readily detectable when the container is first opened. If fermentation is unmistakably present and the surface of the honey has a bubbly or foamy appearance, appropriate notation should be made on the certificate of sampling. Fermenting honey is frequently found to contain excessive moisture. It sometimes results from crystallization, which reduces the soluble solids content of the remaining liquid portion.

V. INSPECTION PROCEDURES

A. Sampling. (continuation)

2. Procedure.

(f) The Style of Honey. An effort should be made at the time of sampling to determine the style of honey the applicant is submitting for grade analysis. Record the style, as offered, on the certificate of sampling. This is especially important since the two styles of product are not graded with the same quality factors.

(g) Determination of Floral Source or Sources. The floral source of honey is usually declared by the applicant. Every effort should be made at the time of sampling to determine if the floral source information is available. This is a financially important part of the quality analysis for honey.

Great care should be taken in recording all information regarding the floral source on the certificate of sampling. If no information is available about the floral source at the time of sampling, record the floral source as "unknown" on the certificate of sampling.

V. INSPECTION PROCEDURES

A. Sampling. (continuation)

2. Procedure.

(h) Verification of Lot Size. In commercial sampling or when sampling lots for export or diversion, it will ordinarily be sufficient to quote the statement of net weight and other label information from the containers on the certificate of sampling. In such cases the number of containers, as shown on the certificate of sampling, should be accompanied by an appropriate qualifying phrase, such as "packer's count," "warehouse manager's count," or "applicant's count." Where the lot is small or so stacked that the sampler can certify the number of containers on his own responsibility, the qualifying phrase may be omitted.

(i) Description of Packaging and Packing. When product is packed in shipping containers, it should be described with any significant markings on the certificate of sampling. Example: "Packed with two cans in nailed wooden shipping case with partition;" "Packed with one can per new fiber carton, stenciled....;" "Packed with 24 jars in corrugated fiber case with corrugated fiber partitions; or corrugated fiber linings top, bottom and sides. Cases stenciled....".

B. Grading.

1. Grading Equipment.

The following list represents equipment necessary for grading extracted honey. A single examination, however, may not require the use of all the following items:

(a) Scale.

(b) Water bath, for liquefying crystallized honey.

(c) Refractometer.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

1. Grading Equipment.

(d) USDA approved color comparator with extra comparator bottles.

(e) Distilled water.

(f) Beakers, 250 ml.

(g) Thermometer.

(h) Grading trays, flat white.

(i) Microwave oven (optional).

(j) Petri dishes, large size (optional).

2. List of supplies, other than grading equipment.

(a) U.S. Standards for Grades of Extracted Honey.

(b) Application for Inspection and any other papers related to the subject inspection, such as contract instructions.

(c) Score sheets.

3. The score sheet.

(a) Size and kind of container. The containers should be described in essential detail.

(b) Code Marks and Labels. Code marks or numbers, if any, should be shown legibly on the score sheet. If the containers bear commercial labels, all significant statements should be quoted or the label may be attached to the score sheet.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The score sheet.

(c) Net Weight. Net weight of retail size containers should be determined and recorded. Do not use the weight of a single glass container as the tare. Glass containers frequently vary significantly in weight. Take the average weight of five or more. If a container appears to be below the declared net weight, it should be emptied, washed, dried and weighed to make sure that the apparent short weight is not due to below-average tare. If the honey is packed in bulk containers, net weights are not taken unless specifically requested by the applicant, and then, only if suitable facilities and accurate scales are available. Record the net weights of all the sample units on the score sheet.

(d) Type and Preparation of Crystallized Honey. Whether liquid, crystallized, or partially crystallized, the type of honey should be shown. Crystallized or partially crystallized honey must be liquefied to complete the remaining steps in the inspection. This should be done by placing the sample containers in a hot water bath until the contents become liquid. The honey should not be heated above 130 degrees F., and should not remain in the bath longer than necessary to liquefy it.

A microwave oven may be used as an alternative method of preparing the sample for grading. The sample unit container, with the cover removed, is placed in the microwave oven. The oven is set at 45 seconds and turned on. Check the sample units to see if they are completely liquefied and ready for grading. If the samples are not completely liquefied, repeat the above process taking precaution that the honey is not heated above 130 degrees F. Do not heat the samples so that there is bubbling at the surface since this indicates moisture is being driven off and affecting an accurate soluble solids reading. Record the type of honey on the score sheet.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The score sheet.

(e) Style of Honey. Determine and record the style of honey on the score sheet. Verify the style from the certificate of sampling.

(f) Color of Honey. The color of honey is not a factor of grade, but is to be determined and shown on the certificate. Color is expressed by use of the terms water white, extra white, white, extra light amber, light amber, amber, and dark amber. The terms, long in use by industry, have been given precise meaning and are determined with the use of any USDA approved device designed for determining the color designation of honey.

The Pfund color grader is not an official device for determining the appropriate color designation when applying the United States Standards. However, if the applicant requests certification in terms of the Pfund scale (for example German importers may include a Pfund reading as a part of the sales contract), it is permissible to show both the color designation as determined by the approved USDA Honey Color Comparator and the Pfund reading in terms of millimeters. However, Pfund instruments may be erratic, out of adjustment and inaccurate, so be sure that the instrument used is properly calibrated and in good operating condition.

(1) Several color comparators have been approved by the Branch for use in the determination of color. One such device, furnished by a licensed supplier, consists of two metal holders divided into five compartments each of the correct size to hold a square glass bottle having internal dimensions of 1.24 x 1.24 inches (31.5 mm x 31.5 mm) and outside base dimensions of 1-7/16 x 1-7/16 inches. Each compartment has a viewing window on each side.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The score sheet.

(f) Color of Honey.

(1) Several color comparators.

The middle and end compartments are fitted with the various shades of amber colored glasses corresponding to the darker limits for six of the color designations named above (except dark amber).

An alternative USDA approved rotating wheel type color comparator may also be used for the determination of color designation of honey. The device consists of a plastic retainer for a specially designed wheel that can be rotated for viewing in front of and beside comparison sample bottles. The specially designed wheel has amber colored glass discs mounted in it to correspond with the darker limits for six of the color designations named above (except dark amber). By rotating the wheel with the glass color discs and viewing through a selected disc, a comparison can be made with honey placed in the adjacent sample bottle. Distilled water or a cloudy suspension solution can be placed in the bottle behind the color disc when viewing cloudy honey samples.

(2) To determine the color, fill one of the empty bottles accompanying the comparator from the sample unit to be graded. Place it in an empty compartment between the colors it most nearly approximates (for disc comparator, place honey sample adjacent to wheel and rotate wheel to position between discs that the honey color most nearly approximates). If the honey is practically clear, a bottle of distilled water should be placed in the compartments behind the permanent color standards. If the honey is appreciably

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The score sheet.

(f) Color of Honey.

(2) To determine the color.

cloudy, use the bottles with cloudy suspension No. 1, No. 2, No. 3, whichever most matches the degree of cloudiness of the sample unit. Bottles containing the cloudy suspensions should be thoroughly shaken before using. The sample unit will belong in the sample color classification as the darker of the two adjacent colors, each of which represents the lower limit of the classification. Some honeys have a greenish tinge which makes color comparison difficult. Refer to Table II as an aid in the determination of the correct color designation.

Determine the color designation for each sample unit and record in the appropriate location on the score sheet.

(3) Preparation of Cloudy Suspensions. This procedure is for the preparation of 1 liter (1000 mL) each of cloudy suspension Nos. 1, 2, and 3.

Measure 1.5 liters (1,500 mL) of warm water (about 140 degrees F.). Add 1.5 grams sorbic acid and mix with a stirrer until dissolved.

Gradually add 1.5 grams of carboxymethylcellulose (Hercules Cellulose gum, Type 70, high molecular weight) to the warm solution. It may take several hours to dissolve.

Divide the stock solution into three equal 500 mL portions.

Add the following amounts of diatomaceous earth (Johns Manville HyfloSuper-Cel or equivalent) for each suspension.

V. INSPECTION PROCEDURES

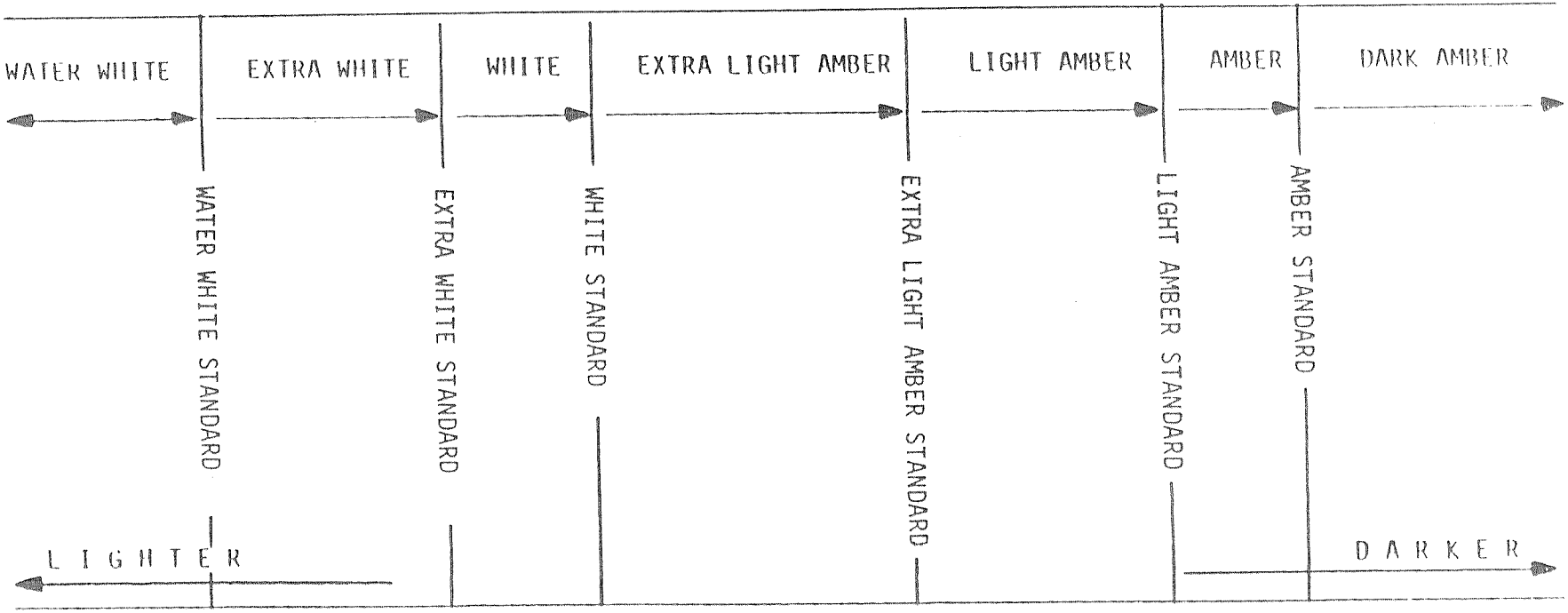
B. Grading (continuation)

(3) Score Sheet

(f) Color

TABLE II

C O L O R D E S I G N A T I O N S



The sample unit is arranged between adjacent colors of the USDA color standards.

The color designation is determined as indicated by the arrow.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The score sheet.

(f) Color of Honey.

(3) Preparation of Cloudy Suspension.

Suspension No. 1 - 100 mg
Suspension No. 2 - 200 mg
Suspension No. 3 - 400 mg

Add 500 mL of glycerine to each suspension. This will result in a final volume of 1 liter for each cloudy suspension. Transfer the suspensions to the same square glass bottles used for color determination and label them clearly.

The glycerine serves to prevent freezing; it also helps to slow the rate of settling out of the diatomaceous earth. The carboxymethylcellulose serves to raise the specific gravity and to prevent settling, while the sorbic acid acts as a preservative.

An acceptable cloudy suspension can be prepared by the use of distilled water and diatomaceous earth alone. The bottles containing the preparation should be thoroughly shaken before use and allowed to stand until all the air bubbles have been eliminated.

(g) Color Designation for a Lot of Honey. A lot of honey as a whole (if officially sampled) will be considered as meeting the requirements of a single color designation if:

(1) The number of sample units which fall in a darker designation does not exceed the applicable acceptance number in the sampling plans contained in Table III below; and

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The score sheet.

(g) Color Designation for a Lot of Honey.

(2) No sample unit falls more than one color designation below that represented by the prevailing number of sample units.

TABLE III

Sample size . . .	3	6	13	21	29
Acceptance No . .	0	1	2	3	4

For example, if, out of 13 sample units, 11 were classed as white and two as extra light amber, the color of the lot would be certified as white.

If, however, 11 sample units are classed as white, one as extra light amber and one as light amber, the lot as a whole could not be certified as extra light amber, and would ordinarily not be certified as belonging to any single color classification. The certificate would show, however, the number of sample units of each color.

(h) Floral source or sources. Floral source or sources of any lot of honey will ordinarily be certified only with an appropriate qualifying statement, as "declared by producer," "packer states," etc. An inspector should endeavor to become familiar with the characteristic flavors of the various honeys produced in his area. If, after extensive experience in such tasting, he is certain of his identification of the floral source of a given sample of honey, it will be satisfactory for him to certify the floral source without qualification. If the floral source appears different from that stated by the applicant and there is a controversy, forward a duplicate sample to the Regional and Washington offices for an opinion. Record the floral source, if known, on the score sheet. Otherwise, record as unknown.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The score sheet.

(i) Soluble Solids and Moisture Content. The percent of soluble solids is determined by use of the refractometer and conversion Table IV of this manual. The table shows the refractive indices with corresponding percent soluble solids and percent moisture. Record the refractive index, percent soluble solids, and percent moisture for each sample unit on the score sheet.

To be certified as U.S. grade "A" or U.S. grade "B," a lot of honey must contain an average of not less than 81.4 percent of soluble solids. To be certified as U.S. grade "C," a lot must contain an average of not less than 80.0 percent of soluble solids. The percent of soluble solids for a lot as a whole (if officially sampled) may be considered as meeting requirements for grade "A" or "B" if the average of all sample units is at least 81.4 percent, the number of sample units falling below 81.4 percent does not exceed the appropriate acceptance number shown in Table III of this manual, and no sample unit falls below 80.0 percent.

An officially sampled lot may be considered as meeting the soluble solids requirements for U.S. grade "C" if the average of all sample units is at least 80.0 percent, the number of sample units falling below 80.0 percent does not exceed the appropriate acceptance number shown in Table III of this manual and no sample unit falls below 79.0 percent.

Determine and record the grade for percent soluble solids in the appropriate manner on the score sheet. The following Table IV can be used as a guide for converting the refractive index to percent soluble solids for honey.

NOTE

BE CERTAIN TO MAKE THE NECESSARY TEMPERATURE CORRECTIONS TO THE REFRACTIVE INDEX IF THE REFRACTOMETER PRISM AND HONEY IS NOT TEMPERATURE STABILIZED TO 20 DEGREES C.

TABLE IV
REFRACTIVE INDICES, CORRESPONDING PERCENT SOLUBLE SOLIDS,
AND PERCENT MOISTURE IN EXTRACTED HONEY 1/

Refractive Index @ 20°C (Range)	Percent Soluble Solids	Percent Moisture	Refractive Index @ 20° C (Range)	Percent Soluble Solids	Percent Moisture
1.4817 - 1.4818	78.1	21.9	1.4930 - 1.4932	82.6	17.4
1.4819 - 1.4820	78.2	21.8	1.4933 - 1.4934	82.7	17.3
1.4821 - 1.4823	78.3	21.7	1.4935 - 1.4936	82.8	17.2
1.4824 - 1.4825	78.4	21.6	1.4937 - 1.4939	82.9	17.1
1.4826 - 1.4828	78.5	21.5	1.4940 - 1.4941	83.0	17.0
1.4829 - 1.4830	78.6	21.4	1.4942 - 1.4944	83.1	16.9
1.4831 - 1.4833	78.7	21.3	1.4945 - 1.4946	83.2	16.8
1.4834 - 1.4835	78.8	21.2	1.4947 - 1.4949	83.3	16.7
1.4836 - 1.4838	78.9	21.1	1.4950 - 1.4951	83.4	16.6
1.4839 - 1.4840	79.0	21.0	1.4952 - 1.4954	83.5	16.5
1.4841 - 1.4843	79.1	20.9	1.4955 - 1.4957	83.6	16.4
1.4844 - 1.4845	79.2	20.8	1.4958 - 1.4959	83.7	16.3
1.4846 - 1.4848	79.3	20.7	1.4960 - 1.4962	83.8	16.2
1.4849 - 1.4850	79.4	20.6	1.4963 - 1.4964	83.9	16.1
1.4851 - 1.4853	79.5	20.5	1.4965 - 1.4967	84.0	16.0
1.4854 - 1.4855	79.6	20.4	1.4968 - 1.4969	84.1	15.9
1.4856 - 1.4858	79.7	20.3	1.4970 - 1.4972	84.2	15.8
1.4859 - 1.4860	79.8	20.2	1.4973 - 1.4975	84.3	15.7
1.4861 - 1.4863	79.9	20.1	1.4976 - 1.4977	84.4	15.6
1.4864 - 1.4865	80.0	20.0	1.4978 - 1.4980	84.5	15.5
1.4866 - 1.4868	80.1	19.9	1.4981 - 1.4982	84.6	15.4
1.4869 - 1.4870	80.2	19.8	1.4983 - 1.4984	84.7	15.3
1.4871 - 1.4873	80.3	19.7	1.4985 - 1.4987	84.8	15.2
1.4874 - 1.4875	80.4	19.6	1.4988 - 1.4990	84.9	15.1
1.4876 - 1.4878	80.5	19.5	1.4991 - 1.4993	85.0	15.0
1.4879 - 1.4880	80.6	19.4	1.4994 - 1.4995	85.1	14.9
1.4881 - 1.4883	80.7	19.3	1.4996 - 1.4998	85.2	14.8
1.4884 - 1.4885	80.8	19.2	1.4999 - 1.5000	85.3	14.7
1.4886 - 1.4888	80.9	19.1	1.5001 - 1.5003	85.4	14.6
1.4889 - 1.4890	81.0	19.0	1.5004 - 1.5005	85.5	14.5
1.4891 - 1.4893	81.1	18.9	1.5006 - 1.5008	85.6	14.4
1.4894 - 1.4896	81.2	18.8	1.5009 - 1.5011	85.7	14.3
1.4897 - 1.4898	81.3	18.7	1.5012 - 1.5013	85.8	14.2
1.4899 - 1.4901	81.4	18.6	1.5014 - 1.5016	85.9	14.1
1.4902 - 1.4903	81.5	18.5	1.5017 - 1.5018	86.0	14.0
1.4904 - 1.4906	81.6	18.4	1.5019 - 1.5021	86.1	13.9
1.4907 - 1.4908	81.7	18.3	1.5022 - 1.5024	86.2	13.8
1.4909 - 1.4911	81.8	18.2	1.5025 - 1.5026	86.3	13.7
1.4912 - 1.4913	81.9	18.1	1.5027 - 1.5029	86.4	13.6
1.4914 - 1.4916	82.0	18.0	1.5030 - 1.5031	86.5	13.5
1.4917 - 1.4918	82.1	17.9	1.5032 - 1.5034	86.6	13.4
1.4919 - 1.4921	82.2	17.8	1.5035 - 1.5037	86.7	13.3
1.4922 - 1.4923	82.3	17.7	1.5038 - 1.5039	86.8	13.2
1.4924 - 1.4926	82.4	17.6	1.5040 - 1.5042	86.9	13.1
1.4927 - 1.4929	82.5	17.5	1.5043 - 1.5044	87.0	13.0

1/ Temperature corrections: If refractometer reading is made at temperature above 20°C (68°F), add 0.00023 to the refractive index for each degree C, or 0.00013 for each degree F. If made below 20°C (68°F), subtract correction. The moisture content of honey and equivalent values may be determined by any other method which gives equivalent results.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The score sheet.

(j) Scoring for Quality Factors. Analysis of the following quality factors is from 100 grams of product. When a single scoring factor for honey is found to be ideal (the best produced commercially), the top score in the range for the factor should be assigned.

(1) Flavor. Flavor is scored according to its degree of excellence for the declared floral source, and also according to its freedom from induced undesirable or objectionable flavors caused by caramelization, fermentation, smoke, chemicals or other causes.

Tastes vary. Some kinds of honey, such as horsemint or cultivated buckwheat, are relished by some persons and not by others. Take care not to be influenced in scoring by what may be a purely subjective preference. On the other hand, some kinds, such as bitterweed or tarweed, are almost universally regarded as unpalatable.

In scoring a sample unit for flavor, consider whether the flavor is distinct and typical for the declared floral source and free from the objectionable induced flavors mentioned above. Samples of even the unpalatable kinds of honey may score in the grade "A" range for flavor if typical.

On the other hand, if a sample unit is declared by the applicant to be of a given floral source, but the flavor indicates a mixture of undesirable honey, it should be scored down for flavor. For example, a sample unit of honey declared as alfalfa-tarweed blend might be scored in the "A" range for flavor because the flavor is clean and typical of such a blend. If declared simply as alfalfa, however, the same sample unit might have to be scored in the "C" or even the substandard range since the flavor is inferior for alfalfa and not typical for the kind declared.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The score sheet.

(j) Scoring for Quality Factors.

(1) Flavor.

Honey should be scored down for flavor if any noticeable amount of honeydew is present.

Overheating may occur when the honey is heated during processing to facilitate straining, imparting a caramelized taste. When a caramelized flavor is detectable, the honey must be scored in the "B" range or lower. Honey that is stored several years at high temperatures may also develop a poor flavor. Although honey with a faint caramelized taste may be scored in the "B" range, the taste may not be more than slight if the honey is to score above "C" grade or substandard for this factor.

Fermentation may occur in honey with low soluble solids. Honey which is partially crystallized and has a layer of liquid honey on top is very susceptible to fermentation. The liquid portion of the honey is usually the portion in which fermentation starts. If the flavor of fermentation is sufficiently pronounced to be unmistakable, score the sample unit substandard for flavor.

Honey acquires flavors from its surroundings very readily when not in tight containers. Sometimes it becomes contaminated through careless handling in the combs or in open containers. If a beekeeper becomes careless in the use of smoke either with the quantity of smoke blown into the supers to free them of bees or with the fuel used in the smoker, the resulting honey takes on an objectionable taint of smoke or even of soot.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The Score Sheet.

(j) Scoring for Quality Factors.

(1) Flavor.

Commercial beekeepers today generally use carbolic acid to drive the bees from the combs when taking honey from the hives. Chemically pure carbolic acid must be used in preparing the solution for this purpose. Otherwise, the honey will become tainted from the cloth dipped in the carbolic acid solution. Honey, so tainted, cannot be reclaimed. If an unmistakable taint from the above named source is present, score the honey in the substandard range for flavor.

Assign and record the score points in the appropriate location on the score sheet for the factor of "Flavor and Aroma" relative to the degree of excellence for each sample unit in the lot. Remember the limiting rule applies to grades "B," "C," and "SStd" for this factor.

(2) Absence of Defects. Honey is scored for defects on the basis of degree of cleanliness and degree of freedom from particles of comb, propolis (a gum gathered by bees from various plants and sometimes referred to as "bee glue"), specks, or other defects either in suspension or deposited as sediment.

It is not necessary to strain samples when scoring for the factor of absence of defects. If on careful examination of the sample unit of liquid honey or granulated honey after liquefying, no more than one speck is present and propolis or other minute particles do not affect the appearance or edibility, the sample unit may be scored in the "A" range. If no more than 3 specks are present and propolis or other minute particles do not materially affect the appearance or edibility, the sample unit may be scored in the "B" range for the factor of defects.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The Score Sheet.

(j) Scoring for Quality Factors.

(2) Absence of Defects.

Sample units with more than 3 specks present that do not seriously affect the appearance or edibility and propolis or other minute particles do not seriously affect the appearance or edibility may be scored in the "C" range for defects. Sample units that are seriously affected by specks and/or propolis or other minute particles are considered substandard in quality and are scored accordingly.

To determine the amount of defects in the 100 gram sample unit, pour the honey to be graded on a clean, flat white grading tray and allow to flow or spread to a very thin layer. The honey should be nearly transparent when completely spread. Any speck(s) readily noticed is then counted as a defect. Very small light colored particles, or particles that can only be recognized with the aid of magnification, are not counted. Tilt the tray from time to time assuring that the specks are indeed suspended in the honey and not dark spots associated with the bottom of the grading tray.

Dark colored honey is best examined for defects after diluting the sample unit with equal parts of warm distilled water. The diluted honey can then be spread over the entire grading tray surface providing sufficient translucency to effectively examine the product for noticeable specks.

Light colored honey, such as water white and extra white, can be examined for defects by pouring the entire 100 gram sample unit into a large size petri dish and examining the contents over a white background. A white

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The Score Sheet.

(j) Scoring for Quality Factors.

(2) Absence of Defects.

grading tray or smoothly surfaced white paper works well for this purpose. A number of sample units can easily be examined in this manner and little time is lost cleaning after the grading is completed.

Propolis may be present in honey. It is recognized as an oily or greasy substance usually found on the surface of the product. Together with comb and other defects, practically none are allowed in grade "A." Grades "B" and "C" permit more of the defects, respectively.

After examination of the sample unit for specks, comb, propolis, and other defects has been completed, record the significant information on the score sheet under "defects." Tabulate the score points for each sample unit and assign the numerical value relative to the allowances for the grade.

"B," "C," and "SStd" classifications for defects are subject to a limiting rule. This requires that a sample unit which is scored in any of these classifications for defects may not be graded higher than that classification which the score is assigned regardless of the total score.

(3) Clarity. The factor of clarity is not scored in "strained" style. To adjust the total score points of the sample unit, total the amounts of the other two factors (flavor and absence of defects), multiply by 100 and divide the result by 90, dropping any fractions.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The Score Sheet.

(j) Scoring for Quality Factors.

(3) Clarity.

The factor of clarity of honey for "filtered" style is determined as a result of the presence of air bubbles, pollen grains and other fine particles that may be suspended in the product, most of which pass through the U.S. No. 80 screen. Samples must be completely liquefied before scoring since any crystals present will give it a cloudy appearance.

Filtered style honey is expected to be approximately as free of particles as distilled water. To score in the "A" range for this factor, the sample unit should be at least as clear as the bottle containing cloudy suspension No. 1.

To score in the "B" range, the sample unit should be at least as clear as the bottle containing cloudy suspension No. 2.

To score in the "C" range, the sample unit should be at least as clear as the bottle containing cloudy suspension No. 3.

Under a partial limiting rule, any sample unit that is scored in the "C" or "SStd" range for this factor may not be graded higher than U.S. grade "C" regardless of the total score. Assign the score points for the factor of clarity and record in the appropriate box on the score sheet.

(k) Assign and record the grade of each sample unit in the lot and record the final grade of the lot. The grade of a lot of honey is based on the results of the inspection of the sample units in accordance with the provisions of the U.S. grade standards and the general regulations.

V. INSPECTION PROCEDURES

B. Grading. (continuation)

3. The Score Sheet.

(1) Each score sheet must be dated and signed. The score sheet is the original record of the inspection that may be called into court, if necessary, to support the statements on the certificate. Hence, the necessity for a neat set of score sheets containing complete information, each dated and signed by the inspector.

The certificate of sampling and the score sheets should be complete and neatly arranged so that another inspector could write the inspection certificate from them.

C. Certification.

1. General.

The certificate and other inspection reports shall be in accordance with the general regulations and applicable instructions under certification.

2. Name of product.

Show EXTRACTED HONEY, using all capital letters.

3. Body of certificate.

(a) Net weight (if in retail size container).

(1) Where weighed by sampler: See applicable instructions on this subject.

(2) Where weighed in laboratory: See applicable instructions on this subject.

(b) Type.

Examples:

"Type - liquid;" "Type - crystallized;" or "Type - partially crystallized."

V. INSPECTION PROCEDURES

C. Certification. (continuation)

3. Body of certificate.

(c) Style.

Examples:

"Style - strained;" or "Style - filtered." If the lot of honey was offered for "filtered" style and the sample units appear to be mixed styles, report the findings on the certificate as follows:

Example: "Style - 8 sample units filtered
5 sample units strained."

(d) Color.

(1) Where all sample units from a single lot fall within the same color classification: Example: "Color-extra light amber."

(2) Where most of the sample units from an officially sampled lot fall in one color classification and not more than the applicable acceptance number shown in Table III fall in the next darker classification: Example: "Color - 11 sample units white, 2 sample units extra light amber. Color of lot as a whole - white."

(3) If the sample units representing a specific lot are composed of more than one color to the extent of exceeding the color tolerance limitations for the darker color, show the number of sample units of each color.

Examples: Color -10 sample units white
2 sample units extra light amber
1 sample unit amber

Color - 5 sample units white
1 sample unit light amber

V. INSPECTION PROCEDURES

C. Certification. (continuation)

3. Body of certificate.

(d) Color.

Since the two above examples represent lots of mixed colors, no statement of color for lot as a whole will ordinarily be made.

(4) If the sample units shown represent deliveries on a commercial contract in which settlement depends on the results of the inspection, the following statement may be made following the color statement: "Lot as a whole fails to grade white, account, excessive proportion of containers of darker color," or "account presence of containers more than one classification darker than white," whichever applies.

(e) Floral Source. Unless the inspector can qualify as an expert and is willing to certify the floral source on his own responsibility, he should show the authority for identification of the floral source. Example: Floral source: "Declared by producer as alfalfa." Floral source: "Packer states buckwheat - sage."

More than one (1) declared or apparent floral source in a given lot of honey should be certified as, "mixed floral sources." Examples for certification of a lot of honey when more than one (1) floral sources are present would be, "mixed floral sources: declared by applicant as sunflower - clover." If no floral source is declared or identifiable, certify as, "floral source: unknown."

(f) Soluble solids and moisture content. Since percentage of soluble solids and moisture content are always complementary, they should be included in the same statement. It should be kept in mind that grades "A" and "B" must contain an average of not less than 81.4 percent and grade "C" not less than 80.0 percent, and that no sample unit in grade "C" may show less than 79.0 percent soluble solids.

V. INSPECTION PROCEDURES

C. Certification. (continuation)

3. Body of certificate.

(f) Soluble solids and moisture content.

(1) When all sample units contain 81.4 percent or more soluble solids, show range.

Example: Soluble solids: 81.4 to 83.2 percent (refractometric method) (moisture 16.8 to 18.6 percent).

(2) When any sample unit contains less than 81.4 percent soluble solids, show the number containing 81.4 percent solids or more, the number containing less than 81.4 but not less than 80.0 percent, and the number containing less than 80.0 percent.

Example: "Soluble solids (refractometric method): 10 sample units 81.4 to 82.8 percent (moisture 17.2 to 18.6 percent)

3 sample units 80 to 81.2 percent (moisture 18.8 to 20 percent)"

Example: "Soluble solids (refractometric method): 9 samples 83.0 to 83.2 percent (moisture 16.8 to 17.0 percent)

2 samples 80.0 and 81.0 percent (moisture 19.0 and 20.0 percent)

2 samples 77.5 and 78.0 percent (moisture 22.0 and 22.5 percent)"

V. INSPECTION PROCEDURES

C. Certification. (continuation)

4. Grade. Follow applicable instructions under certification.

5. Remarks. Include any essential information with respect to the product not covered under preceding headings. This will cover principally: the date of sampling, number of cans or cases, weight, warehouse where located, and identifying marks (unless described elsewhere on certificate). Detailed description of location of lot in warehouse will be shown on the certificate of sampling and copied on the inspection certificate under REMARKS.

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U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

SCORE SHEET FOR EXTRACTED HONEY

CONT. NO.		NAME AND ADDRESS OF APPLICANT
P.O.NO.	CERT. FORM	
REF.NO.	CERT. NO.	

NO.,SIZE AND KIND OF CONTAINER

LABEL

CONTAINER MARK OR IDENTIFICATION	CONTAINER													
	CASES													
NET WEIGHT (OUNCES)														
TYPE (LIQUID, CRYSTALLIZED OR PARTIALLY CRYSTALLIZED)														
STYLE (filtered or strained)														
COLOR														
FLORAL SOURCE OR SOURCES														
REFRACTIVE INDEX														
MOISTURE/ SOLUBLE SOLIDS (PERCENT)														

FACTORS	SCORE POINTS													
I. FLAVOR	50	(A) 45-50 (B) 40-44* (C) 35-39* (SStd) 0-34*													
II. ABSENCE OF DEFECTS	40	(A) 37-40 (B) 34-36* (C) 31-33* (SStd) 0-30*													
III. CLARITY 1/	10	(A) 8-10 (B) 6- 7 (C) 4 5* (SStd) 0- 3x													
TOTAL SCORE	100														
GRADE															

CHARGE ON CERTIFICATE	
FEE	
EXPENSES	
TOTAL	

PRINCIPAL REASONS FOR DEGRADING PRODUCT

OFFICIAL INSPECTOR

DATE

* Limiting rule. x Partial limiting rule. 1/ Does not apply to "Strained" style.