

# Peaberry Coffee Beans Shape Influence in Final Cup Quality

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## Introduction

- Peaberries are small, ellipsoidal coffee beans from single-embryo fertilization.
- Factors like environment and pollination issues cause their formation.
- They make up 5-7% of coffee crops, with some Ethiopian varieties reaching 16%.
- Peaberries, though seen as defects, often have better quality due to uniform drying and roasting.
- The study compared peaberries and standard beans in terms of drying, roasting, and mechanical properties.
- Tests evaluated peaberries' impact on coffee quality.

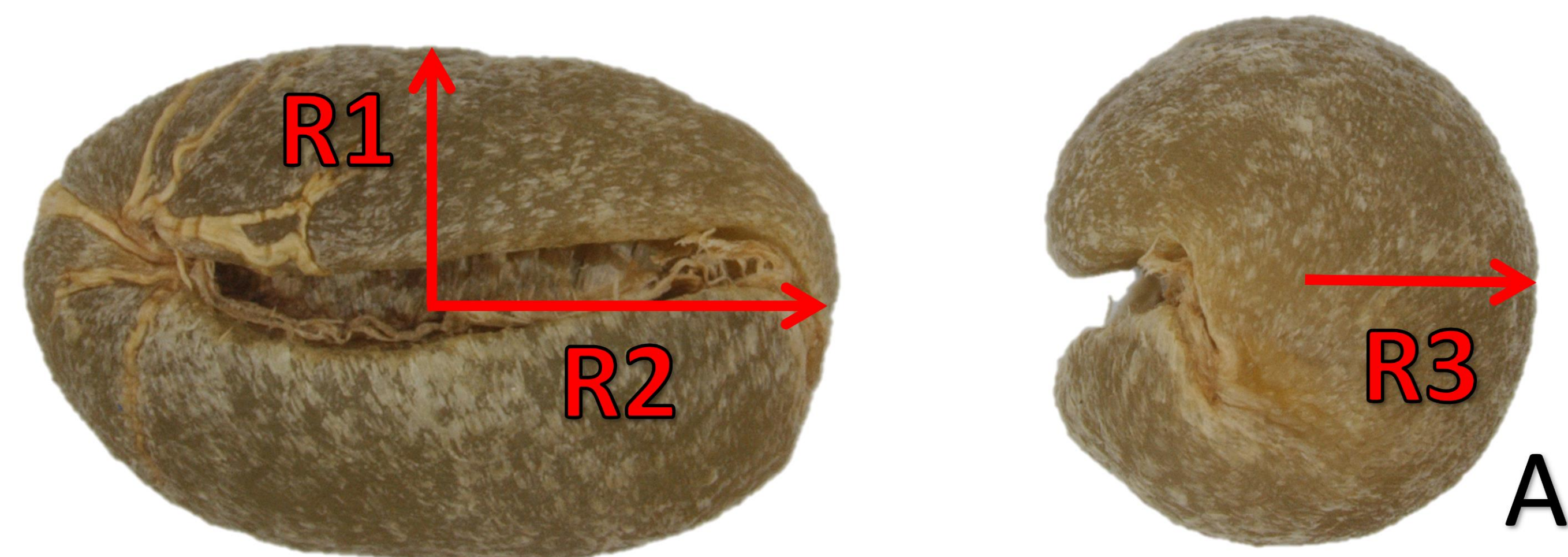


Figure 1. Peaberry radiuses.

## Methodology

- The study used *Coffea arabica* L. var. **Cenicafé 1** from Cenicafé, Manizales, with beans picked in Chinchiná.
- Beans were processed via wet method to obtain 8 kg of dry parchment coffee at Cenicafé (4.991873, -75.597159; 1306 m.a.s.l.).
- The coffee was roasted in a **PROBAT** roaster at **200°C** for **8-12 minutes** to a medium-high profile 55 agron.
- Evaluated characteristics:
  - **Orthogonal dimensions**: Mitutoyo 293-340-30 IP65 digital micrometer ( $L, w, t$ ).
  - **Drying**: Gravimetric principles ISO 6673:2003.
  - **Roast profiles image analysis**: Fiji.
  - **Compressive and shear tests**: MARK-10 ESM 1500S testing machine.
  - **Colorimetry**: Konica Minolta CR410 Chroma Meter colorimeter.
  - **Coffee cupping**: Q-Grader panel (SCA protocol)



Figure 2. A. Compressive and shear tests. B. Colorimetry

## Results

- After evaluating the beans in the mentioned processes, the peaberries displayed:
  - Reduced orthogonal dimensions.
  - Faster drying times (15vs. 18h).
  - More uniform compressive and shear forces for failure.
  - Uniform roasting profiles in the inner domain.
  - Score of 81.77 vs 81.97, both “very good specialty coffee” SCA.

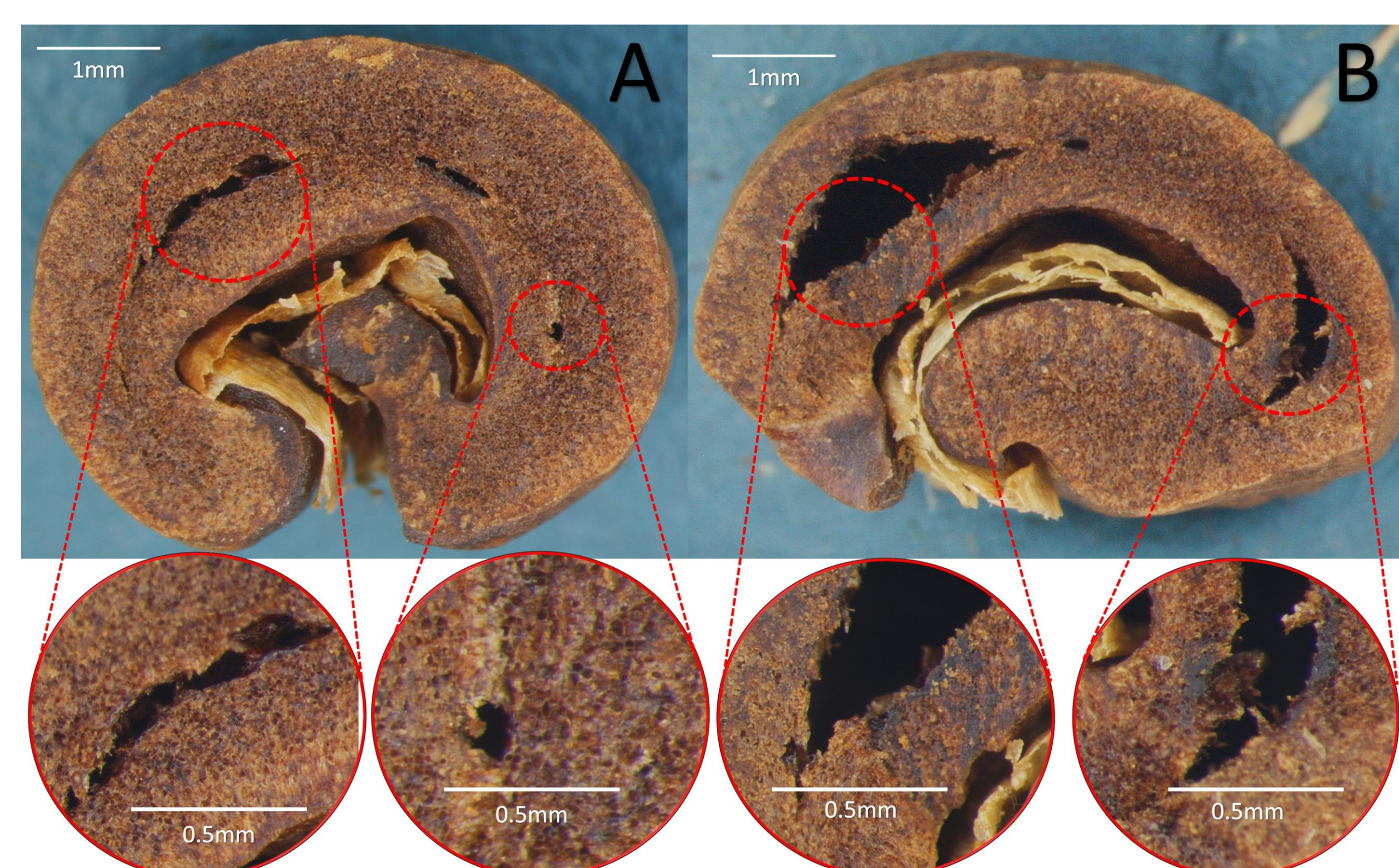


Figure 3. Inner domain comparison.

- Bigger air gaps are seen in the standard bean:
  - × Burned edges (low air thermal conductivity)

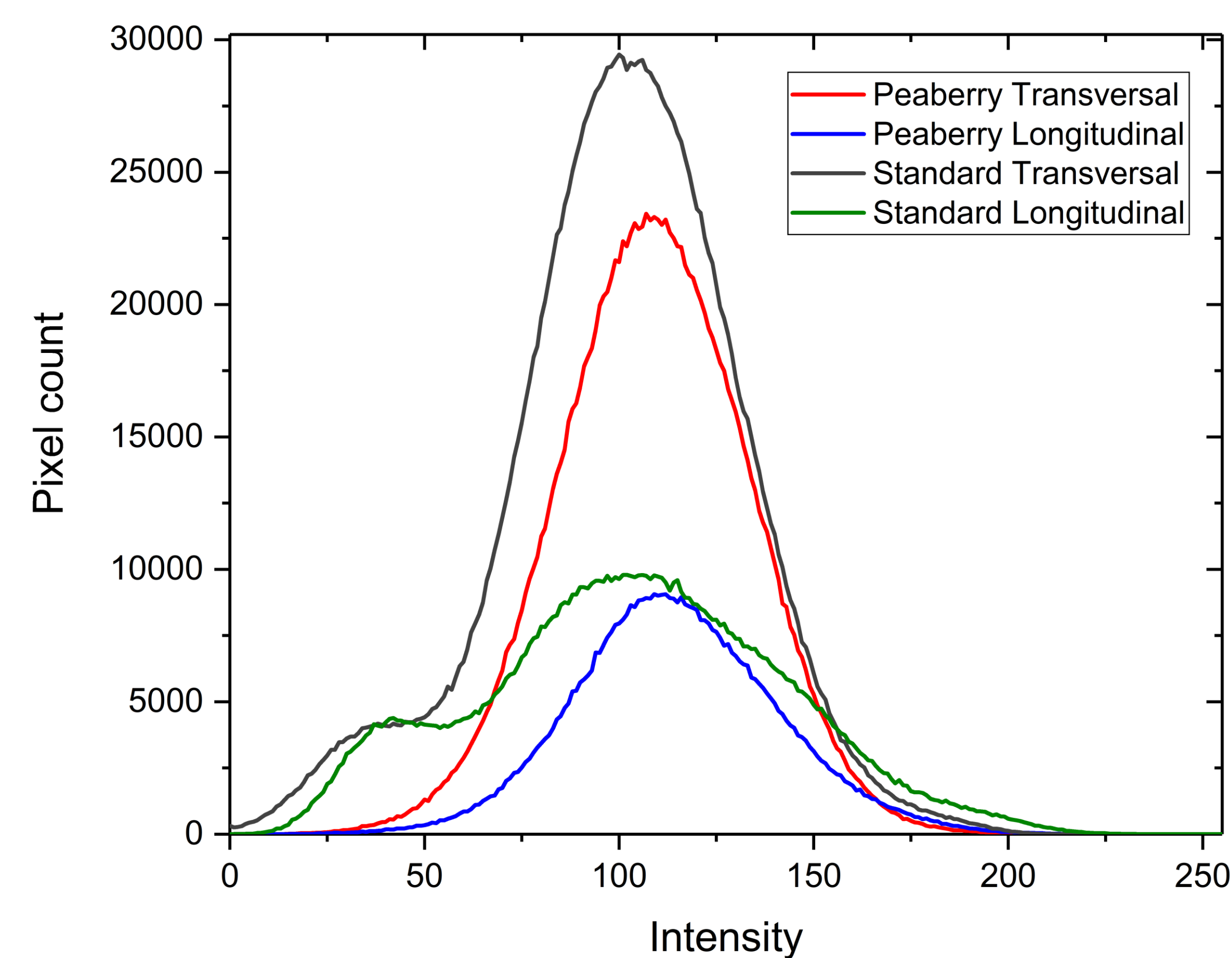


Figure 4. Transversal and longitudinal cuts colour intensity.

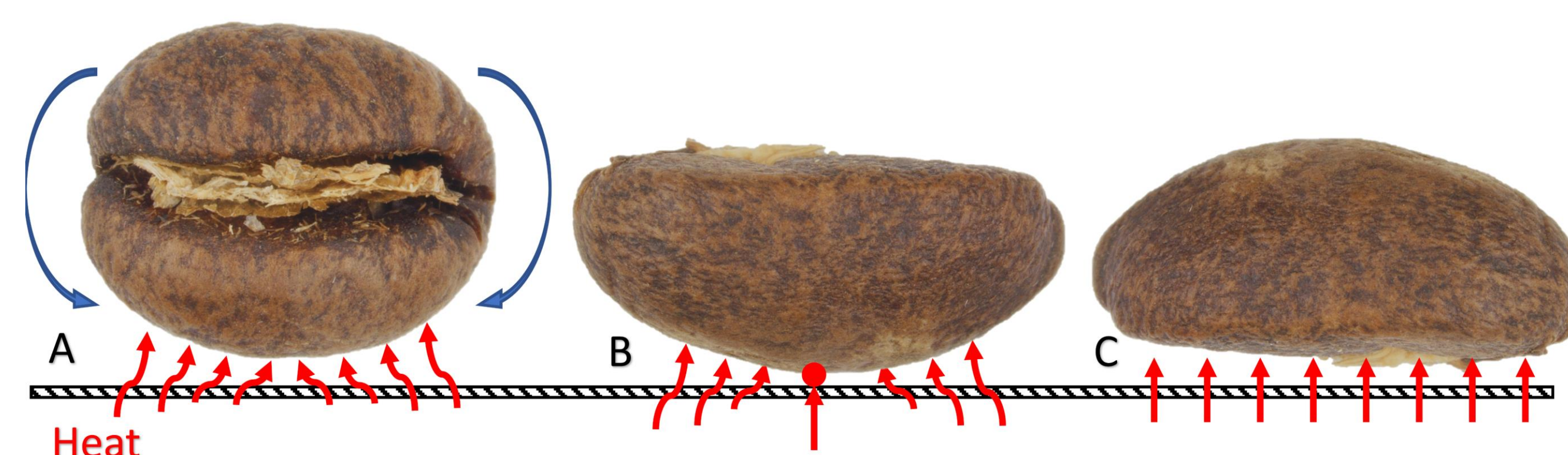
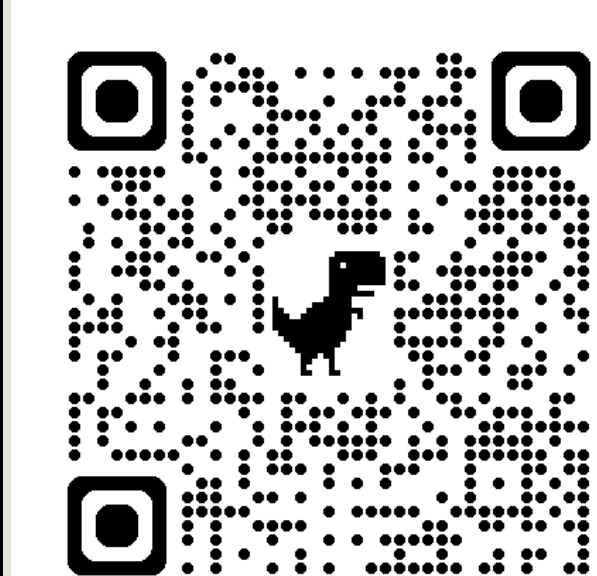


Figure 4. Heat distribution patterns during roasting. A. Rotating peaberry. B. Standard grain in unstable equilibrium. C. Standard grain in stable equilibrium.

## Conclusions

- Peaberries, despite being seen as defects, have advantageous traits due to their shape.
- They dry **faster**, roast **more evenly**, and achieve **high cupping scores**.
- Research could improve methods to **recover** and **utilize** peaberries.
- Better commercialization of peaberries could **boost market trends** and grower **income**.



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