



MILESTONE
H E L P I N G
C H E M I S T S

APPLICATION REPORT

EX18 - STRAWBERRY FLAVOR

Strawberry Microwave Hydrodiffusion and Gravity (MHG)



Introduction

Extraction, notably from fruits for production of juices or specific ingredients, is a highly studied subject. Microwave hydrodiffusion (MWH) can be used for the extraction of flavors from fruits or for the production of various extracts. Fruits and vegetables are known for their health beneficial properties, however the nutritional recommendations have proven hard to reach by the general population, among others due to lack of convenience. Fruit juice is viewed by the general public as a convenient alternative to fresh fruits and the fruit juice production presents a high economical attraction (Étiévant et al., 2010). The health beneficial impact of fruits and vegetables are connected to their content in micronutrients and antioxidants, so that density of fruit and vegetable products in micronutrients and antioxidants has become a preoccupation of the food industry. A challenge is therefore to produce fruit juices with high nutritional densities, for example by using fruits rich in antioxidants.

Aurélien Cendres, F. C. (2012).

Comparison between microwave hydrodiffusion and pressing for plum juice. *LWT - Food Science and Technology*, 229-237.

Why to choose Microwave Flavor set-up?

The patented and revolutionary Microwave Hydrodiffusion and Gravity (MHG) system paves the way to new flavoring products which were impossible to be obtained with the ancient extraction concepts. Percolation, solvent extraction etc... were inefficient and environmental-unfriendly methods of flavor extraction. MHG is going to improve the efficiency and the quality of flavoring products.

- New natural flavors
- Fast extraction
- No thermal degradation
- No solvent

Instrumentation and Principles of Operation

A very efficient extraction process can be achieved thanks to the selective heating of microwaves to materials through molecular interactions with the electromagnetic field via conversions of electromagnetic energy into thermal energy. The high quality flavor was obtained through MHG techniques. (See the "Microwave Extraction Techniques" section for theory and principle).

Results and experimental procedure

The MHG technique is suitable for both dry and fresh raw material, see the "Quick start guide" for a list of easy and sequential setting-up operations (*Table 1*).

Fresh Strawberry							
Reactor	Weighted fresh raw material [g]	Power [W]	Chiller		Total flavour extract [mL]	Volatile fraction [mL]	Total flavor extract yield [%]
			1kW	2.1kW			
Small	610	610	•		350	0	57.2
Medium	1920	1800		•	1100	0	57.0
Large	4540	1800		•	2600	0	57.1

Time, Power

The extractions were carried out till complete recovery of the fragrance

≤ 1800 g: Power(W) = Weight(g) for 20 min.

> 1800g: Power = 1800W for 40min

Chiller settings:

≤ 900g, 1 kW Chiller

> 900g, 2.1 kW Chiller

Table 1

Important remarks

Please take into account that the interaction between microwaves and raw material is based on the water content. The optimized method (power and time) depends on the type of strawberries, mainly to the water content of strawberry itself. Please use the reported parameter as general application note to start to optimize your own method. Be careful, that using an excess power might cause burning of your sample. Please take care to seal properly the glass reactor during the installation of the flavors set-up according to the manual, to avoid loss of vapor during extraction.

Conclusion

A newly and cleaner design process for extraction of flavors was developed in this study: MHG. This green process has been studied and tested using strawberries. This new system was developed to date indicate that microwave extraction process of flavors offers important advantages over antiquated extraction techniques, namely, shorter extraction times, less energy consuming, lower costs as well as new flavoring products. The MHG system offers furthermore the possibility to work with scalar amounts of sample due to three different reactor vessels (small, medium, large), complying with a high range of extraction-scale needs.