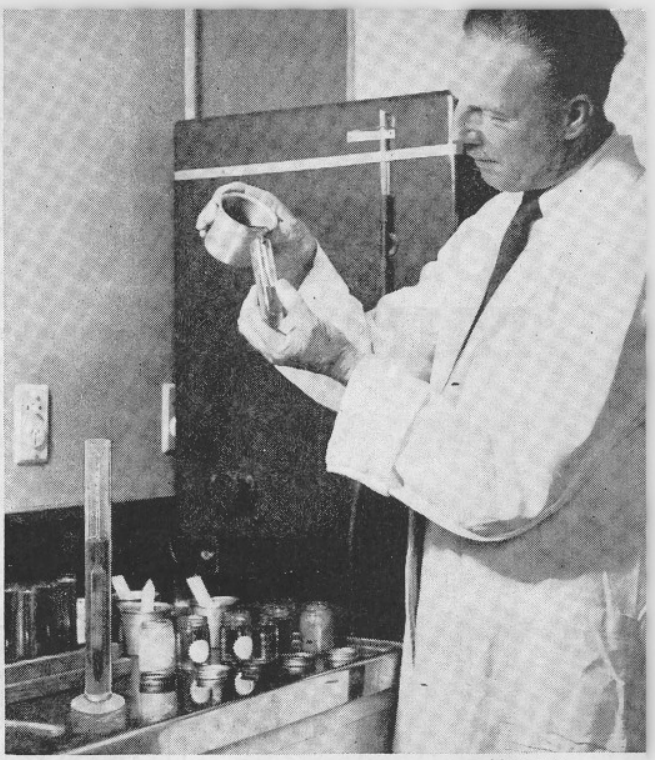
Anti-granulation Method for Honey Packers

By R. S. WALSH,
Honey Grader,
Department of Agriculture,
Auckland



[*Sparrow*

Experiments have shown that the moisture content within the range of typical honeys and most suitable for all types of bottling honey is 19 or 20 per cent water. Use of a Chataway honey hydrometer (shown in the bottom left corner of this illustration) is recommended to determine the specific gravity of honey.

A METHOD that might be applied to restrict granulation of honey at any stage of its development and thus enable packers to prepare their product to meet market demands exactly is described in this article. The method was evolved from observations during the processing of honey to ensure its remaining liquid and crystal free for a year or longer. It can be expected to overcome most of the major difficulties with which packers are familiar.

LIQUID honey is much less prone to fermentation than granulated honey and pasteurisation ensures that it remains free considerably beyond the normal period of immunity. The generally accepted practice of preventing granulation by heating honey to various temperatures has proved moderately successful if all crystals are melted out, but they begin to form again too soon.

The laevulose-dextrose ratio and the water content are two factors in honey that are not quite stable and both influence the granulation of honey. The greater the ratio of laevulose sugar to dextrose and the higher the water content of honey the less tendency there is toward granulation. There is an optimum figure suitable to each type of honey at which either or both factors can be adjusted to ensure a long crystal-free period. Though laevulose, dextrose, and water are natural ingredients of honey, the adjustment of the water content is obviously the simplest and most practical way to deal with the problem.

It has been found by experiment that a moisture content within the range of typical honeys and most suitable for all types of bottling honey is 19 or 20 per cent.

Destroy Yeasts and Crystals

The process, then, involves heating the honey sufficiently to destroy all crystals and sugar-tolerant yeasts, the determination of the moisture content, and the addition of the necessary amount of sterilised water to lower the specific gravity of the honey to the desired figure.

With many different types of honey from widely scattered localities it is always a problem to gauge the amount of heat necessary to melt out the crystals. This can vary considerably in both intensity and length of application, but fine-grained honey generally requires less heat than coarse, and honeys of low specific gravity less than those with a lower percentage of moisture. Prolonged heating at excessive temperatures tends to darken honeys, particularly those in the lower colour range. Granulated honey in commercial quantities cannot quickly be rendered liquid whatever the amount of heat used; and as it is the length of time honey is held at high temperatures rather than the temperature itself that causes its quality to deteriorate, heat applied in the initial melting of the honey should not exceed 130 degrees F.

To destroy the crystals and pasteurise the honey the temperature should then be raised to 170 degrees F for 15 minutes; if crystals are very coarse, the temperature may have to be raised to 180 degrees F for 10 minutes. The honey should be kept moving during this treatment and then the temperature should be lowered as rapidly as possible. In liquid packs even these temperatures would not retard crystal development for long in some coarse types of honey without moisture adjustment.

Moisture Adjustment

Specific gravity readings should now be taken with either a refractometer or Chataway honey hydrometer and after the moisture content has been checked against the weight per gallon of the honey by reference to the chart on page 231, a quick calculation should enable the packer to gauge the quantity of boiled or distilled water to be added to the honey to adjust the specific gravity to 20 per cent.

The body of liquid honey with a specific gravity adjusted to 20 per cent

is excellent and will give complete satisfaction to the customer, as it pours readily and has not the stickiness associated with more viscous honeys.

The important point to remember with this type of pack is that pasteurisation must be thorough or fermentation will soon develop.

Jars should not be filled unwashed, as dust particles can initiate crystal formation, and they should be sealed as soon as possible after filling; otherwise inoculation by crystalline material in the atmosphere may occur.

The ideal storage temperature for this type of pack pending dispatch to retailers is 32 degrees F or less, but even at normal room temperatures the honey should remain crystal free for a year or more.

Effect of Food Trends on Granulated Honey

What can be done with the components of liquid honey to bring about a particular result must obviously apply, at least in part, to granulated honey. It is natural for honey to granulate more or less firmly, in accordance with its water content, and until fairly recently this was all the consumer desired provided the honey was smooth grained and mild flavoured. The producer on the other hand was content to advertise honey as a pure food and to refer to its firm granulation as evidence of its purity. However, the refining of foodstuffs is so stressed today that packers of honey have been compelled to follow the current trend. Consequently there has been much experimentation to find means of providing the consumer with a smoother and more spreadable article.

Some of the methods used include crushing the sugars mechanically, excessive stirring and pumping, and a succession of heat treatments. Some packers with a sound knowledge of the chemistry of honey have been successful, but many others have supplied the market with poorly packed honey heavily impregnated with air and with its natural keeping qualities much impaired.

Granulation Influenced by Specific Gravity

Granulation may be complete at any point between the extremes of hardness and softness. Honeys with a low water content crystallise very firmly and are prone to the unsightly "frosting" that so mars the appearance of granulated honey in glass containers. Conversely soft granulating honeys are nearly always high in water content and do not "frost". Those rare types that do not granulate result from an unbalance of sugars. The density of such honeys is a clear indication of the cause and the remedy is to blend with a honey high in dextrose sugar. The question is: How are producers to satisfy the market requirements other than by recourse to the various methods now used in attempting to release the water held in suspension in the honey?

If all honey contained sufficient water to maintain a soft granulation, it would not be necessary to attempt to bring this about by some methods used at present. The obvious remedy is to adjust the water content of too firm honeys by the addition of just the right amount of water to ensure the honeys are safe from fermentation yet provide a naturally smooth and plastic spread.

Honeys with coarse crystal formation will require to be liquefied, when the necessary moisture adjustment can be made, and "seeded" with a fine-grained starter.

Sterilisation would be automatic during this process. While 17.2 per cent moisture is a perfectly safe figure at which to fix the specific gravity of sterilised honeys, packers may prefer a slightly higher gravity for honey that does not require reprocessing.

If the specific gravity of the honey is ascertained, the adjustment in water content can be calculated by use of the formula and chart above.

MOISTURE AND WEIGHT CHART

Moisture per cent	oz of water per gal of honey to increase moisture to 17.2 per cent	oz of water per gal of honey to increase moisture to 20 per cent	Weight of honey per Imp. gal at 68 deg F
			lb oz
13.2	11	19	14 8
13.6	9½	18	14 7½
14.0	8½	16½	14 7
14.4	7½	15½	14 6½
14.8	6½	14½	14 6
15.2	5½	13½	14 5½
15.6	4½	12	14 5¼
16.0	3	11	14 4½
16.4	2	10	14 4¼
16.8	1	9	14 3½
17.2	0	7½	14 3½
17.6	—	6½	14 3
18.0	—	5½	14 2½
18.4	—	4½	14 2
18.8	—	3½	14 1½
19.2	—	2	14 1
19.6	—	1	14 0½
20.0	—	0	14 0

These tables were calculated from the following formula:

Weight of water to be added (in ounces per gallon of initial honey) is W where:

$$W = \frac{160\ (D_1 - D_2)}{D_2 - D}$$

and where D_1 = initial density of honey, D_2 = required density of honey, D = density of water (all densities in the same units)

Use of Moisture and Weight Chart

Reference to the chart will show in ounces the amount of water required to adjust a gallon of honey of any specific gravity to a moisture content of 17.2 per cent. Dividing the weight per gallon of the original honey into 2,240 lb will give the number of gallons per ton and this, multiplied by the number of ounces of water per gallon required to raise the specific gravity to 17.2 per cent, gives the total amount of water to be added to the honey. The chart also enables the producer, by use of finely balanced scales and approved standard gallon measures to find the total amount of water required by weight only. However, because of the risk of error through carelessness or faulty equipment the use of a refractometer or hydrometer is strongly recommended. These instruments ensure cleaner working and save considerable time. Information about a honey hydrometer that is absolutely accurate, costs considerably less (about £12) than a refractometer, and would be invaluable to producers and packers for this and other purposes will be supplied by the writer on request.

Little difficulty will be experienced in incorporating water with honey that has been softened just sufficiently to stir. In fact water mixes slightly more readily with honey in this condition than it does in liquid honey.

Harrowing's Limited Role in Pasture Management

ON well subdivided, high producing dairy farms harrowing is not necessary for most of the year. Provided droppings are fairly soft they will break up and quickly disappear with normal weathering. Harrowing of each paddock after the milking herd has grazed it spreads very little dung and results only in bruising of the grass and retarding of growth for a day or two. Over 15 to 20 paddocks this adds up to a serious loss in grazing time.

After heavy wintering of dry stock on a particular paddock harrowing will probably be necessary to spread large concentrations of dung and level off the ground surface if pugging has been bad. For wintering, some farmers fence their cows into very small daily breaks, feeding out hay and silage on the strip each day. This builds up fertility, and if 4 to 6 lb per acre of perennial or short-rotation ryegrass is oversown, then harrowed and rolled in, worthwhile results are often obtained.

Using heavy tearing harrows in autumn to promote pasture growth is useless and only opens up the turf, resulting in an invasion of weeds. Topdressing and correct grazing management are the soundest way to improve these mediocre swards.

—*D. L. JANETT,*
Farm Advisory Officer,
Department of Agriculture,
Pukekohe