The effect of different roasting degrees in bioactive compounds content in coffee beans

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Abstract

Vietnam (Robusta) and Santo (Arabica) are the two different varieties from which the study's samples were collected. The objective of this research was to examine how local coffee processors employ light, medium, and dark roasting levels in relation to various coffee quality parameters. The second objective is to offer suggestions for optimizing the roasting process to reach the ideal balance of ingredients that improve the final product, coffee, and bioactive substances that are crucial for health.
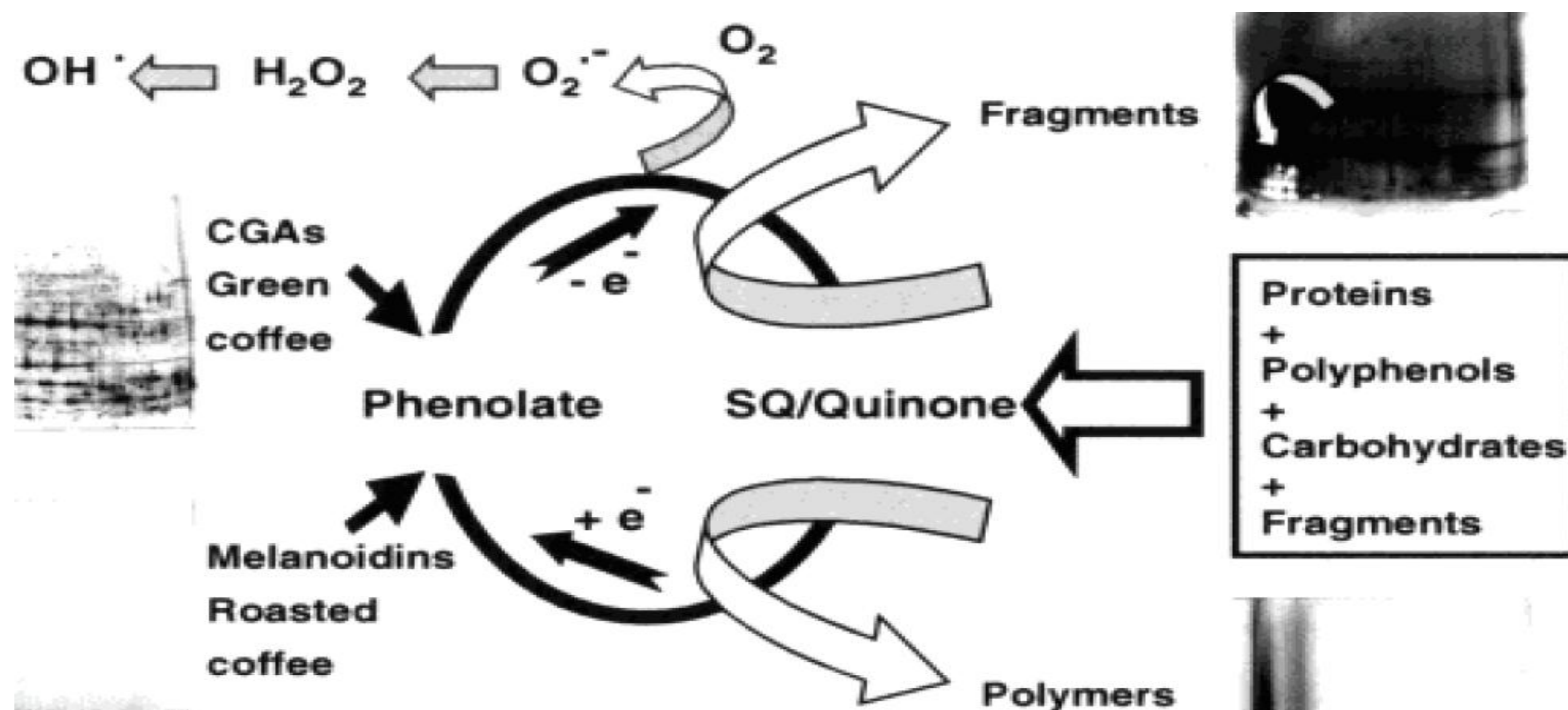
Fig. 1 Proposed reaction scheme of autoxidative mechanisms in coffee, by Montavon et al.

Methods

1- Coffee extract preparation

The preparation of the coffee extract was carried out according to the following route:
- 2 grams of coffee + 20 ml of distilled water
- 100°C for 15 min on magnetic stirrer
- Centrifugation at 2500 rpm for 15 minutes
- Samples are stored in a refrigerator.

2- The coffee extract were analyzed for these parameters:
- Caffeine content (mg/l CFA)
- Total Polyphenols (mg/L GAE)
- Flavonoids (mg/L QRC)
- Orthodiphenols (mg/L CFA)
- Flavan-3-ol (mg/g (+)-catechin)
- Antioxidant Activity (DPPH)

3- The statistical processing of the data was carried out using the SPSS program

Table 1. Sample Codification

Roasting Degree	Variety	
	Vietnam (Robusta)	Santos (Arabica)
Light	V1	S1
Medium	V2	S2
Dark	V3	S3

Fig 2. Sample taken from local producers

Due to variations in sensory qualities and biochemical composition, high-quality roasted coffee beans contain complex attributes. The results in this study that while caffeine, flavan-3-ols, and antioxidant activity are independent by the roasting degree , it is a significant variable (P < 0.001) for the level of total polyphenols, flavonoids, and orthodiphenols. However, it should be noted that the amount of caffeine, flavan-3-ols, for dark roasting is trending decrease for as discovered in the literature as well.

Table 2. Roasting degree effect on qualitative coffee parameters

	Roasting degree (R)			SEM	Significance
	Light	*Medium*	*Dark*		*Roasting*
Caffeine content ((mg/l CFA)	89.07 [A]	92.6 [A]	75.7 [A]	85.81	
Total Polyphenols (mg/L GAE)	438.24 [A]	405.53 [B]	275.9 [C]	373.23	**
Flavonoids (mg/L QRC)	276.8 [A]	184.8 [B]	79.16 [C]	180.29	**
Orthodiphenols (mg/L CFA)	1.31 [B]	0.46 [B]	2.74 [A]	1.50	**
Flavan-3-ol (mg/g (+)-catechin)	2.79 [A]	1.20 [A]	2.80 [A]	2.26	
Antioxidant Activity (DPPH)	25.05 [A]	21.81 [A]	21.9 [A]	22.9	

Averages marked with different letters are significantly different for:
[A-B] $P \leq 0.01$; [a-b] $P \leq 0.05$
** Significance $P < 0.01$

Conclusions

The recommendation for local producers is to concentrate primarily on medium roasting, as it is demonstrated by the literature and our study. This is because light to medium roasting corresponds to when antioxidant activity is at its peak because melanoidins start to form and chlorogenic acid is still present in significant amounts. In conclusion, roasting impacts the aroma and flavor of coffee by altering the profile and concentration of physiologically active chemicals in coffee beans. The quality and nutritional value of coffee may be maintained by adhering to all roasting regulations. As parameters like raw materials, production processes, machinery and equipment, packaging techniques, and storage methods are as crucial to the production of quality roasted coffee as baking, future research is anticipated to create a database that can be used to determine failure factors in that process.