Identification and quantification of regular coffee in peaberry coffee by NIR spectroscopy and multivariate analysis

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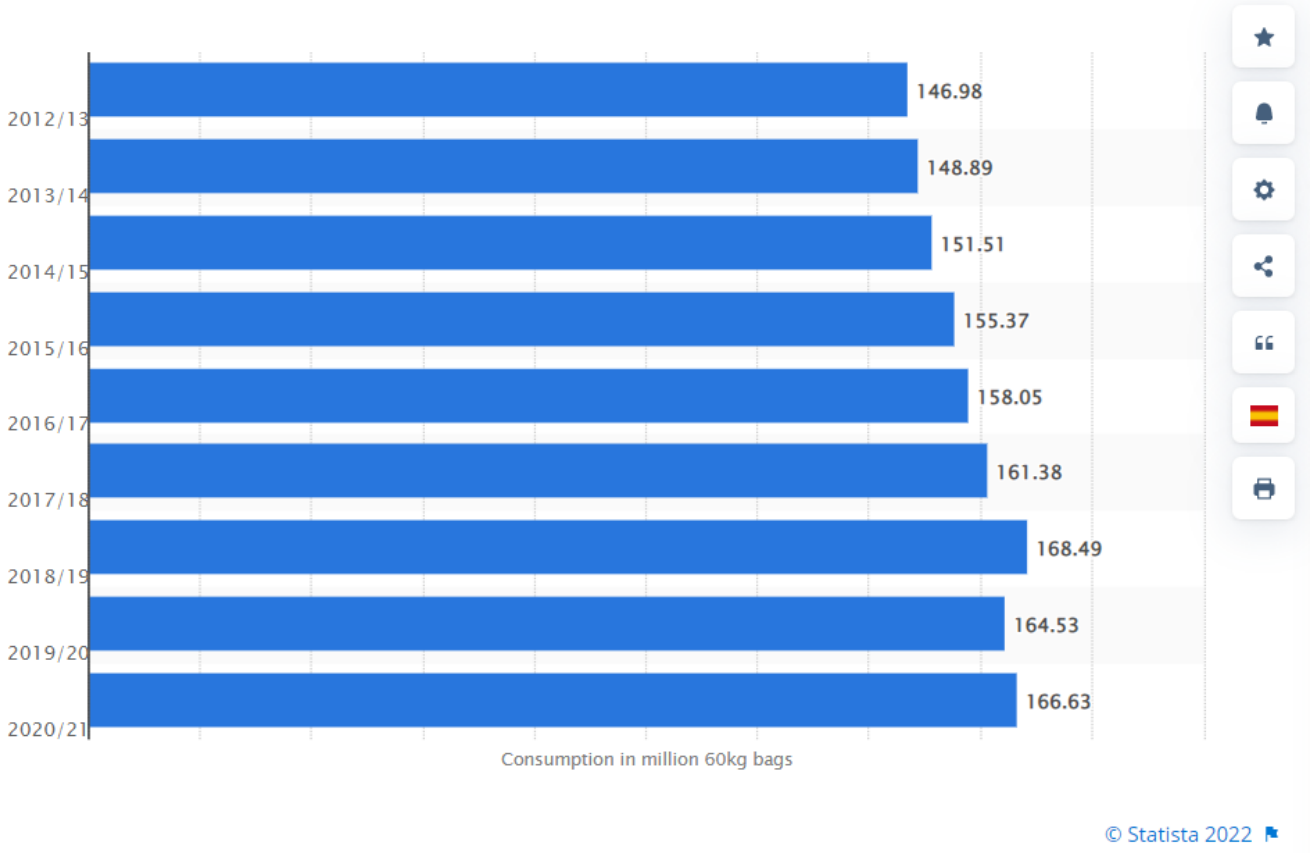
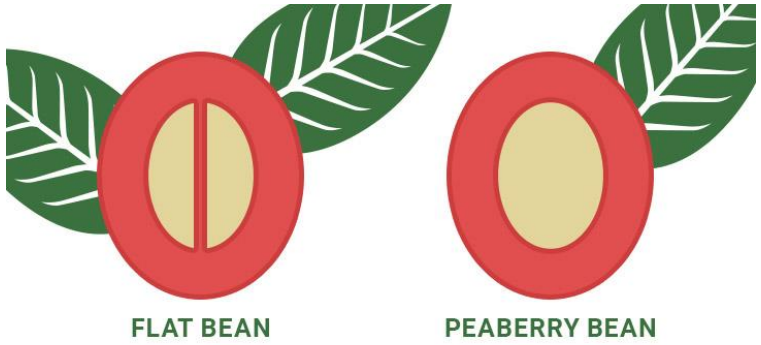
Introduction



Credit: Sonny Tumbelaka, AFP/Getty Images

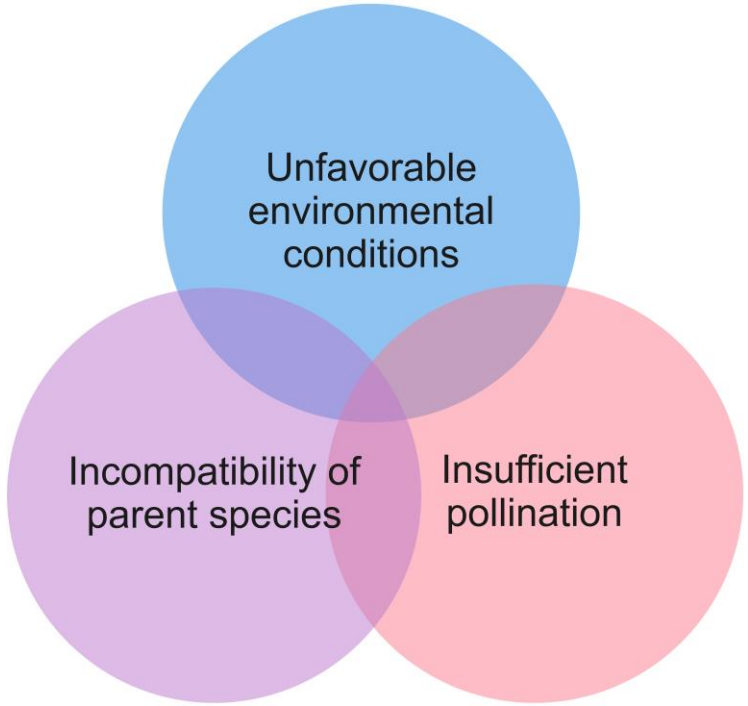
7-15% of the total harvest, due to natural mutation.



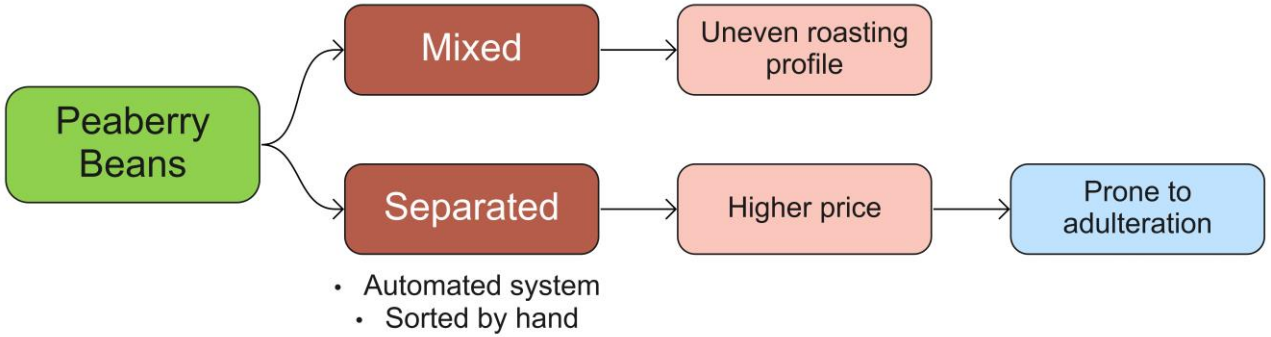
Credit: Coffee Bean Corral

Introduction

Factors influencing development of peaberry coffee beans:

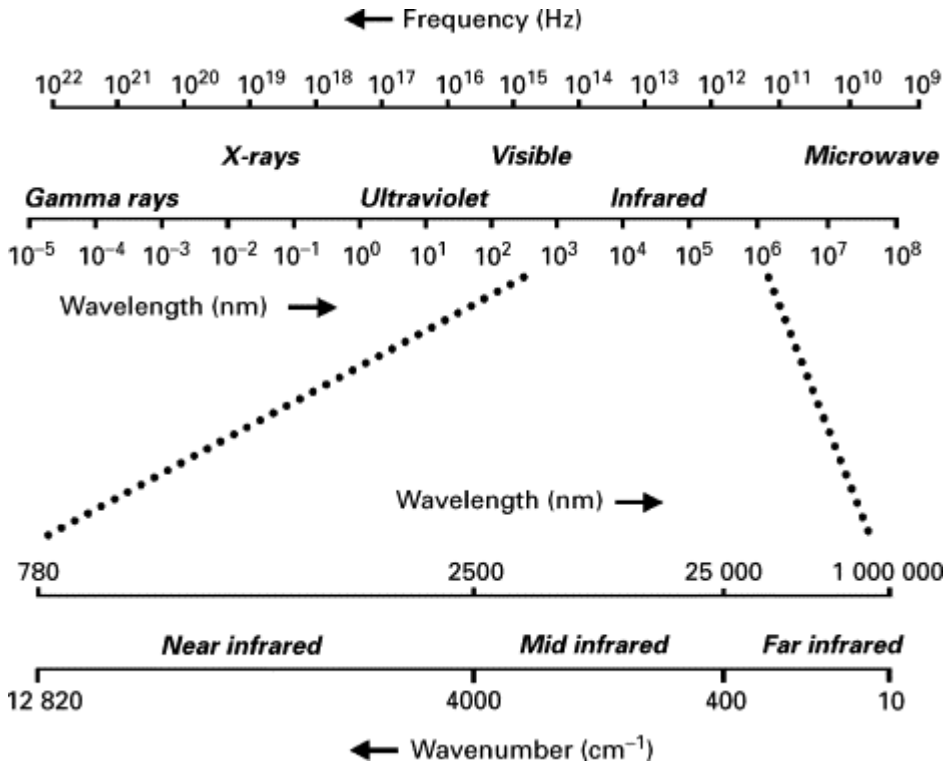


Resulting in failure to fertilize one of two ovaries, or failure of an ovary to develop into an endosperm.



- Adulterations in coffee industries:
  - Civet coffee with non-civet coffee (Sugianti et al., 2016)
  - Addition of corn in Peaberry coffee using UV-Vis Spectroscopy (Yulia & Suhandy, 2021)

Introduction



Discrimination between mature and immature beans

Prediction of coffee roasting degree

Detection of defects in green coffee

Green coffee beans quality

Quantification of regular coffee in off-/on-line mixing of Peaberry coffee

Materials

- Two green coffee samples (peaberry and regular) are obtained from a coffee producer in Bangli region, Bali, Indonesia.

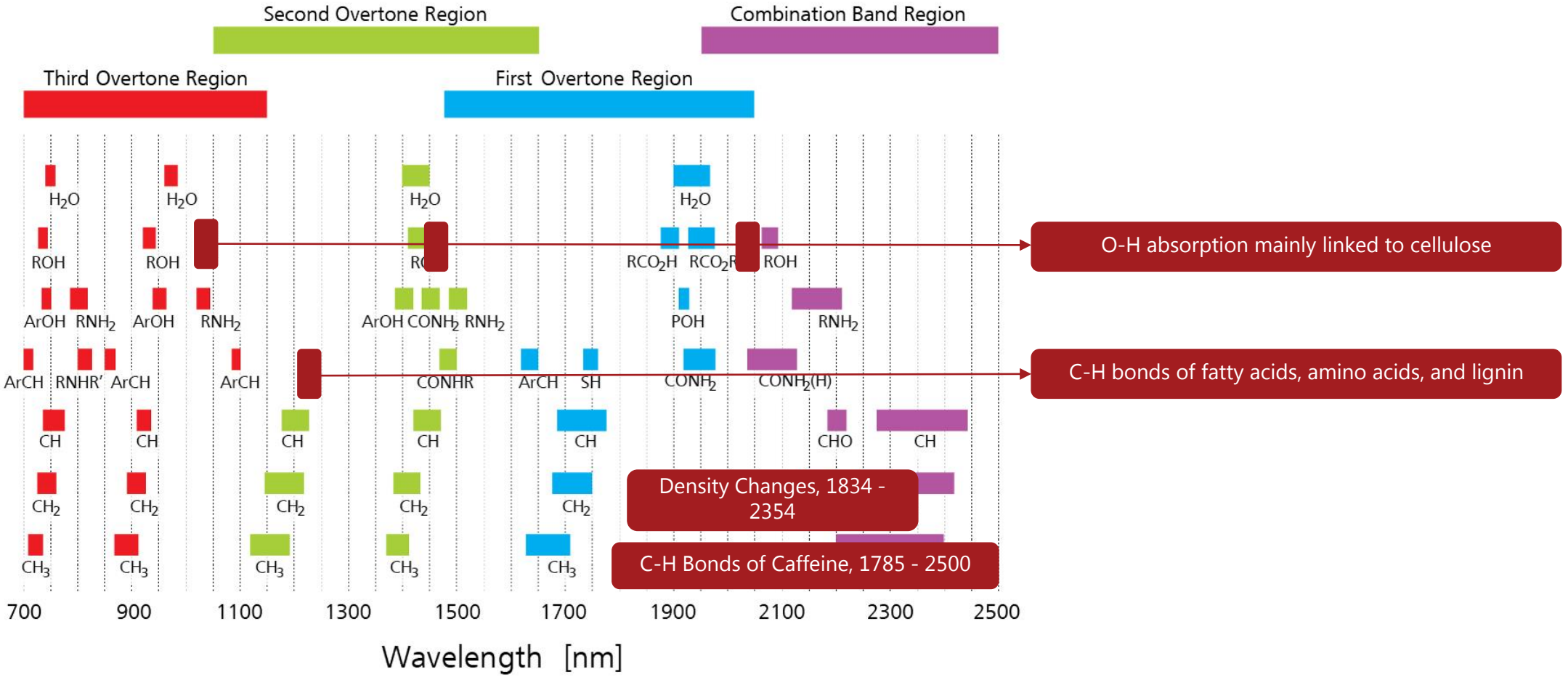
- Both beans are Arabica coffee processed by a full-washed process.
- Both samples are mixed with 11 different combinations (on-line from 100:0 to 0:100) and roasted at constant power input for 5 different roasting times (8, 9, 10, 11, and 12 min). To recreate off-line mixing, peaberry and regular coffees are mixed after roasting.

Methods

- **Spectral Data Acuisition** is carried out using a NIR spectrophotometer (Q-Interline) where NIR spectra are collected from 10,000 – 4,000 cm^{-1}, with a resolution of 8 cm^{-1} from 64 scans. Three replicates are collected or each sample, using a background of PTFE diffuse reflectance standard.
- **Multivariate Data Analysis**
  - NIR spectra are pre-processed using PLS_Toolbox working under Matlab2021b. The following pre-processing treatments are applied to test for their effectiveness.
  - Principle Component Analysis → data exploration
  - Partial Least Squared Regression → predicting the regular coffee content, and total color changes.

Methods

- Selected wavelengths:



Thank you very much ☺