DICHROMATED GUM PRINT — The 'gum' solution

IN the dichromated gum printing method, both the steps' execution and the choice of materials can contribute to making the finished work unique. To fix some elements and then apply them with awareness and reasonable repeatability, it is greatly advisable to continuously record the operations performed, starting from the characteristics of the used materials.

Arabic gum is a vegetable product, consisting mainly of polysaccharides — totally harmless and versatile, used in food and pharmaceutical industry too — secretion of different sub-Saharan acacia species by incision of the bark. Operation on which certainly the plant was not asked.

As it is, the 'gum' is subject to environmental variations of all types, as well as processing, so it is difficult to "normalize" it without appropriate equipment, even to simply evaluate the moisture content and/or dry matter.

You will settle for observing a couple of sensorially recognizable features and treasuring the gained experience. Read the technical information about color, smell and touch; indicatively do not trust the powdered product that can be mixed with dextrin (chemically similar but of other origin) or other 'saccharides', but prefer that 'in pieces' or 'pearls' or 'tears' (term certainly more suited to the suffering of the tree: *https://www.youtube.com/watch?v=0uZIbDnenI0*); it means to prefer the substance in lumps, as it is gathered. These large drops, with a glassy hardness, sometimes retain small fragments of wood as the drained liquid is not subjected to further treatments other than drying out.

In addition to this "organoleptic" analysis (as it is said when evaluating through our 5 senses) an "instrumental" measure must be carried out, after dissolution.

The arabic gum is soluble in water (1), but ... you have to cope !
Of course, the powder greatly reduces the problem of a difficult solubility because, when on the market, it has already been dissolved, filtered, dried - let us hope in vacuum at low temperatures - and finely chopped. Then, with a constant stirring and a temperature ≤ 40°C, the powder dissolves with an acceptable *slowness*.
For large pieces, few grams each, since you cannot resort to hot water to avoid denaturation of the product, nor you can crumble the drops before soaking, unless you use a hammer, shooting chips all around including eyes, nor you can dive the pieces into the little water needed and stir 48 hours right away, depriving yourself of sleep and fighting with the stickiness of the lumps, … .
... Because I haven't said yet that the solution should have a concentration about 40% w/w. This means that 100 gr. of solution will be composed of 40 gr. weight of 'gum' and 60 of water. And filtering impurities from this caramel stack, is impossible.

But our 'elders' had already found the way: the proper weight of drops are settled in a fine gauze (today more easily in the cut 'foot' of a woman's stocking once the owner has slipped out of it). The edges of the sock are overturn on the outer edge of a glass jar so that the grains do not touch the bottom. The amount of distilled water apt for that weight is introduced and the vessel is closed or covered.

(Fig.1) - Dissolving the 'gum' lumps

The 'gum' must 'soak' in the liquid in such a way that meanwhile the dissolution proceeds, the 'solute' filters through the sock, leaving what is undissolved to get soaked. The vessel will be moved periodically to permit the new settling for the solid upper phase in the liquid inside the stocking and let the dissolution proceeds.
If you are wealthy, you can buy a little lab magnetic stirrer (2) saving half of the time.

Better if everything is kept in a warm place, protected from light.
Every impurity will remain in the sock's tip and in two/three days you will have a limpid treacle, the last part of which you will have to squeeze by hand through the fabric.

We are, by that, ... halfway the job!

The colloidal solution - whether it comes from powder or pieces - should be practically odourless and should be left at room temperature, away from direct light for about one week, until it gain a fresh, sugary and very slight acidic smell, revealing the beginning of fermentation, with an increase in its viscosity. This

essential ripening should therefore be blocked by adding an antifermentative, e.g. *sodium benzoate* 1 ‰, (is the food preservative E211) or *thimol crystals*, (see apiculture sites) to proceed with the measurement and regulation of viscosity. …

So here we are to the above-mentioned 'instrumental' measure, which will ensure the constancy of the mixture to be spread on the paper. But if you are looking for unrepeatable, uncontrollable and funny masterpieces, you skip this step.

The tool - a visco(si)meter - can be a rather complex and expensive tool, but what we like best is simple and self-made (3). It consists of a short cylinder with a volume of at least 50-60 cc, ending with a conical drilled end; if there is nothing you can guess, I point out that a big plastic syringe without needle or big test-tube is good for the purpose. Just cut the short needle's holder carefully and smooth very finely the edges of the hole that remains, to 3-4 mm in diameter. Now fill the cilinder, up to a reference mark, with the gum solution while capping with a finger the lower end; the sophisticated device will be ready to perform its measurement.

(fig 2) - A home-made viscosimeter

Hanged on a support, vertically above the gum jar (to make the liquid falling into it) you release the finger and start a stopwatch. The solution must go down uninterruptedly as a thread; at the instant the flow stops, halt the stopwatch: this time (measured - say - 3 times) is a viscosity value of the solution and applies to that specific gum batch, for the quantity of liquid measured at that temperature (to register), at that concentration, for that opening and for that specific, sophisticated 'instrument'.

The obtained value is therefore related to all the above variables and consequently only yours (4).

The *temperature coefficient* (how much the viscosity varies for 1°C change in temperature) is ±1"/C°, that means: every +1°C, the flux speed is increased and therefore the viscosity is lowered by 1" and vice versa at lower temperatures to your reference room T°.

The *dilution coefficient* (i.e. how much viscosity varies by adding — say — 1 cc of water to 100 grams of solution), ... each will have its own, with some indispensable test.

In this proper regard a further hint is necessary, remembering that if the whole process is linear as previously mentioned, it is nevertheless peculiar and fussy.

Since the solution must be set with a good approximation to the tested viscosity limits (hereafter it will be seen the importance to observe the tolerance of ±2 seconds), a slightly more concentrated solution will have to be prepared and then add a little water to bring it within the limits. The opposite would be crazy: add fragments of solid gum to a 'weak' solution and wait for it to dissolve homogeneously ... we saw what it entails! Then the addition of 1-2% of water with caution, drop by drop, keeping the colloidal solution in weak agitation with a rod or your brand new magnetic stirrer, without incorporating air bubbles (difficult to take to the top), will allow the achievement of equilibrium and to perform again, within an acceptable time, a viscosity measurement.

Companies that produce these solutions for oenology (unfortunately not at the high concentration here required) give a 24-month expiration for the product stored in a cool and dark place. Personally I had longer life-time at good smell and constant or slightly increased viscosity, i.e. correctable.

Here I stop because much has been said even if something else could be said.

a. m.

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(1) Actually what is formed is a 'colloidal solution', halfway between a real dissolution and a dispersion.

(2) A magnetic stirrer is a very useful instrument for several tasks in these old methods, something our 'elders' not even could dream! Look on lab tools sites or chemical products sellers.

(3) Or you can buy for a bit more than 100 € a socalled 'Ford Cup' that is a simplified but proper solid metal viscometer.

(4) Personally I have values a bit under 30" for 45 cc of solution's volume at 18°C and hole ≈ 4 mm diameter (the exact numbers are not interesting, beeing individual).