SPOTLIGHT feature

Food & Beverage Analysis

Foodstuff Production: utilising knife mills to ensure greater analysis accuracy

Holger Brecht, Fritsch GmbH, Email: info@fritsch.de

Time and time again consumers are confronted with scandals in the foodstuff industry. The latest case is the Fipronil egg scandal in the hen egg farm in the Netherlands [1] and in Lower Saxony (Germany) [2]. What actually do foodstuff producers and marketers do to avoid such cases? A lot, if you believe the rising costs in the area of modern foodstuff analysis. Over the past decades, newer and more sophisticated processes have and will continue to be developed with the most sensitive detection thresholds (ELISA, PCR or the mycotoxin analysis) for quality control. The purpose of this is to lower the number or even eliminate such scandals and the potential danger for consumers. In the context of these analytical processes, again and again, methods for sample preparation of the most diverse matrixes have been developed. In the case of foodstuffs and the raw materials, convenience products are often composed to be clearly more heterogeneous than all other substance groups. Especially in regards to comminution, there are often limits, such as the rheological properties of a material, the ingredients or the volatile components, which can only be prepared without regulating factors (sieves). This is why knife mills are often utilised. Fritsch now offers such a knife mill in industry quality: the Knife Mill PULVERISETTE 11. Some examples of the comminution of foodstuffs and their backgrounds are explained below.

Hops and Malt

Known and used as a base material for the production of beer shows hops much more diverse pharmacological-effective aspects. So many secondary plant substances like humulene, caryophyllene, as well as certain plant dyes contribute to the anti-inflammatory or soothing effects of hops. Possibly they contain species-related mechanism of action to the body's own sleep hormone melatonin. In order to examine this in detail and to ensure a better extraction of these ingredients, fresh female hop cones were comminuted and homogenised in the PULVERISETTE 11 at 4,000 rpm for 15 seconds.

Figure 1. Hop cones before and after the comminution.

Figure 2. Hops milled at 4,000 rpm, grinding time 15 seconds.

Mandatory labelling of sweets

In order to identify vitamins or other ingredients of fruit flavoured hard candy according to the mandatory product labelling, usually the candy must be mechanically processed. The often utilised HPLC requires only weighted samples of a few milligrams though, in which a realistic random distribution of characteristic features of the sampling seem difficult. Problematic during the sample preparation are often the high content of sugars and the vitamin content. An embrittlement with liquid nitrogen seems therefore unavoidable, in order to change the breaking behaviour of the hard candy and to guarantee the temperature stability of the vitamins.

Embrittlement conducted beforehand with the Knife Mill PULVERISETTE 11 in the stainless steel vessel, as well as only a brief comminution of 20 seconds at 5,000 rpm, created a finely distributed powder without a too high application of energy.

Figure 3. Hard candy with liquid centre, embrittled in nitrogen.

Figure 4. Comminuted hard candy after 20 seconds.

On the trail of mycotoxins

Mycotoxins as metabolites of mildew, like aspergillus niger or aspergillus flavus, present a health risk for the consumer. But also the economic losses, as well as the possible not identified infestation and the associated spoilage of the quality due to mildew is enormous.

Figure 5. Approximately 800 g hazelnuts.

Especially significant are the so called aflatoxins, since they are already carcinogenic in the slightest amounts. Due to this reason, are the detection limits in the range of a few µg/kg. Especially prone to such 'mildew nests' are spices or nuts of any kind. Based on the formation of nests in such material samples, the representative sample preparation for a laboratory sample requires a relatively large sample size. During tests with the Knife Mill PULVERISETTE 11, approximately 800 g hazelnuts were processed at an interval mode of 3 x 5 seconds utilising 4,500 rpm, and subsequently the entire sample was homogenised again for 15 seconds at 6,500 rpm.

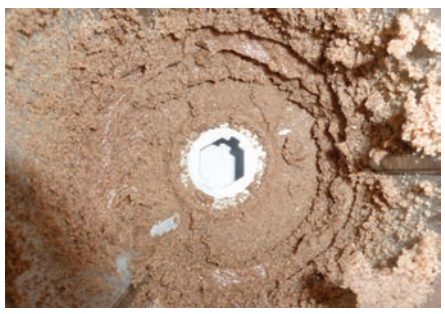

Figure 6. Hazelnuts after 30 seconds grinding in the grinding vessel made of stainless steel.

Figure 7. Homogenous sample of hazelnuts.

References

1. https://www.bbc.co.uk/news/world-europe-40878381
2. https://www.bbc.co.uk/news/world-europe-44452399

We also offer a Video with different application examples for the Knife Mill PULVERISETTE 11 *- see: www.youtube.com/embed/sM5GVYlUsJ8?rel=0*