of bats of cotton are saturated, and above and under which is placed a layer of flowers; when the mucilage is properly impregnated with the odorous principle of the flowers, it is slightly pressed. The mucilage, saturated with the volatile oil, is then treated with alcohol, which takes up the oil and precipitates the gum, which may continue to be used indefinitely. This process is more economical, because mucilage is much cheaper than the various fixed oils employed up to the present time, and is moreover not changed by the operation.

Other substances, such as the iris and vanilla, yield no volatile oil, either by distillation, maceration, or expression; their perfume can only be extracted by successive infusions in alcohol.

CHAPTER XVIII.

SUGAR

Sugar is one of the essentials for the production of liqueurs; it is therefore important for the liquorist to be thoroughly acquainted with the nature, characteristics, and methods of its classification.

Chemically, sugar is a substance which, when dissolved, and placed in contact with a ferment, has the property of being converted into alcohol and carbonic acid; composed entirely of oxygen, carbon, and hydrogen, it may be considered as a vegetable oxide; according to Gay Lussac and Thénard, sugar consists, by weight, of 42.47 parts of carbon, 50.73 parts of oxygen, and 6.90 parts of hydrogen.

Two principal varieties of sugar are recognized, viz. common or crystallizable sugar and uncrystallizable sugar. The former, produced generally from the sugar-cane and beet, is also found in the sap of the maple, the carrot, pumpkin, &c.; the latter is met with in the grape, pear, potato, and a great number of fruits, vegetables, and seeds.

Sugar, suitable for the use of the liquorist, is obtained exclusively from cane and beets. It is found in the market under three different forms: brown, clayed, and refined sugar.

Cane and beet sugar are absolutely identical, and do not differ one from the other when refined to the same degree of purity. The taste, crystallization, color, and weight are the same. It is the result of habit or ignorance to assert the contrary.

When in a state of purity, sugar is white, crystallized, shining, and hard, of a very sweet taste, phosphorescent when struck together in the dark, unalterable when exposed to a dry atmosphere, and very soluble in water. At the ordinary temperature, water dissolves its own weight; but at the boiling point it dissolves it in all proportions.

The taste of sugar is sensibly modified by rasping and pulverizing. That which is very hard exhibits this phenomenon in the highest degree. It appears that the force applied by the pestle or the rasp, raises the temperature sufficiently to establish the commencement of carbonization, which communicates to it a slight empyreumatic flavor.

Sugar is soluble in alcohol only to a limited extent. When heated dry, it liquefies, becomes discolored, and is converted into caramel. Hydrochloric, nitric, and sulfuric acids added to a boiling solution of sugar, render it uncrystallizable. Long-continued ebullition produces the same effect as the acids; but it is necessary to continue this operation more than eighteen hours, while most frequently a few minutes are sufficient when the acids are used.

The uses of sugar as an alimentary substance and a condiment are so numerous and so well known, that it is useless to refer to them.

Sugar in large, brilliant crystals, with very smooth faces and angles, is called sugar-candy. There are three varieties, the white, straw-colored, and red. White candy
is without odor, and is sugar in a state of absolute purity.

Molasses is the residuum from the manufacture and refining of sugars; it is a dense, viscous, uncrystallizable syrup, marking from 41 to 44 degrees on the areometer of Baumé (pesse-sirop). It is a deep yellow, a bright brown, or almost black, according to the source from which it is obtained. It contains from 40 to 50 per cent. of its weight in crystallizable and 12 or 15 per cent. of uncrystallizable sugar.

Molasses from the cane is not identical with that from the beet; the former is infinitely superior. Sugar-house molasses is inferior to that obtained from the refineries.

Among the uncrystallizable sugars, glucose occupies the foremost place. This natural product of vegetation is met with in a great number of fruits which present an acid reaction, in honey, and diabetic urines. Under some influences many vegetable substances, especially grain and potato starch and gum, are susceptible of conversion into this kind of sugar.

We will take a hasty glance at the different forms in which glucose is met with.

Grape Sugar.—This abounds in the grape, and in all saccharine fruits; it may be separated as follows: An excess of chalk, or, what is better, marble dust, is poured into the must of the grape. This calcareous salt saturates the acid tartrate of potash which exists in the grape juice; effervescence takes place, accompanied by the escape of carbonic acid, which aids in the agitation. The saturated liquid is immediately clarified with the white of eggs, or bullock’s blood; then it is evaporated until, while boiling, it marks 35 degrees, and is allowed to cool. After some days, it forms a granular mass, which is drained and carefully washed with cold water, and submitted to a strong pressure.

Grape sugar occurs only in the form of small whitish grains of little consistency and grouped together in little nodules; its taste is fresh yet sweet, but not so much so as common sugar. It requires two and a halve parts of grape sugar to communicate the same degree of sweetness to a given quantity of water, as that produced by one part of cane sugar; it is less soluble in water than the latter at the ordinary temperature. Boiling alcohol dissolves it readily, and, when cold, precipitates it in small white nodules. These characteristics distinguish it from cane sugar, all the chemical properties of which it has. It is composed of carbon, 36.71; oxygen, 56.51; hydrogen, 6.78.

Grape Syrup.—This syrup is obtained by the same process as grape sugar, the evaporation being continued only until the syrup has attained 31 degrees.

Grape syrup is used with much success in improving brandies, especially reduced troix-six.

Sugar from Potato Starch.—This substance was discovered in 1812, by Kirchhoff, by treating starch with dilute sulphuric acid. This sugar is in its nature absolutely like that obtained from grapes and other saccharine fruits. The following is the simplest process for preparing it: Twelve kilogrammes of potato starch are mixed in forty litres of water, acidulated with 200 grammes of sulphuric acid. The mixture is boiled in a vessel which is not attacked by sulphuric acid, as a pan lined with lead; during the first hour of the ebullition it is constantly stirred. The mass then becomes more liquid, and no longer requires constant stirring. The water must be replaced as it evaporates. When the liquid has been boiled sufficiently (seven or eight hours), chalk or Spanish whiting (carbonate of lime) must be added to neutralize the acid; it is clarified with charcoal, white of eggs, or bullock’s blood, and filtered through a woollen bag. The liquid is evaporated to the consistence of syrup. On cooling, it deposits a considerable proportion of sulphate of lime. The liquid is decanted, and the operation completed by concentrating it to 40 or 41 degrees; then it is poured into coolers where the change is allowed to begin; finally,
the thick syrup is poured into hogsheads, where the solidification is finished.

Many vegetable substances, when treated like starch, with water acidulated by sulphuric acid, yield similar sugar. Thus it may be prepared from woody fibre when separated from all foreign substances, as, for example, paper and linen rags.

Syrup from Potato Starch.—The syrup of starch is a solution of saccharified starch, but not concentrated; it is obtained by the same process as the preceding sugar, using, however, less acid, and boiling for a shorter time. White Syrups are filtered through animal charcoal (bone black) in grains; then evaporated to 32° when hot; when cold they should weigh 36°, be very white, and have a sweet taste, and be free from any unpleasant flavor.

It is readily ascertained if a syrup of starch has been badly prepared; that is to say, if it still contains starch, by pouring a small quantity of the syrup into a wine-glass and adding a drop of the tincture of iodine, which instantly produces a violet color. A syrup of starch containing a certain quantity of sulphuric acid, in consequence of incomplete saturation, is recognized by means of litmus paper, which, by contact with the acid, becomes instantly a bright red.

White syrups are used by liquorists and confectioners for a great many purposes, especially for liqueurs and cooling drinks.

Colored Syrups are used in the breweries for simple beers, or for the manufacture of common caramels. They are also employed for glazing.

Syrup of Grain Starch.—This is obtained by the same process as the syrup of potato starch, by substituting grain starch. Its properties and application are the same as the syrup of starch from potatoes.

Syrup of Wheat.—For many years there has been in the market a product bearing this name; in principle this syrup should be prepared from grain either by means of wheat starch or some other; but this is not always the case. The syrup of wheat is most usually nothing but a very thick white syrup from potato starch.

The true syrup of wheat, as sold at present, is an extremely thick white liquid, but almost devoid of saccharine matter. The syrup of potato starch of good quality should always be preferred.

There are other varieties of non-crystallizable sugar, such as honey, levulose or liquid sugar, mannite, and glycyrrhiza. We shall give a short sketch of each of them.

Honey.—This substance is not a distinct species of sugar. It is a mixture of crystallizable with grape sugar, and an uncrystallizable sugar analogous to molasses, accompanied by a peculiar but variable aromatic principle. When honey is not altogether pure it contains, among the rest, wax, an acid, mannite, and even a vegeto-animal substance which communicates to it the property of spontaneous putrefaction. This last is the substance which forms the cells in which the bees deposit their eggs.

By age, honey ferments easily, is discolored, and acquires a sharp taste. Sometimes fermented honeys are found in the market to which consistency and whiteness have been imparted by the addition of flour or starch. This fraud is easily detected by the deposition of the adulterating material when the honey is mixed with cold water, and by the blue color caused by the addition of tincture of iodine to the deposit.

Honey cannot be used in liqueurs on account of its high price; it has also the inconvenience of depositing in the course of time a granular substance which consists of mannite and wax.

Levulose or Liquid Sugar.—This is found in all acid fruits, especially in apples, pears, honey, in the nectar of flowers, in the juice of the onion, &c. For a long
time it was supposed that liquid sugar was nothing but glucose associated with foreign substances, such as albumen, gum, soluble salts, and free acids, which prevented its solidification and crystallization; but the experiments of M. Biot have demonstrated that it differs essentially from both glucose and crystallizable sugar. This is the dense uncrystallizable substance which Deyeux called mucoso-saccharine principle. It consists of a liquid which cannot be converted into ordinary sugar; after a long time, however, it is changed into nodules of grape sugar.

Levulose is produced when prismatic sugar is under the influence of acids and may be produced artificially by the action of the latter on brown sugar; it constitutes in great measure the molasses obtained in the treatment of cane and beet juice in the manufacture of sugar. It is distinguishable from prismatic sugar by being very alterable under the action of alkalies, and from glucose by being very alterable under the influence of water and dilute acids.

Mannite.—A saccharine substance which forms a constituent part of manna. It is met with in the mushroom, couch-grass, celery, and in many vegetable exudations.

Mannite is white, crystallized in small needles, and of a pleasant and sweet taste. It is unalterable in the air; very soluble in cold water; soluble in hot alcohol, from which it is partially precipitated on cooling.

Glycyrrhizin, or Saccharine Matter of Liquorice.—This peculiar sugar, very different from the preceding, is obtained by making a saturated infusion or decoction of liquorice root, and after it becomes cold, adding a small quantity of sulphuric acid; a transparent gelatinous precipitate is formed, consisting of the saccharine matter and the acid. When this precipitate has been collected and washed with cold water, it is dissolved in alcohol, and the acid saturated by carbonate of soda. The sulphate of soda is precipitated and the saccharine matter remains in solution in the alcohol.

When pure, glycyrrhizin is a yellow transparent mass, of a pleasant sweet taste, similar to that of the root from which it was obtained; it is non-crystallizable and with-
then open the ash-pit door to revive the fire; keep up a well-sustained state of ebullition in order that the bubbles may burst on one side, and the new scum be removed from the other side of the pan. When at last the syrup only yields a very light whitish foam, and is become sufficiently transparent, and the bottom of the pan can be seen, it is passed through a blanket or felt bag. If, however, the syrup is not boiled enough it must be left on the fire until it has acquired the proper degree of density. If it has been boiled too much, and marks a point, above 31°, it will be necessary to dilute it by the addition of water until it is reduced to this degree.

Albumenized water is prepared as follows: Take the whites of six or eight fresh eggs for 50 kilogrammes of brown sugar, according to the size of the eggs; put them in a pan along with the shells, and add one litre of water, then beat the whole together with a whip or egg beater, and add, in repeated doses, seven litres of water, in order to have the whole form eight litres of albumenized water.

By at once pouring one litre of water on the whites, they are prevented from being beaten up into a froth. It will be observed that we pour three-fourths of the albumenized water into the sugar before heating it. Experience has taught us that the white of eggs coagulates between 50 and 60 degrees Centigrade, and that, when the albumenized water is added at the moment of the ebullition, the clarification is only partial or incomplete. In order not to injure the operation, the syrup should not be stirred with the skimmer during the clarification and even so long as it may be tepid.

There are some brown sugars which, in consequence of being damaged, have become viscous, and are consequently very difficult to clarify. It is proper, under such circumstances, to add about ten grammes of acetic acid (radical vinegar), or, if it is preferred, some litres of lime-water. This water is prepared by placing some quicklime in a wooden bucket, and adding water and stirring with a wooden spatula until the lime is entirely mixed; when the bucket is full, time is given for the water to become clear before using it.

Acetic acid and lime-water serve to cleanse the melted sugar, and facilitate the separation of the foreign substances which it may contain.

Bullock's blood is also employed in the clarification of sugar, but it frequently communicates a bad flavor and repulsive odor, in consequence of the difficulty of procuring the blood fresh. The whites of eggs are to be preferred.

Refined sugars are clarified in the same manner, except that the number of eggs is reduced one-half. The beautiful white sugars are so well clarified at present in the refineries, that they require nothing but pure water for their clarification.

The skimmings and water, in which the utensils are washed, are put in a bucket kept for that purpose; they still contain an appreciable quantity of sugar, and must be clarified together. For this purpose, they are put into a pan with very nearly the same volume of water, stirred strongly with a wooden paddle, and heated to the boiling point; when it begins to boil, the fire is drawn from beneath the pan, and it is left at rest for half an hour before it is skimmed; the fire is then rekindled, and, after it boils up again, the liquid is passed through a woolen strainer, or bag. This syrup may, if it is thought proper, be evaporated to a more concentrated degree, or it may replace a portion of water in a second clarification.

Decolorizing Sugar.

For many years, in consequence of the great fall in the price of sugar, liquorists have preferred to use white sugars rather than brown, and have in a measure given up the practice of decolorizing their sugars. We consider it, however, our duty to describe the process.

When it is desired to clarify, and at the same time decolorize sugars which are deficient in whiteness, we proceed as follows:—
Sugar . . . . 50 kilogrammes.
Water . - 30 litres.
Animal charcoal, purified and in coarse powder . . 2 kilogrammes.
Wood charcoal in powder . . 1 "
White of eggs, number . . 4

Mix the eggs in a portion of the water indicated, break the sugar in pieces of medium size, place them in a copper pan, add the pure water and the albumenized water, reserving two litres of the latter to be used during the clarification; heat promptly, stirring continually with a wooden spatula until the whole of the sugar is melted; then, while the stirring is continued, add the animal and wood charcoal. When the syrup boils, add the reserved albumenized water in two or three doses, give a last boiling, and draw the whole from the fire. After a short rest, remove the skimmings, and pour the syrup through a woolen bag.

The first portion of syrup which passes is turbid, and contains the finely divided charcoal; it is necessary to return it to the filter, taking care to cover it well in order to prevent the loss of heat, which, by rendering the syrup less fluid, will hinder the filtration. Receive the perfectly clear syrup in a clean vessel.

Animal black is purified as follows: Two kilogrammes of bone-black are placed in a stone jug, and enough water added to form a paste; this paste is washed with 250 grammes of concentrated hydrochloric acid; it is stirred in order that the mixture may be complete, the vessel is refilled with boiling water, it is left to rest for a moment, and the supernatant liquid poured off; this washing is repeated four or five times, and the charcoal well drained.

The process for clarification and decolorizing, which we have just described, yields limpid syrups, the flavor of which is improved by the use of wood charcoal. The effect of the animal black is to decolorize the syrup.

We would advise the liquorist to use Dumont's filter, with animal black in grains, as the best process for decolorizing syrups.

When it is desired to filter a syrup, the small diaphragm is placed in the bottom of the filter, supported by its four feet, above the stopcock, and the orifice of the air-tube; on this diaphragm is spread a somewhat open cloth, moistened, and slightly stretched, on this is placed the animal black, in grains about the size of blasting powder (freed from dust and previously moistened with about one-sixth of its weight of water), so as to fill the filter uniformly; each layer of about eight centimeters, is smoothed over and lightly packed by means of a sort of trowel, and the process of packing is continued in the same way until the animal black occupies a height of about 36 centimeters.

The first layer of black placed on the cloth should not be more than three centimeters thick, in order that it may be packed more evenly and firmly. When the filter is filled to the height of 36 centimeters, the surface of the black is covered by a clean cloth, also moistened and stretched, and the second diaphragm; then the syrup is poured, as nearly as may be, on the middle, until it stands at the height of about eight centimeters in the vacant space above the black. By this arrangement, the black is not disturbed by pouring in the syrup, and there is no reason to fear the formation of channels through which the syrup will flow too freely. The syrup, by penetrating the various strata of black, displaces the water with which it was moistened, and it is drawn off by the cock; this is separated to be rejected until it is found to be sweet, and is then replaced by the syrup, which very soon flows off in an uninterrupted stream, which is kept up by a constant renewal of the supply as it flows away, being careful to keep the filter full to the top while the batch of syrup holds out.

If the black is not previously moistened with water, the syrup will find difficulty in being absorbed equally;
it may pass more freely through one part than another of the mass, and the filtration will progress irregularly. Under these circumstances, the water produces yet another advantageous effect when animal black is used, which is to effect, at least, a partial lixiviation, as may be ascertained by the saline taste of the water as it flows from the filter.

We should observe that, as limpidity of syrups is an essential condition in order that the filtration and decolorizing may be conducted to the best advantage, it is important to clarify the syrups in advance, as has already been described for brown sugars.

The grains of the animal black should be more or less fine, according to the density of the syrup to be filtered. Thus, the liquorist being under the necessity of diluting with water the alcohol he uses for his common liqueurs, will use for 50 kilograms of sugar, 40 or 50 litres of water; he may then filter through a finer black, and procure a more beautiful decolorizing. In any event, the economy of animal black will always indicate its use.

It is to be remarked that black, in grains which has been previously washed and dried, produces a more prompt filtration than when it has not been subjected to this preparation.

The Dumont filters are of different sizes; the small contain about 6 or 8 kilograms of black, and as much as 100 kilograms are required for the largest. By means of this apparatus syrups may be filtered of different degrees of density, from the most feeble to the highest, which mark 25 or 30 degrees by the areometer when cold. If operating on syrups marking 35 or 36 degrees (or from 31 to 32 boiling), it will be necessary to pour them into the filter very hot, say, at from 70 to 80 degrees Centigrade. For intermediate densities it will be sufficient that the temperature of the syrups may vary from 45 to 55 degrees. When filtering hot, we should use, as has already been said, a some-what coarser charcoal; the operation requires a little longer time, but the product is not altogether as completely discolored.

The superiority of syrups thus filtered, in regard to agreeable flavor, over those which are boiled with the black, is indisputable, and may well be imagined. Indeed, animal black communicates to syrups heated with it, a disagreeable taste, which is more decided as the proportion of black is increased; the moistening and washing, on the other hand, deprive the bone black of a great part of its soluble principles; and, as the operation is conducted below the boiling point, and even sometimes cold, it is another reason why the syrups do not have so unpleasant a flavor as when boiled with the black.

The use of Dumont's filter, in addition to being productive of a very decided superiority, on account of perfect decolorizing and a good flavor, offers a real advantage in washing the black. In the old process it was necessary to wash the residual charcoal in many waters to remove the sugar with which it was impregnated; this required a very expensive evaporation if the waters were to be used for a second clarification. This long and troublesome work is entirely avoided by the Dumont filter. Without disturbing the apparatus, it is sufficient to pour on the black a sufficient quantity of water to remove all the sugar promptly, and what is more important we obtain, at the first flow, about three-fourths of the syrup contained in the black at very nearly the same degree of density as that from the original operation, especially if the cock is closed a little, so as to reduce the stream of syrup, and thereby retard the filtration. The rest should be put with the skimmings, or poured into a new clarification. The importance of the above operation, in an economical point of view, will be readily understood by all who manipulate sugars. It is estimated that this process has a power of decoloration equal to three times that of the old system, and the value of the decolorized syrups is increased 20 per cent.

We should remark, that in order to make a second
DISTILLATION OF ALCOHOL.

Decoloration with the same black, or to proceed with the washing of the latter, the operation should be made before twenty-four hours have elapsed; for the prolonged delay of the sugar in contact with the animal black causes a whitish decomposition, which, when added to syrup or the water of washing, renders them very difficult to clarify.

Animal black which has been used for decolorizing sugar, may be employed advantageously as a manure. Its decolorizing property may be restored by revivification, which consists in submitting the black to calcination, which carbonizes the adhering organic substances, and uncovers the surface of the charcoal. Animal black may be revived 20 or 25 times; the loss is estimated at 4 or 5 per cent. at each revivification.

Besides its decolorising properties, animal black possesses the quality of neutralizing the alkalies.

Saccharometer (Pese-sirop).

The saccharometer is an instrument, the object of which is to estimate the gravity of saccharine liquids. Its point of departure (or zero), placed at the top of the stem, is distilled water; it is graduated to 50 degrees; its decolorizing property may be restored by revivification, which consists in submitting the black to calcination, which carbonizes the adhering organic substances, and uncovers the surface of the charcoal. Animal black may be revived 20 or 25 times; the loss is estimated at 4 or 5 per cent. at each revivification.

Besides its decolorising properties, animal black possesses the quality of neutralizing the alkalies.

The saccharometer is usually a glass tube blown into an elongated bulb, and loaded at the lower extremity with a lead weight; the inconvenience, inseparable from having too great a length of stem, should induce the liquorist to have several saccharometers; one comprising the densities from 0 to 20 degrees, and another from 20 to 50 degrees. It may be understood that, with an equal length of stem, the densities may be four times greater, and the half and quarter degrees may be observed on such an instrument as readily as the whole degrees on one bearing the entire scale. Like all other areometers, the saccharometer is more delicate in its indications, when it has a large bulb and the stem is more delicate.

Heat causes a marked difference in the degrees indicated by the instrument when examining saccharine liquids; thus, a boiling syrup, which marks 31 degrees, will give 35 degrees when cold; it is therefore indispensable, whenever it is desirable, to ascertain the degree of any syrup very exactly, that its temperature should be reduced to 15 degrees Centigrade.

Liquorists are frequently guilty of the carelessness of taking hold of the saccharometer with dirty hands, of leaving the stem soiled with foreign substances, or at least wet when they have taken the trouble to wash it. Moreover, they plunge the instrument carelessly into the syrup to be weighed, so that, before attaining a state of rest, it oscillates and covers itself with the syrup to a greater or less height. All these circumstances increase the weight of the instrument, and cause false indications of the density of the syrup. To obviate these inconveniences, it is proper, before using the instrument, to wash it carefully, and dry it thoroughly.

It is best, also, to have the syrup when examined in a suitable vessel, large enough for the saccharometer to be plunged into it with ease; a glass or tin tube, having a little larger diameter than the bulbous portion of the instrument, will answer. It is important to maintain the tube in a vertical position, and so arrange it that it shall be full of liquid when the saccharometer shall have attained its point of equilibrium; then note the degree.

Frequently saccharometers are carelessly constructed, and indicate the degrees more or less; the use of such instruments may cause an error both in the value of the product and in the preparation of liqueurs. These instruments, manufactured at a low price, have not been prepared with the necessary care and according to the standard. It is known, too, that saccharometers are graduated by the aid of paper scales, fixed within the stem of the instrument by means of sealing-wax or glue. This method does not, under certain circum-
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stances, afford the full guarantee which is desirable; in fact, the paper on which the scale is written becomes puckered, warped, or deranged; the instrument is then defective, and only fit to be thrown aside. The liquorist should select his saccharometer with the greatest care.

The two tables which follow will demonstrate conclusively the advantages which are derived from the use of the saccharometer. They indicate in grammes and centigrammes the quantity of sugar contained in a litre of syrup—one for crude or brown sugar and the other for refined sugar.

In very many circumstances, these tables will render great service. Let it be desired to know, for example, the quantity of sugar contained in 18 litres of syrup of brown sugar at 33 degrees: on consulting the first table, it is found that one litre contains 902 grammes and 22 centigrammes; multiply 902.22 by 18, and we have the product 16.239.96, which gives, by neglecting the two last figures, 16 kilogrammes and 239 grammes of sugar.

**Table indicating the quantity of refined Sugar contained in a litre of cold Syrup.**

<table>
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<th>Degree</th>
<th>Weight 1</th>
<th>Weight 2</th>
<th>Weight 3</th>
<th>Weight 4</th>
<th>Weight 5</th>
<th>Weight 6</th>
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<td>57.50</td>
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<td>77.50</td>
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<td>8.0</td>
<td>200.00</td>
<td>240.50</td>
<td>320.50</td>
<td>330.50</td>
<td>340.50</td>
<td>360.50</td>
</tr>
</tbody>
</table>

**Table indicating the quantity of good brown (crude or raw) Sugar contained in a litre of cold Syrup.**

<table>
<thead>
<tr>
<th>Degree</th>
<th>Weight 1</th>
<th>Weight 2</th>
<th>Weight 3</th>
<th>Weight 4</th>
<th>Weight 5</th>
<th>Weight 6</th>
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<tr>
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<td>12.50</td>
<td>18.50</td>
<td>27.35</td>
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<td>47.50</td>
<td>57.50</td>
<td>67.50</td>
<td>82.50</td>
</tr>
<tr>
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<td>37.50</td>
<td>53.50</td>
<td>67.50</td>
<td>77.50</td>
<td>87.50</td>
<td>102.50</td>
</tr>
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<td>50.00</td>
<td>66.50</td>
<td>87.50</td>
<td>97.50</td>
<td>107.50</td>
<td>127.50</td>
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<tr>
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<td>62.50</td>
<td>80.50</td>
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<td>117.50</td>
<td>127.50</td>
<td>147.50</td>
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<tr>
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<td>75.00</td>
<td>95.50</td>
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<td>137.50</td>
<td>147.50</td>
<td>167.50</td>
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<tr>
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<td>200.50</td>
<td>210.50</td>
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<td>240.50</td>
</tr>
<tr>
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<td>220.50</td>
<td>230.50</td>
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<td>260.50</td>
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<td>250.50</td>
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</tr>
<tr>
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<td>340.50</td>
</tr>
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<td>320.50</td>
<td>330.50</td>
<td>340.50</td>
<td>360.50</td>
</tr>
</tbody>
</table>

**CHAPTER XX.**

**SYRUPS.**

Syrups are liquid compounds, resulting from the concentrated solution of sugar in plain water, or in water impregnated by emulsion, maceration, or decoction with the principles of various substances; or of a solution of sugar in the fresh or fermented juice of fruits, wine, vinegar, &c. These products are obtained in the cold way or by heat; the latter is almost the only one used.

It is not, however, sufficient to know that a syrup can be obtained by dissolving sugar by the assistance of heat in water, or some other prepared liquid; it is necessary to know, also, how to estimate the qualities of the sugar, and to vary the proportions of the substances employed, according to the character of the liquid to be converted into syrup; to be acquainted with the precautions requisite for the clarification; and to manage the
fire properly, in order that the evaporation may be accomplished rapidly and by a quick ebullition. On this account, we shall indicate under each receipt what is proper to be done.

The syrups manufactured by the liquorist are divided into two very distinct classes, simple and compound syrups; both are used for cooling beverages.

Syrups are further divided into two kinds, syrups of pure sugar, and syrups of sugar and glucose, or glucose syrups (sirops glucosés).

Degeneration and Preservation of Syrups.

Many causes may concur to produce changes in syrups, and cause them to degenerate partially or entirely.

Among these causes fermentation occupies the foremost place; it may be set up when a syrup has not been boiled enough, or when it contains an excess of mucilaginous substances; an unsuccessful clarification also causes this change; the impure portions not having been thrown off from the syrup, decompose it in time. Syrup ferments, also, if it has been boiled too much, or concentrated to too high a degree, because the excess of sugar crystallizes; the crystals when formed gradually attract a portion of the sugar contained in the syrup, and grow at the expense of the sugar necessary for its preservation.

Fermentation may also originate if the syrup be corked before it is cold; the vapor of water which escapes from it, being condensed into a liquid, dilutes the upper stratum, this the next, and so on, thus destroying the equilibrium of the mass. The same phenomenon occurs if the vessel happens to be moist; the water, being lighter than the syrup, rises to the surface. Finally, if syrups are left in a moderately warm place, and in vessels that are not quite full, fermentation will take place still more promptly than in the preceding cases; for it is well known that air and moisture are the principal agents in every fermentation.

When fermentation commences, the syrup becomes clouded and then frothy. Carbonic acid is formed, which traverses the liquid, and, raising a froth, very often drives out the corks with an explosion, and throws the syrup out of the vessel which contains it. The syrup, which has undergone this alteration, becomes acid, and changes color; if red, it becomes brighter; by degrees the fermentation is checked by the presence of the alcohol which is formed; but the syrup has a vinous odor, and its consistency is not so great. If the syrup which has experienced these changes contains aromatic or volatile principles, they are entirely lost; if it contains fixed acids, it is possible to restore its original properties by heating it; by means of this operation the carbonic acid and alcohol are drawn off; it is, however, more convenient to clarify it anew and evaporate it to a proper consistency.

Another species of change occurs in acid syrups when they are boiled too much, or when the substances used are too acid. A short time after they are prepared, they let fall to the bottom of the bottles a considerable deposit; and sometimes they even form a single concrete mass. By a moderate heat, they may be restored to their fluidity, and their original transparency, but they lose it again very soon. This deposit is due to a combination of the acid with the sugar. It never presents crystals; it has the appearance of cauliflower; it is looked upon as analogous to grape sugar.

Mouldiness is also an alteration which may manifest itself when the bottles of syrup are corked before they are entirely cold, or when the bottles have been damp when filled. Emptying prolonged through days may also occasion mouldiness in a well-corked vessel; this comes from the slight moisture which, after rising from the syrup, has circulated in the vacant space of the vessel, falls back on the surface of the syrup in the form of water, and does not mix with it because it is not shaken.

Syrups to be preserved should be put in well-corked bottles, always full; they must be kept in a cellar, or in a cool place.
They may also be preserved an indefinite time by de-
priving them of air, by boiling them in a water-bath in
well-corked bottles.

Receipts for Syrups.

The following receipts for syrups are based on the
same quantity of sugar and liquid; they should therefore
produce results which are very nearly equal.
It is understood that the receipts may be increased or
diminished at will as required, always, however, using
the proportions indicated.

Simple Syrup (Sirop de Sucre).

Simple syrup is a liquid composed only of sugar and
pure water; there are two kinds, syrup of raw or crude
(brown) sugar, and syrup of refined or white sugar.
The first has been sufficiently noticed in the article
relating to the clarification of sugar, and we may dis-
pense with further allusion to it.
We shall only insist on the choice of sugar intended
for syrup of brown sugar. It is better to employ only
those that are in good condition, and free from taste and
bad odors, in order to avoid having the perfume of
liqueurs made from this syrup being affected by it.
The syrup of brown sugar is employed in the manu-
facture of common (ordinaire) and demi-fines colored
liqueurs. The liquorist ought always to have a certain
quantity prepared in advance; it should be boiled to 31
degrees hot and 35 degrees cold; in this condition, and
by observing the precautions we have indicated above,
it may be preserved for a long time.
The syrup of white sugar is prepared as follows:

Simple Syrup.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refined white sugar</td>
<td>50 kilogrammes</td>
</tr>
<tr>
<td>Pure water</td>
<td>26 litres</td>
</tr>
<tr>
<td>Whites of eggs, number</td>
<td>4</td>
</tr>
</tbody>
</table>

Place the sugar, broken into pieces of average size, into
an untinned copper pan or kettle. Add 17 litres of pure
water, and 6 litres of albuminized water (see the prepa-
ration of this water, p. 379); stir the whole with a
spatula to dissolve the sugar, and proceed with the clarifi-
cation, as has been said, by pushing the fire actively in
order to prevent the prolonged action of the heat from
coloring the syrup (this inconvenience is avoided by
using steam); taking care, however, to regulate the fire
so as not to throw the syrup over the edge of the pan.
This accident would render the addition of water neces-
sary, which would then have to be evaporated; this ob-
jectionable manipulation would communicate a color to
the syrup which we seek to avoid. The clarification
being finished, ascertain if the syrup has boiled enough
in the skimmer into the syrup and touching the
finger to it; then apply the finger to the thumb, and
see if the syrup forms a thread without breaking when
they are separated; (32°) when this point is reached it
is filtered through a woollen cloth or bag.
An ordinary linen towel may also be employed for
straining syrups, but in this case care must be taken to
moisten it with water and wring it out before using it.
If this precaution is neglected, the syrup will pass with
difficulty and will acquire the taste of the linen.
Syrup of white sugar is employed for the manufacture
of demi-fine, fine, and superfine liqueurs; that which
is intended for sale should be inclosed in bottles, the
syrup being yet tepid in order to facilitate its introduc-
tion into these vessels; nevertheless the bottles must be
corked only when they are entirely cold.
It should be observed that in pouring a hot syrup into
a can or jar, if the syrup is allowed to become cold
while uncovered, there will be formed on the surface a
thin pellicle of sugar-candy, which, on decantation into
the bottles, remains in a state of suspension, or falls to
the bottom. This inconvenience is prevented in the fol-
lowing manner: a clean sponge filled with clarified
water is shaken over the vessel or can which contains
the syrup until the moment when the pellicle is seen to
have disappeared. In the former case the transparency
of the liquid is disturbed; in the latter the formation of large crystals of sugar candy is excited.

Syrup of Orange Flowers.

Refined white sugar . . . . 50 kilogrammes.
Orange-flower water (triple) . . . . 6 litres.
Pure water . . . . 21 "
Whites of eggs, number . . . . 4.

Dissolve the cracked sugar in 13 litres of pure water and 6 litres of albuminous water, clarify it by the methods already described, then, after straining the syrup, add the orange-flower water, well filtered; mix quickly and cover. This syrup, which ought to weigh 31° after the mixture, should, however, weigh 36° when cold.

The syrup of roses is prepared in the same way.

Syrup of Capillaire.

Refined white sugar . . . . 50 kilogrammes.
Canada capillaire (Maidenshair, Adiantum pedatum) . . . . 2 kilogrammes 500 grammes.
Pure water . . . . 26 litres.
Whites of eggs, number . . . . 4.

Infuse two-thirds of the capillaire for two hours in 18 litres of water at a boiling temperature; add the sugar to the infusion. After this has been passed through a sieve, clarify with the albuminous water; and when the syrup has been boiled to 31°, pour it into a can or other vessel on the rest of the leaves of the capillaire; allow it to infuse for two hours, and strain it through a woollen bag with two or three sheets of filtering paper reduced to a pulp.*

As described by Dubief:—The paper is torn into shreds, steeped in a little water, well beaten in a mortar, washed in two or three waters passed through a sieve, and pressed nearly dry; it is then returned to the mortar with a sufficient quantity of the liquid to be filtered to form a stiff paste, which is reduced to the consistency of thin gruel by gradual additions of the liquid. It is then passed through a hair sieve which is shaken to facilitate the flow; if any of the paper remains on the sieve, it is returned to the mortar and the operation repeated.

By gradually adding one-fourth or one-third of the liquid to this pulp, a true size is obtained, which is then poured on the filter. As the liquid flows off, it is continually poured back on the filter until it runs clear; then the rest of the sized liquid is poured in the filter, and after it the three-fourths or two-thirds which was at first reserved.

—Trans.