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Classification and Grading of Green Coffee Beans in Asia

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INTRODUCTION

Asian countries cultivate almost 28 % of the total coffee beans produced in the world (World Atlas, 2016). It's known for producing some of the world's greatest and most unique coffees. The taste of Vietnamese or Indonesian coffee, for example, are two flavors that some coffee enthusiasts will travel thousands of miles for (Byloos, 2018). Additionally, it represents an important source of income. However, the question is, how do the growth location and production methods of same species of coffee beans make them taste differently?

Coffee is graded and classified for export with the aim of producing high-quality coffee and thereby ensuring the fair price. However, there is no universal grading and classification system, thus each producing country, like Indonesia, Philippines or Vietnam - they produce coffee or coffee mixes under their own standards.

The aim of this article is to promote a regional classification or grading system for green coffee beans. A system, which is qualitatively and quantitatively measured based upon scientific testing and sets values for coffee according to the region's coffee drinking preferences. Hence, it facilitates more options and a fair system of pricing.

The well-known grading describes the size of the bean and are commonly expressed in 1/64 of inch. For example, beans of grade 18 will pass through screen 18 (holes with a diameter of 18/64") but are retained by screen 16 or 17. The theory behind classification based on bean size is that coffees of the highest altitudes are more dense and larger in size than those produced at lower altitudes. Similarly, coffees develop more slowly at higher altitudes and often have the best flavor profiles. The size and size distribution of beans also have impact on the optimization of roasting conditions (International Coffee Organization, 2018).

CAFFEINE'S EFFECTS ON THE BODY

Caffeine affects the body by reducing the adenosine signal, more clearly, inhibiting the binding of adenosine which keeps the adrenaline level normal. Caffeine binds the same

receptor except inhibiting adrenaline or epinephrine. In other words, caffeine facilitates the excitatory chemicals that keep humans awake. Coffee does not energize but keeps the brain alert and awake. There are reports that people who drink coffee regularly have lower risk of developing Alzheimer's and dementia. However, over-indulging in coffee can cause side effects.

CONSUMPTION AND CONSUMER PREFERENCES

Some Asian countries such as Japan and South Korea already have a very developed coffee consumption culture. China, because of its large population, surpasses early adapters. In other countries such as Indonesia, Malaysia, Philippines, Taiwan, Thailand and Vietnam where 20 years ago there was no coffee consumption culture, coffee is becoming popular.

Fig. 1 shows the average imported coffee in the form of green (70 %), roasted and soluble, indicating that coffee is mainly processed internally. The only market where green coffee represents less than half of imports is Indonesia. Imports of processed coffee, mainly soluble, make up 53% of total coffee imports (International Coffee Organization, 2018).

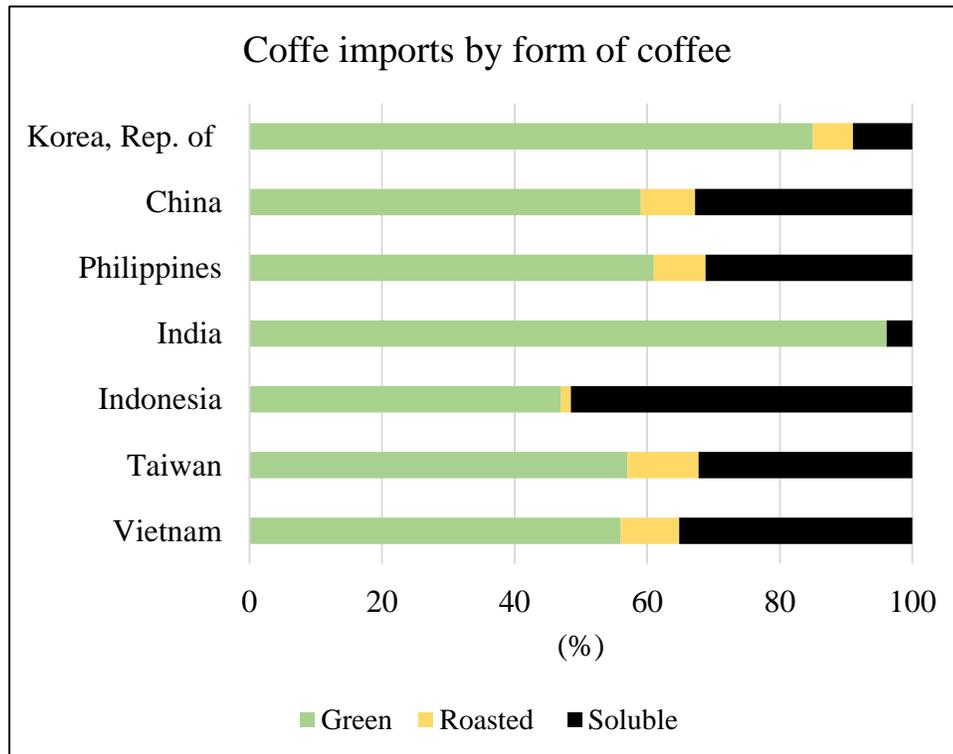


Fig. 1. Coffee imports by form of coffee, average volume 2012-2016 (International Coffee Organization, 2018)

Simultaneously the search for better quality and flavor also rises. When a customer buys coffee beans from the supermarket or orders a cup of coffee at the local coffeeshop, that person likely would like to have quality coffee beans according his/hers taste. For instance, it is better to have an option to buy traditional, strong coffee, which is grown in

low altitudes in Indonesia, Vietnam, Philippines or sweet, fruitier flavored, coffee grown in the mountains of Ethiopia or Kenya.

CLASSIFICATION

As mentioned in the introduction, there seems to be some correlation between size and flavor of coffees, however this relation is not accurate. The International Coffee Organization (ICO) therefore mentions more classification systems for green coffee that correspond further to coffee flavor.

- Altitude and/or region
- Botanical variety
- Preparation (washed or natural process)
- Bean size (screen size), sometimes also bean shape and color
- Number of defects (imperfections)
- Roast appearance and cup quality (flavor, characteristics, cleanliness...)
- Density of the beans

However, these classifications are diverse, open to confusion and misinterpretation regarding the ‘transferability’ and ‘reproducibility’ of certain descriptions and terminologies between producing countries.

PROCESSING OF COFFEE CHERRIES

Processing of coffee cherries mainly consists of washing coffee cherries with water, followed by removing the pulp and skin, and then drying for 30-40 days. Another way of processing is to naturally dry and ferment the coffee cherries under the sun for 30 days. This fermentation influences the taste and makes for sweeter, less intense coffee.

Coffee bean extraction processes from the pulp influences the aroma (Fig. 2). According to the method used for processing the well ripened coffee cherries, the world coffee bean production is classified as “dry natural”, “pulped natural”, “wet hulled” or “fully washed”. These processes are applied to remove the mucilage and to reduce the moisture content of the bean.

In Indonesia the farmers make use of de-pulping machines that take out the outer skin, and de-hulling machines that free the beans from the dried hull, called “luwak”. Mucilage remains coated on the beans, that are stored for up to a day to dry, then the mucilage is washed off in a semi-wet process and the coffee is partially dried to 30% to 35% moisture (Poltronieri & Rossi, 2016).



Fig. 2. Structure of the ripe coffee cherries (Gleason, 2014)

Growth location makes huge differences also in coffee quality. For example, when comparing Indonesian with Ethiopian coffee, it is found that in Indonesia most of the

coffee beans are grown at low altitudes, while Ethiopian coffee beans, on the other hand, are grown on the mountains.

Roasting

The coffee roasting consists of cleaning, roasting, cooling, grinding, and packaging. Czerny and Grosch identified some odorants of raw Arabica coffee and their changes during roasting (Czerny & Grosch, 2000). Dark roasting beans results in savory flavors.

Brewing

Coffee can be brewed depending on how the water is introduced to the coffee grounds: decoction (through boiling), infusion (through steeping), gravitational feed (used with percolators and in drip brewing), or pressurized percolation (as with espresso). Most practiced brewing methods are:

- French press (total emersion)
- Pour over coffee (chemex)

The French press is considered one of the oldest and simplest methods to brew coffee. Despite its simplicity, however, it can be a little tricky. The most important part of the process is to not leave the coffee in the French press for too long after pressing (Kitchn, n.d.).

FACTORS THAT AFFECT THE CHEMICAL COMPOSITION OF THE GRAINS AND FLAVORS

Complex chain of chemical transformations affects the coffee flavor in processing. Prior to roasting, green beans have hardly any noticeable odor, or indication of the coffee aroma. However, all the necessary precursors to generate the coffee flavors are in there. The levels of these precursors and biochemical status may vary in relation to genetic traits, environmental factors, maturation level, postharvest treatment, and storage (Poltronieri & Rossi, 2016). Biochemical qualities were studied in immature and mature green coffee suspensions incubated under air or argon. Aerobic incubation triggers the fragmentation or digestion of the 11-S seed storage protein and the release of free amino acids (Chu, 2012; Clarke & Vitzthum, 2008; Guyot et al., 2007; Lee, Cheong, Curran, Yu, & Liu, 2015; Vinícius de Melo Pereira, Soccol, Brar, Neto, & Soccol, 2017).

Desirable flavors have been described, as bright or dry-highly acidic leaving a dry aftertaste; caramel or syrupy; chocolatey-aftertaste similar to chocolate or vanilla; earthy-a soil-like quality; fragrant-an aroma ranging from floral to nutty to spicy, etc.; fruity-having a berry scent; mellow-a smooth taste lacking in acidity but not flat; nutty; sweet-a lack of harshness; wild—a flavor considered favorable; winy-aftertaste-resembling a mature wine (Flament & Bessière-Thomas, 2002).

Elimination of pesticides and heavy metal residues in agricultural products is also one of the key successful adoptions of high-quality coffee standards as well as promotion of related agricultural products (Dao Bach Khoa, Nguyen Thi Nhung, & Nguyen Van Liem, 2015). Categorization of coffee according to the taste related traits will also clarify the appeal for the coffee type. Golden Mountain coffee growers in Thailand must be mentioned as an example, since they put a special care, both before and after processing, to inspect beans and ensure the export of only the finest choice of high-quality products. Both electronic light sensors and individuals pick out imperfections, ensuring that when the beans reach roasters and customers, they reflect all the hard work involved in growing

and processing them. They use special food-grade packaging to seal in freshness and ensure that excellent cupping scores are maintained from origin to roastery. The staff constantly visit partner producers and oversee drying, hulling, storage, exports, and imports, maintaining quality along the entire supply chain (Poltronieri & Rossi, 2016).

Naturally, there may be a question regarding low graded coffee beans. What will happen to these beans and farmers who produce them, including their business? The counter argument will be, the grading or classification system will aid to clarify the customer preference and optimize the cost-effective coffee bean production. After all, why invest on low resulting yield? Although, cultivation of high-graded beans might affect the farmers' livelihood, the branded coffee roasters such as Starbucks and Nespresso are willing to pay for the privilege.

Governments of Asian countries can encourage in improving the coffee industry by enacting policies which promotes grading and categorization of green coffee beans. After government adoption of the classification and grading, the importers will have more confidence in purchasing and will reduce the rejection. For instance, in 2005-2006 harvesting season, the amount of coffee rejected in the LIFE market (London) was about 708,250 bags 88% of which are imported from Vietnam (Tran & Vu, 2017). Coffee bean classification and grading, especially regarding flavor is important not only because of product quality, but also clear identification of the taste and acidity. Additionally, grading of Asian coffee can contribute marketing and appreciation of different types of regional coffee at the same time providing many selections for coffee lovers.

CONCLUSION

Despite the success, expansion of coffee production in Asia, the producers must face considerable challenges in order to improve the quality, classification and develop regional standardization. Properly classified and labeled coffee not only generate more revenue but also make the regional coffee more appreciated. Thus, a regional classification system will not only help to market the local coffee beans, but also make the coffee bean production more uninterrupted and sustainable. Therefore, this is an opportunity for regional coffee producing countries to develop a flavor related classification or grading system.

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