THE MYTH OF THE LITTLE SPOON

Michel Valade, Isabelle Tribaut-Sohier, Frédéric Panaïotis

CIVC Technical Services

How do you keep champagne bubbly in an opened bottle? Many claim that a small spoon placed in the neck prevents it from losing its fizz. Is this just a popular belief or a future first prize winner from the Academy of Sciences? How can a small spoon, preferably silver, defy all the laws of physics and possess this legendary effectiveness? This question, frequently asked of us, deserved an answer.

EXPERIMENTAL CONDITIONS

Several bottles of the same vintage are opened simultaneously.

To simulate consumption, they are partially emptied of 250 and 500 ml, leaving a remaining volume of champagne of 500 and 250 ml respectively.
Different preservation methods are being tested:

open bottle;
bottle with small spoon (in silver or stainless steel);
bottle with airtight stopper cap;
-bottle with crown cap.
The bottles are stored upright, at a constant temperature (12°C).
To assess the amount of residual gas, three separate checks are carried out:

the pressure;
- weight loss;
- the tasting.

THE PRESSURE

The initial pressure, measured on three corked bottles, is 6 bars at 20 °C.
After "consumption", the average residual pressure is 4 bars for 500 ml of residual volume and 2 bars for 250 ml of wine.
The pressures are then checked at 8, 24 and 48 hours after unblocking using an aphrometer.

In order to install the aphrometer, the bottles are recapped beforehand (except for the 4th batch, which is already capped).
Since pressure measurement, using an aphrometer, requires agitation of the bottle, thus increasing degassing, checks over time are carried out systematically on bottles (three bottles at each stage).
As an example, we have recorded in Table 1 the results obtained on the bottles with the greatest reduction in volume (250 ml remaining). After 8, 24, or 48 hours of uncorking,**The pressure drop is of the same order of magnitude whether with or without a teaspoon.**the loss is greater than 50% after 48 hours, in both cases.
However, the pressure loss of the capped batch is lower and on the order of 10%.
The pressure readings are lower with the stopper cap. In fact, its performance is identical to the sealed batch. However, since the aphrometer cannot be fitted to this type of stopper, it is necessary to open the bottle and recap it before measurement. Removing the stopper cap causes degassing, resulting in a pressure loss of approximately 0.5 bar.

These results demonstrate that an airtight closure (cap, stopper) allows a greater volume of dissolved CO2 to be maintained in the liquid than in a bottle that is not hermetically sealed (nothing, a small spoon).

WEIGHT LOSS

According to Pasteur's calculations, 24 g/l of sugar produces 11.4 g/l of carbon dioxide (CO2) during the secondary fermentation process. The gas escaping from the bottle after opening is easily measured on a precision balance, allowing for comparison of different closure systems using this simple method.

In this experiment, after emptying half the contents of each bottle (remaining 400 ml of volume), three groups were created: one without a stopper, one with a small spoon, and one with a stopper. The bottles were kept at a constant temperature for 72 hours.
The values obtained (Table 2) confirm the pressure measurements. Weight loss is the same with or without the teaspoon.

With the stopper, there is no weight loss. The gas accumulates in the headspace of the bottle and escapes when the stopper is removed. The sound upon opening is evidence of this.
Nevertheless, the amount of gas dissolved in the liquid remains higher because the stopper limits the degassing of the champagne.
The degassing of sparkling wine depends on the pressure exerted above the liquid, but it also depends on the suspended matter it may contain and the imperfections of the container's surface.
If we observe several recently opened bottles, we can easily see that some release more gas than others.

As Professor Maujean explained very well in an article entitled: "Stories of Bubbles", the birth of a bubble requires that there be a "heterogeneous induced nucleation".

This bubble formation occurs from a potassium bitartrate crystal, a residue of yeast or stirring aid, or an imperfection on the glass surface. The phenomenon is identical in a glass.
To exaggerate this phenomenon, simply add a foreign object, such as a piece of pumice stone, to the opened bottle. Degassing is considerably increased in the presence of this impurity in the wine, as can be seen in the second part of Table 2.

TASTING

To confirm the physical measurements, the bottles were tasted in parallel.

With or without a small spoon, the effervescence diminishes but does not disappear completely, even after three days. Adding pumice stone completely degasses the wines and flattens them.
Tasting confirms that the small spoon does not improve the preservation of the effervescence.
On the other hand, wines from bottles fitted with a stopper exhibit superior effervescence despite the degassing following the removal of the stopper.
It should also be emphasized that, apart from the loss of effervescence, the wines are quickly marked by notes of oxidation which detract from the qualities of the wine.

CONCLUSION

We regret to debunk, with this study, the theory of the teaspoon that maintains the effervescence of champagne. Fortunately, we will not offend anyone, as the author of this "discovery" remains unknown.
A small spoon, even a silver one, placed in the neck of a bottle will never stop champagne from degassing. The laws of physics remain unchanged, so much for our Nobel Prize winner!
More seriously, we recommend using stopper caps; they limit gas loss and are often aesthetically pleasing and original.

But the best way to keep the effervescence good is to finish the bottle and to rediscover that delightful sensation... open another one!

Table 1

Nothing	1.55	1.60	1.40	1.52	0.95	1.00	1.25	1.07	0.85	0.85	0.80	0.83
Small spoon	1.80	1.55	1.55	1.63	1.30	1.00	1.05	1.12	0.90	0.90	0.85	0.88
Rouchon stopper	1.45	1.55	1.85	1.62	1.35	1.50	1.60	1.48	1.30	1.05	1.30	1.22
Capsule	2,0	1,75	1,95	1,90	1,95	1,85	2,00	1,93	1,70	1,80	1,75	1,75

Table 1. Pressure evolution (in bars at 20°C) during storage. Residual volume 250 ml

Table 2
Nothing 0.7 0.8 0.9 0.8 1.1 1.1 1.3 1.2 1.8 1.8 2.0 1.9
Small spoon 0.8 0.8 0.7 0.8 1.2 1.1 1.1 1.1 2.0 1.8 1.7 1.8
Rouchon stoppeur 0 this this this this this this this this this this this

After removing the stopper
0,8 0,8 0,7 0,8 1,2 1,1 1,1 1,1 ,8 1,3 1,2 1,1

Nothing + pumice stone 0.8 1.3 1.2 1.1 3.6 3.4 3.2 3.4 3.7 3.6 3.4 3.6 3.9 3.8 3.6 3.8
Small spoon + pumice stone 3.3 3.2 3.5 3.3 3.5 3.4 3.6 3.5 3.6 3.5 3.9 3.7
Bouchon stoppeur + pierre ponce this this 0,1 0 this this 0,4 0,1 this 0 1,0 0,3
After removing the stopper plug + pumice stone - - - - - - - - 1.4 1.6 1.7 1.6