Challenges of UK Organic Wine

– a Comparison with Organic Sugar Production

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Introduction

This is, of course, a story in two distinct parts :

- the vineyard [or field]
- the winery [or factory]

Introduction

Archaeologists are starting to find evidence that wine production was being undertaken as much as 6 millennia ago.

Those early days were in the region which we now call Armenia and Georgia :

Introduction

In terms of recorded history, at the end of the 5th century BC Thucydides noted :

The people of the Mediterranean began to emerge from barbarism when they learnt to cultivate the olive and the vine.

The Romans, however, were more precise in recording their practices : growing vines on trellises [rather than up trees] and preferring, where possible, steep hillsides to flatter lands.

Introduction

The truth, of course, is not anything like that : it was Dionysus – son of Zeus – who invented the grapevine and the winepress.

When his closest satyr friend died trying to bring him the vine, Dionysus forced the vine to bear fruit and he later invented wine. His fame spread and he finally became a god in his own right :

Modern Era

We should really refresh our memories about viniculture and oenology.

Modern Era

Given all of that history, it is a bit surprising that it was only in the modern era that we realised what was causing this [magical] transformation of grape juice into wine.

On the other hand it helps us understand why wine was so easy to discover as the lovely grape juice we made the other day became ... *wow, what a drink … oh hell! what's gone wrong now? We'd better call this stuff wineyuk or wineghur!*

Modern Era

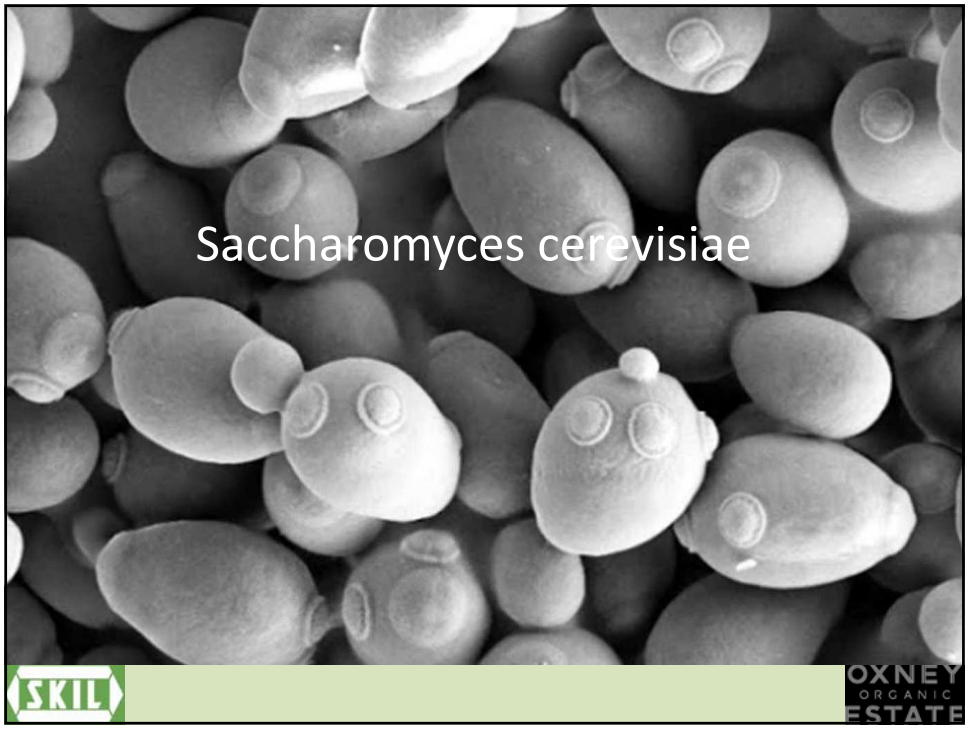
It was Louis Pasteur who first identified that microorganisms were involved in turning grape juice into wine. That was in the mid-19th century.

Pasteur also realised that the particular microorganisms were bi-modal : they worked both aerobically and anaerobically. He showed that alcohol was only produced in anaerobic fermentation and that poor hygiene and aerobic conditions led to acetic acid production.

Modern Era

The microorganisms were the ‘true’ yeasts which belong in the *Ascomycota* phylum of the kingdom of *Fungi* along with many other yeasts.

By the way, forget 'wild' yeasts in winemaking [or indeed whisky/brandy/rum making] … established wineries are so laden with their own selected strains that 'natural' fermentations are not really that, they are with Chateau Whatever's own strain(s) of *Saccharomyces cerevisiae*.



Modern Era

Finally, a quick look at the chemistry of alcohol production, probably the first bit of stoichiometry that we learn :

$$C_6H_{12}O_6 = 2(C_2H_5OH) + 2(CO_2)$$

Those of us who embraced the dark arts of fermentation inevitably also learnt a second bit of stoichiometry [taught by Mr AC ('Toe') Bacter] :

$$C_2H_5OH + O_2 = CH_3COOH + H_2O$$

Agriculture

Up until the 19th century all of our crops were 'organic' – albeit uncertified – because all fertilisers and weed / pest control methods were natural.

In that century demand for food drove mankind to create industrial fertilisers, essentially mining them or at least mining their feedstock [dinosaur shit makes superphosphate for instance].

Agriculture

However, it was really in the 20th century that things took off when Herr Doktor Fritz Haber worked out how to fix atmospheric nitrogen and hence make cheap ammonia / nitric acid / nitrates.

Of course, few in that chaotic century cared whether their food was organic or not, they most often considered themselves lucky to have any food at all.

Agriculture

Organic food [and drink] production requires us to go back to the days before mining : only 'natural' fertiliser, herbicidal methods and pesticides are permitted and the pesticides can only be used when really required.

[Having said that, some 'unnatural' chemicals – like Bordeaux Mixture for instance – are accepted.]

Agriculture

Not much certified organic sugar is produced in the world. The largest producer is Paraguay which is said to produce about 48 000 tons a year.

There is some production in other Central / South American countries but the second largest producer is probably Okeelanta in Florida at about 10 000 t/a.

Australia got excited about organic sugar 10 years ago but seems to have dropped the scheme.

Agriculture

It takes Okeelanta three years to convert a field to organic as residual conventional treatments are eliminated. During that time the cane is processed as non-organic.

In the third year, the field is ploughed out and a fallow crop – Okeelanta uses wet land rice – planted. The field is then ready for organic sugarcane production.

Agriculture

The certifiers prefer the seed cane to be 'organic' but, apparently, do accept normal seed cane.

The Okeelanta experience is that the organic plant cane yield is not that dissimilar to that of non-organic plant cane.

However, the second crop yield is significantly lower so the cane is ploughed out after two crops for another crop of wet land rice.

Agriculture

The two year cycle followed by fallow is very useful for organic sugarcane agriculture as it helps control pests and diseases.

The selling price of organic sugar justifies the high fixed cost of ploughing out after only two crops.

Agriculture

What is difficult to obtain, is hard data on yields from organic sugarcane fields.

There was a paper published in Australia in 2011 that concluded that there was no impact on yield when growing cane organically. It is difficult to believe that when one considers that the Australians trying organic production have reverted to non-organic cane.

Agriculture

Organic vineyards such as Oxney don't have that luxury of fallow crops because the vines are perennial of course. They have to start organic and stay organic for ever.

The one positive factor [even if the accountants don’t think so] is that no wine can be produced from young vines so the period required to get organic certification runs in parallel with the establishment of vine maturity.

Agriculture

What fertilisers are available to organic vineyards if traditional chemical NPK's are not?

It comes down to manure and, at an industrial scale, that probably means chicken droppings because the rest are difficult to obtain in bulk.

Agriculture

Herbicides are equally an issue.

There are only two acceptable methods available to an organic vineyard : manual/mechanical weeding and mulching.

Agriculture

Fungal diseases are the bane of live for viticulturists, in particular the mildews. Downy mildew and powdery mildew will both reduce yield significantly.

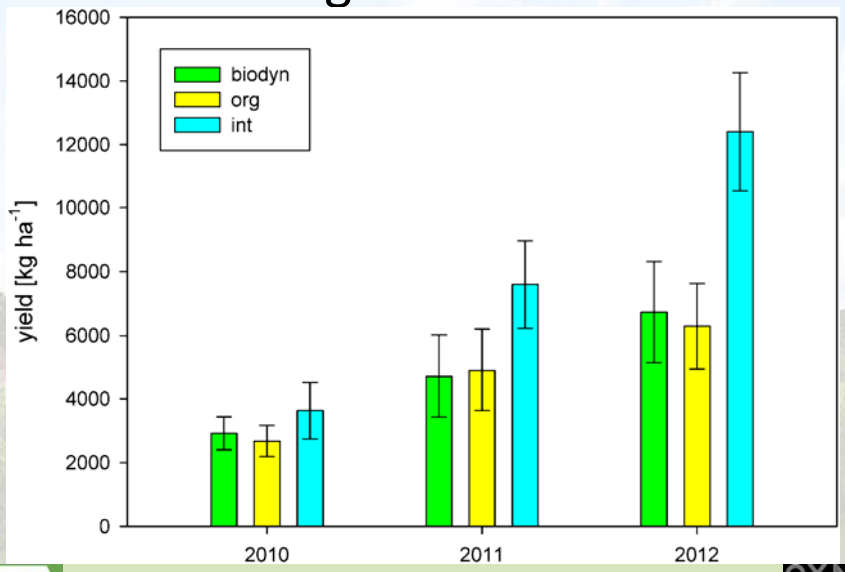
The rule for organic farming is only to intervene when absolutely necessary and, then, only to use natural fungicides : i.e. copper sulphate or Bordeaux Mixture.

Agriculture

As for sugarcane, it is difficult to obtain any hard data on organic grapevine yields.

There is a paper from 2015 on the subject but the results are, to say the least, varied :

Agriculture



Agriculture

The vines were planted in 1991 and the organic ones were converted from 2006 so the variability can, presumably, only be annual variation.

Industry

Wine making was, by default, organic from the very start. It was only in the modern era that winemakers had available the range of treatments that make modern winemaking so reliable and consistent [within the limitations of working with a variable crop!].

The above could equally be written as '*sugar manufacture … etc.*'

Industry

The Florida crop is from late September through to roughly Easter, dependent on the crop.

Okeelanta shuts for Christmas and then starts up with its one organic sugar production run of the year.

The plan is to partially liquidate over the shut so that the minimum loss of certified organic sugar is suffered as non-organic material is flushed out of the system.

Industry

The issues for organic sugar production at Okeelanta begin in the field where only green harvesting is permitted. FCC routinely burns its cane so is not geared up to the high trash levels of the organic cane coming in.

In practice it is not too serious a technical problem as throughput is limited downstream by poor clarification. Financially, the lower bulk density reduces the load of the cane trucks.

Industry

Biocides are forbidden so hygiene is a problem in the mills [but luckily the organic run only lasts a few days].

Imbibition also has to be with condensate or purified water and water quality control is seen as important.

Industry

Only lime and heat are acceptable for clarification. Some natural flocculants are available, but are not suitable for large scale production.

In addition, enzymes such as amylase are forbidden.

Similarly, no flocculants are permitted in the filter station and the wash water must be 'organic'.

Industry

The clarified juice is quite good at the beginning of the run but the mud is very thin and solids retention at the filters is poor because of the lack of flocculants.

The result is increased recirculation of thin mud into the limed juice and deteriorating clarifier performance.

This may, in part, be because of the mechanical harvesting.

Industry

No scale inhibitors are permitted in the evaporator station and strict organic CIP is imposed.

The resultant syrup has poor turbidity because of the poor clarification so an organic syrup clarification is required [at least for US customers]. Okeelanta uses membrane filtration for that.

Industry

As we all know, membrane filtration of syrups is not easy [particularly without biocides]!

It also reduces the overall yield since the retentate from the membrane system is sent back to the raw process and therefore the sugar recovered as conventional raw. The overall yield is considered acceptable but the organic yield is reduced.

Industry

Finally, product colour.

Most organic sugar is in the colour range 250-400 ICU so simply melting the sugar and recrystallization will reduce the colour to <50. No chemicals, just melt and filter.

However, some organic sugar certifiers do allow activated carbon for decolourisation if needs be – provided that it is plant based, organic carbon.

Industry

Organic wineries face similar problems to organic sugar factories with many chemicals not permitted if the wine is to be organic.

There are chemicals and treatments that are permitted however.

Industry

One of the issues with grape juice is the tartrate concentration which can give rise to potassium bitartrate precipitation.

As we have seen, holding the wine at low temperature forces the tartrate to precipitate so that it can be filtered out.

Industry

With respect to filtration and clarification in general, isinglass is a permitted fining agent for organic wine production.

Oxney does not use it because it wishes to sell wines suitable for vegans to drink. Instead, it uses bentonite as a fining agent when necessary.

Industry

The other issue with grape juice and hence with the wine is the amount of naturally occuring malic acid. Sometimes winemakers want the malic tartness [e.g. Gewürztraminer wines] but when they do not [e.g. Chardonney] they need to adjust it.

Organic winemakers use a malolactic secondary fermentation to do that. Lactic bacteria such as *Oenococcus oeni* convert the malic to lactic acid.

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Industry

Finally, there is the question of sulphite to preserve wine.

There is some natural sulphite in the grape juice which comes through to the wine. Additional sulphite is permitted under organic rules but only enough to keep the total sulphite at or below 100 ppm.

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Fusion : Dosage et Degorgement

We started by saying that this is a story in two parts : agriculture and production.

It is also a story in two different parts : sugar and wine. They come together in the making of sparkling wine ...

… and if that wine is to be organic then the sugar which is added needs to be organic.