Quick and reproducible grinding of feedstuff with the new Rotor Beater Mill SR 300

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Fig. 1:
Size reduction of feed pellets of various sizes in the Rotor Beater Mill SR 300

Grain, compound feeds or feed pellets occur in a variety of forms; compound feeds are usually inhomogeneous. Feedstuff is analyzed, for example, to determine the nutritional value, to detect hazardous substances or genetically modified ingredients. To ensure meaningful and reliable analysis results, representative and homogeneous samples are required. Therefore, sample preparation involves homogenization and size reduction of the material to a defined particle size. RETSCH laboratory mills are perfectly suited for this process.

Usually only a few grams or milligrams of sample are required for analysis; these, however, have to represent the entire original sample. Depending on the part of the material from which a sample is taken, information on its composition may vary greatly. To determine the nutritional value of compound feed, for example, all components need to be equally represented in the sample which can be achieved by thorough homogenization.

To obtain a correct and meaningful analysis result, the preparation process needs to be adapted to both the sample properties and analysis requirements. This means that grinding parameters and accessories have to be selected in a way that the properties to be analyzed will not be modified in the process. For most digestion and extraction methods a particle size of 0.5 mm is ideal. Feedstuff varies greatly with regards to hardness, moisture or fat content. Quality control involves daily analysis of a number of samples which in some cases are extracted from a few kilograms of material which are first homogenized to ensure representativeness. Easy and intuitive operation, effective size reduction and quick cleaning of the mills help to increase efficiency in the lab. Medium-hard and grainy feed material is best ground with a

combination of impact and shearing forces. Impact lets the grains or pellets disrupt and the particles are then further reduced in size by shearing.

Homogenization of large feed pellets without preliminary size reduction

Thanks to its robust design and the possibility to process large sample volumes up to 30 l in one working run, RETSCH's Rotor Beater Mill SR 300 – which is now available in a completely updated and revised version – is perfectly suitable for use in the laboratory and for small scale production. The large free surface of the 360° sieves ensures rapid processing. A selection of accessories makes the mill adjustable to a wide range of applications. The new SR 300 features variable speed from 3000 to 10,000 rpm and a powerful 2.2 kW drive; it accommodates feed sizes of up to 25 x 25 mm resp. 35 x 15 mm. The application example of two different samples of horse feed (500 g each) illustrates the performance of the new SR 300. The soft, round pellets (25 x 25 mm - Fig. 1, left) are ground at 10,000 rpm, using a 0.5 mm 360° sieve, to a particle size of 90% < 0.5 mm within 2.5 minutes. The hard, longish pellets (15 x 35 mm - Fig. 1, right) are homogenized to a particle size < 0.5 mm after 3 minutes, using a 0.5 mm 360° sieve and maximum speed.

For grinding soft, temperature-sensitive or slightly fat or oily samples an optional distance rotor is available. The larger gap between rotor and sieve serves to reduce frictional heat during grinding so that smudged sieves and rotor blockings are successfully avoided. The use of a cyclone helps to improve sample discharge and provides additional cooling. Thanks to a ring filter and collecting receptacle with convenient bayonet locking mechanism the grinding process is virtually dust-free. Cleaning the mill can be done very quickly due to the removable grinding cassette, push-fit rotor and removable hopper.

Fig. 2:
Size reduction of feed pellets (left) and a poultry grain mix (right) in the ZM 200

Homogenization of compound feed and corn in the Ultra Centrifugal Mill ZM 200

The high-speed rotor mill ZM 200 is particularly suitable for grinding slightly fatty grain or compound feed as well as small feed pellets. The sample passes through a hopper and hits a horizontal rotor, where centrifugal forces throw it outwards. The particles hit the rotating teeth of the rotor and are crushed in the process. Further size reduction is achieved when the particles are ground between rotor and sieve through shearing forces. The sample remains in the grinding chamber for only a very short time so that its properties are not altered during the grinding process. 100 g of feed pellets (10 x 3 mm - Fig. 2, left) is processed in the ZM 200 at 18,000 rpm,

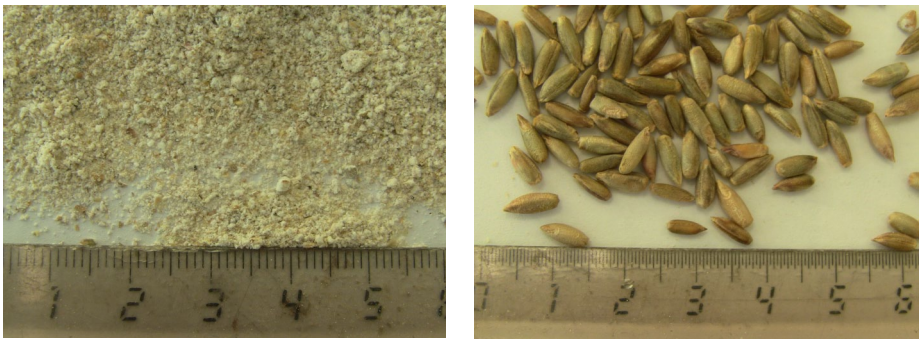

Fig. 3:
Size reduction of rye in the Cyclone Mill TWISTER

using a 0.5 mm ring sieve, to a particle size below 0.5 mm (d90 value) in less than 30 seconds. The ground sample is collected in a cassette. The patented system ensures that ring sieve and cassette are removed together thus allowing for full sample recovery and avoidance of cross contaminations.

A mini cassette with matching sieves and rotor is available for sample volumes below 20 ml. It can be used, for example, to grind 10 g of a poultry grain mix with a 0.25 mm sieve and an 8-tooth rotor at 18,000 rpm to a fineness of <200 microns within 20 seconds (Fig. 2, right).

The ZM 200 is also suitable for milling slightly fatty and grainy seeds. For this type of sample the use of a distance sieve is recommendable. A small gap to the rotor ensures that the sieve apertures are not smudged by fatty sample particles. In addition, less frictional heat is generated so that this sieve is also suitable for grinding temperature-sensitive samples. By using a cyclone, the sample is not only discharged more quickly but is also cooled; with a cyclone up to 5 l can be processed in one working run.

Cyclone Mill TWISTER for non-fatty grain samples

RETSCH's cyclone mill TWISTER is the perfect choice for grinding feedstuff or grain such as wheat or rye. It is mainly used for sample preparation to subsequent NIR analysis. The mill quickly grinds fibrous and soft samples by impact and friction to analytical fineness. The high speed and the optimized shape of the rotor and the grinding chamber generate an air stream which transports the sample through the integrated cyclone into the 250 ml sample bottle while the sample is cooled. Additionally, most of the sample residues are removed thanks to the air stream. Three speeds and sieves with different aperture sizes allow for optimum adaption to a wide range of samples. A 160 g sample of rye was milled at 14,000 rpm to a fineness <1.5 mm within 60 seconds, using a 2 mm sieve (Fig. 3).

Conclusion

RETSCH mills are suitable for grinding and homogenizing all types of grain and feedstuff quickly, reproducibly and neutral-to-analysis. Rotor mills have become the standard in the industry thanks to their great flexibility and wide selection of accessories. Efficiency in the lab can be greatly improved by using RETSCH mills.

Fig. 4:
The latest generation of the rotor Beater Mill SR 300