

Characterisation of polyphenolic and heavy metal contents in carob trees found in Malta



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INTRODUCTION

The carob tree (*Ceratonia siliqua* L.) is a perennial indigenous tree in Malta belonging to the Leguminosae family (Fabaceae) and is widely cultivated in the Mediterranean region [1]. The carob is rich in polyphenols, mainly flavonoids and tannins, which have antioxidant effects that are beneficial to human health [2].

AIMS

To compare the polyphenolic content of carob pods from previously assigned trees in different localities around Malta. There are several varieties of carob trees found in Malta and the differences in the morphological and phytochemical characteristics of the pods distinguish one variety from another.

METHOD

- Carob pods samples were collected during maturation cycle (August) from 20 different localities, within five districts in Malta.
- Morphometric analysis was performed by measuring length, width and mass of ten pods from each locality.
- Total phenolic content was determined using Folin-Ciocalteu test [3] and analysed using Gen 5 software.
- UV-Vis spectrometry was performed by calculating tonality ratio, colour density, flavonoid ratio and anthocyanin content.
- Microwave plasma-atomic emission spectroscopy was used for the determination of heavy metal content
- Data analysis was conducted using One-Way ANOVA with Bonferroni Post-hoc test using the software Prism 5. The morphometric, physicochemical and metal results were assessed using multivariate analysis.

RESULTS

- UV-Vis spectrometry showed a peak at 280 nm indicating the presence of flavonols (Figure 1).
- The mean carob pod length was 12.89cm (Table 1).
- The mean total polyphenolic content was 0.565% w/w, ranging from 0.206% (w/w) to 1.298% (w/w).
- The highest polyphenolic content was from the Western District of Malta. Pods from the Southern district contained significantly high levels of arsenic (134.90 ± 16.37 ppm), copper (2.46 ± 0.30 ppm), tin (102.4 ± 2.42 ppm) and chromium (4.24 ± 0.09 ppm). A high level of zinc (5.92 ± 0.69 ppm) was in pods collected from the Northern districts of Malta.

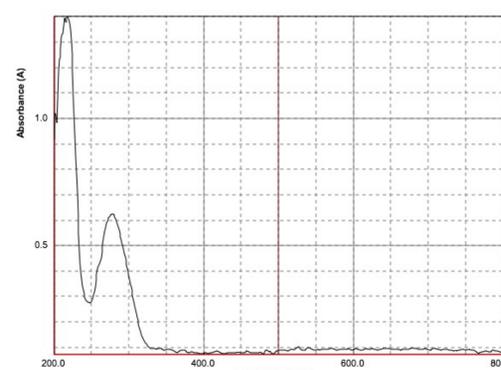


Figure 1: Wave scan at UV absorbance range of 200 nm to 800 nm of one of the analysed samples

| Measurement | Malta | Morocco | Croatia |
|--------------------|-----------|-----------|------------|
| Length (cm) | 12.89±0.9 | 11.41±2.8 | 17.61±1.66 |
| Width (cm) | 1.92±0.1 | 2.25±0.3 | 2.648±1.34 |
| Mass (g/pod) | 11.74±0.9 | 12.4±0.4 | 28.93±4.38 |
| Length:width ratio | 6.955±0.4 | 5.07±0.8 | 6.65±0.2 |

Table 1: Comparison of the Maltese carob pod morphology to Moroccan [4] and Croatian [5] pods.

CONCLUSION

The Maltese carob pod morphology was more similar to the Moroccan pods [4]. The polyphenolic content of the analysed carob pods was found to be significantly lower compared to the 1.25% w/w reported in Sicily [6] and 1.58 - 1.80 % (w/w) in Morocco [2].

References

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