

Best practices at wet processing pay financial benefits to farmers and processors



High quality coffee is demanded and well paid by international coffee traders and roasters. However, international clients are only willing to pay high prices for high quality.

Generally, Arabica coffee prepared via the wet method receive the best prices on the world market because it exhibits the most desirable taste characteristics. However, wet coffee processing requires a lot of care and knowledge as well as a lot of labour to produce a high quality product.

In order to achieve an optimum quality and price, a coffee processors should know the potential of the coffee grown in the area and then decide the best way to process his coffee. From a natural point of view, the higher the altitude in which Arabica coffee is grown, the better the inherent quality. Other influences on quality

play of course climate and soil conditions and the variety planted.

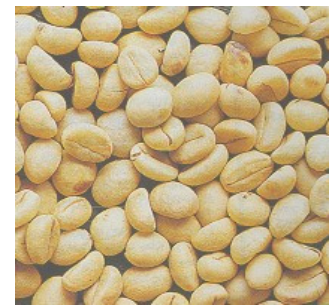
However, the most crucial step to turn Arabica coffee cherries into a well paid product is processing. Coffee processors must be aware of best processing practices in order to make use of the whole quality potential and must not spoil quality by inadequate processing techniques.

“Washed” and “unwashed” coffees

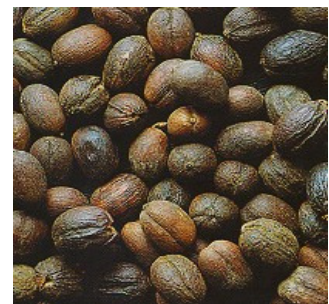
Internationally, “washed” (Spanish: “lavado”) or “fully washed” are expressions suggesting a good quality Arabica coffee derived from wet processing. Washed is used for coffee which has undergone a fermentation step including a thorough cleaning after fermentation. The expression “semi-washed” coffee often causes confusion as people mean

different processing techniques. The expression semi-washed is mainly used for coffees which are pulped and then left for drying without prior fermentation.

Carefully processed washed coffees are higher valued than unwashed coffees as they exhibit a fine acidity, are generally lighter in body and “cleaner” in cup than unwashed coffees.



Picture 1:
Clean, dry parchment: **washed**



Picture 2:
Dried cherry: **unwashed**

Quality starts in the field

The first step for producing quality, is good field maintenance, suitable climate and soils, fertilisation and control of pests and diseases. Only a healthy coffee tree will carry good cherries.

Post Harvest Processing Arabica Coffee

During harvesting, it is important to pick cherries selectively, only the red and ripe coffee cherries. The fully ripe cherries will run smoothly through all steps of wet processing and will develop a good aroma during roasting and will be appreciated by buyers.

Green and unripe cherries develop a peanut like, grassy or green taste in the cup, leading to quality discounts. More serious defects are black beans, stemming from cherries which have been dried on the tree already or collected from the soil. Beans which are overripe, rotten or have started to ferment in the cherry already due to long delays between picking and processing also need to be avoided by all means.

Coffee must be delivered to the processing line as quick as possible to avoid set on of fermentation.

Selective picking for only ripe and red cherries requires more work but will produce higher quality. Stripping of coffee, i.e. just brushing off cherries from the tree must be avoided, because no differentiation between ripe, unripe and defected cherries can be done.

Cherry reception

At cherry reception, the processor should make sure that the coffee delivered is of good quality by tipping out the bags and taking a sample of cherries for evaluation. If there are too many green and/or already fermented/rotten cherries



Picture 3:
High Percentage **defected cherries and foreign matter**

(more than 10 to 15%), it is advisable not to process this coffee at all as it has the potential to spoil the whole coffee lot. Low quality cherries should be rejected at delivery or sorted out as early in the process as possible. Later removal of defects is time consuming, expensive and not all defects will be eliminated. Low quality cherries will be detected by clients when they are roasted and cupped!

It should also be borne in mind that every defected bean results in the same costs as a high quality bean for transport, storage and machine capacities. However, it creates only little financial return. It must be the goal of processors to avoid defects as early as possible during processing, that means at cherry reception!

Green Bean defects due to natural conditions and harvesting



Spotted beans
Fungus infection in field, lack of fertilisation



Immature Bean, Quaker
Picking of unripe cherries



Black bean
Cherries collected from the floor



Withered Bean
Insufficient field husbandry

Post Harvest Processing

Arabica Coffee

Pre-cleaning and floating

Weather conditions during processing time in Vietnam are wet and therefore mud sticks to the cherries delivered to the processing line. Dirt and foreign matter like sticks, leaf and stones need to be separated before lead to the pulpers to avoid damage of machines. This is ideally done with water on perforated metal screens.

In a second step, cherries should be fed into a siphon to eliminate floating cherries and other light material of red and ripe cherries. This technique makes use of the different density of coffee cherries: ripe cherries will sink to the bottom while rotten cherries will float and can be discarded easily.

Pulping

Although many Vietnamese coffee processors use green cherry separators in front of the pulpers, the experience shows that still a high percentage of unripe cherries are processed. The concept of making more quantity appears to be unfortunately more prevailing than the concept of quality.

From a mechanical point of view, pulpers and green cherry separators must be maintained regularly and spare parts must be at hand. Operational results must be checked regularly by visual examination of the product.

Due to overloading or sticks and stones in pulpers,

pulper blades wear off and deform so that they possibly harm coffee beans and parchment. As soon as only the protective parchment husk is damaged, beans will



Cut and broken parchment
Too much pressure on green cherry separator

Cut beans

Problems with pulping blades be more exposed to the environment and therefore prone to deterioration during drying and storage. Parchment and beans must not be damaged during pulping.

Demucilating

The technology of mechanical mucilage removal has been developed in Columbia and Mexico in order to reduce total water consumption for processing by skipping the fermentation and washing step. In addition, it has also been considered to bring economic benefits to processors because wet coffee can be handled

quicker when the time consuming fermentation step is left out.

In the process of demucilation, the friction of beans moving against each other is used to remove the mucilage. Beans are fed into the bottom of a cylindrical device in which beans are conveyed upwards. The pressure and movement of beans against one another is sufficient to remove most of the mucilage. At some parts, however, mucilage will remain, especially in the difficult accessible centre cut of the bean where it will slowly ferment off at later stages but will give the centre cut a slightly dirty appearance at roasting.

Fermentation

Natural fermentation is a biological way to remove the slimy, hygroscopic mucilage layer from the parchment in order to prepare it for later drying.



Overfermented or Stinker Bean

Too long time between picking and processing, insufficient cleaning of fermentation tanks and machinery

During the preparation of fully washed coffee, the pulped coffee is led into the fermentation tank where it is

Post Harvest Processing *Arabica Coffee*

Wet processing

left around 36 hours. During this time, enzymes of fermenting bacteria will grow in the wet and warm conditions of bulked parchment and are turning simple sugars (mono-sacharides) into acids. The removal of the slimy mucilage cover of the bean appears to be closely related to the increasingly acid conditions during fermentation. Therefore, slightly acid conditions (pH 4,5 to 5) are needed in the tank to achieve a full removal of the mucilage during fermentation. However, too acid conditions need to be avoided.

In order to maintain good conditions for fermentation, most care and attention has to be paid. If conditions for fermentation are not right (too cool ambient air or water, exceedingly acid environment, too little available oxygen), fermentation will happen only slowly or not at all. It must be made sure that the temperature of the processing water is around 20 C, sufficient oxygen should be dissolved in the water and the acidity of the water should not be lower than pH 6 at the beginning of pulping operation. These conditions will allow fermenting bacteria and enzymes to create the desired environment for fermentation.

In order to raise the temperature, increase the demucilating enzymes in the

fermentation tank, slowly increase acidity, keep the amount of oxygen dissolved in the water at high levels, it is suggested to recycle filtered pulping water and lead it through the freshly pulped coffee. This will greatly speed up the fermentation of simple sugars and will slowly increase acidity for removal of polysaccharide pectins.

Washing

After fermentation has fully removed the mucilage layer and the parchment fills rough and grippy in the hands, parchment needs to be washed to remove remaining fermentation by-products like acids, alcohols and disintegrated pectins. If not done so, the liquefied mucilage in the tanks will discolour parchment after a while and provides a good growing ground for moulds and yeasts. Therefore, parchment must be washed to remove all remaining mucilage and the coffee will be white and clean before further processing.

In Kenya, a supplier of highest quality coffee, processors apply a “two step dry fermentation procedure” in which parchment is fermented under fully drained conditions in fermentation tanks. After washing, parchment is soaked under water for an additional period. The soaking found to have positive effects on raw and roasted bean appearance. This effect has been attributed to the result of



Picture 4:
Demucilated parchment stored in silo for 12 hours and recycling pulping water through the wet parchment (left) the and parchment stored in plastic bags without washing (right)

some otherwise deleterious water soluble chemical components diffusing out of the bean.

Demucilated vs. fully washed coffee

In terms of cup quality, it is often claimed by traders that fully washed coffee delivers better quality than demucilated coffee. From a technical standpoint, this is not necessarily true. According to research carried out in Columbia, lower cup qualities have been only found when mechanically demucilated parchment is put from demucilators directly into driers. A flat, grassy taste and little acidity has been detected organoleptically by experts. However, the same coffee processed with a fermentation and washing step exhibited better taste characteristics as one would expect from this very coffee.

Post Harvest Processing Arabica Coffee

Wet processing

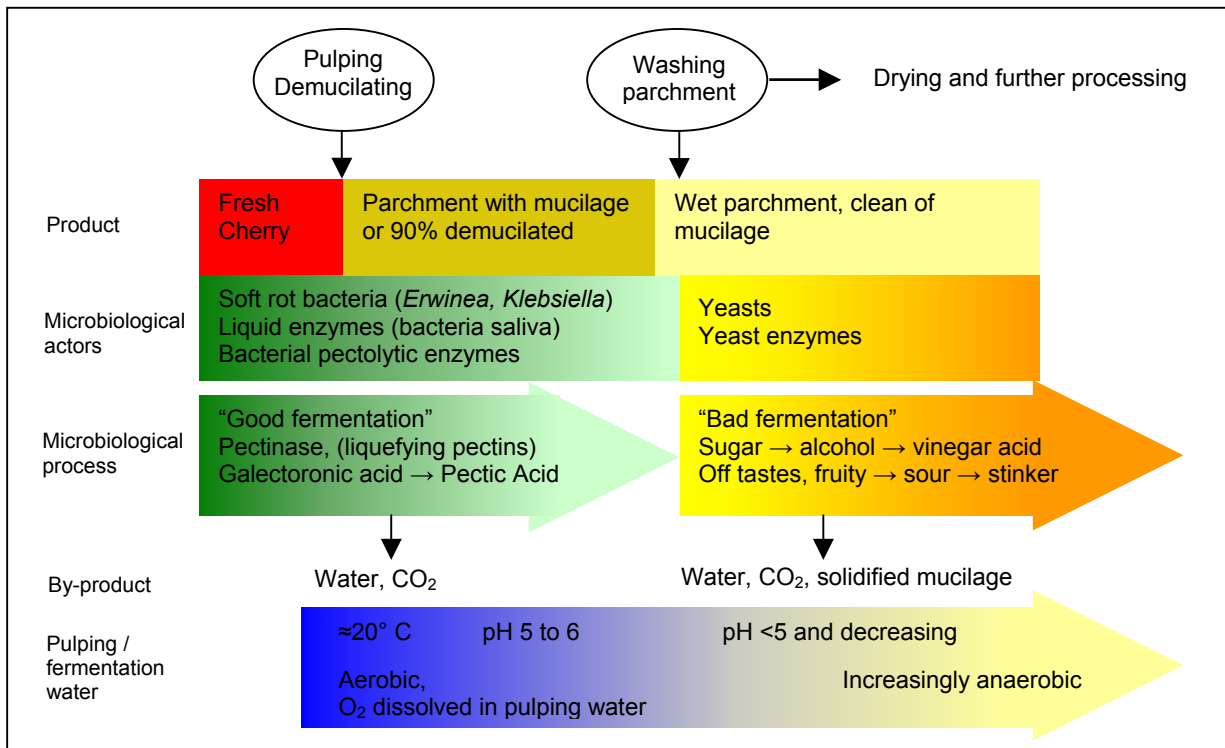


Figure 1: Processes during fermentation

Latest research suggests that not the fermentation itself develops acidity and aroma in the coffee cup but rather the time in which the pulped/demucilated, wet parchment is left in fermentation or storage tanks before drying. The time during fermentation with warm and moist conditions might stimulate processes in the bean which cause a biochemical restructuring, leading to the development of desired acidity and aroma carriers. Therefore, wet demucilated coffee should be left in bulk for "finish" fermentation" (e.g. overnight in fermentation tanks, silos, etc.) before drying and thorough washing, quality characteristics like acidity will increase and the

green/grassy taste will be reduced.

In terms of cup defects, demucilated parchment is less prone to fruity flavour, sour and stinkers caused by overfermentation because mucilage and sugars are removed mechanically rather than by microorganisms. However, when demucilated coffee is stored too long in wet condition or airtight in plastic bags, moulds and yeasts will be developing, resulting in cup defects and possibly OTA.