

Raw materials

Wet feeds – opportunity or

With skyrocketing prices for regular feed raw materials feedmillers and farmers more and more become interested in alternative ingredients. In The Netherlands a lively industry was developed in valuing by-products from the food industry. Recently new nutritional tables became available for calculating the right feed formulas that include these wet feeds.

By Dick Ziggers

The food, beverage and fermentation industry produces a large volume of wet, liquid and moist by-products (wet feeds). These products are often not suitable for human consumption and have to be disposed of in other sectors. Because of costs and sustainability these products find their way directly more and more on the farm to be fed to pigs, beef and dairy cattle. More important is their nutritional value as an animal feed. Most of them can be considered valuable raw materials. And since these products are derived from human grade materials their safety is without question. Nutritional values of wet feeds however have not been adjusted since 1999. This was the reason that Schothorst Feed Research on behalf of the Concession Group Wet Feeds (OPNV), a group representing wet feed suppliers in the Netherlands and Belgium, have put together a new set of product sheets with the most recent nutritional values of available wet feeds in the Netherlands. This should help farmers to calculate their rations to proper feed standards on their farms.

Usage

Dutch farmers in 2006 fed more than 5.15 million tonnes of wet feeds to their animals, equalling to around 1 million tonnes of compound feed. This reflects 7% of total Dutch compound feed production of 13.745 million tonnes. The products were either supplied as single raw products or as standard mixtures. With these volumes wet feeds have become an integral part of the Dutch feed industry.

It is argued that the use of wet feeds contributes to sustainability because producers of these feeds can save on energy, CO²-emissions and costs when they can sell the products in a wet form and do not need



to dry them. It is important though, that the products can be supplied within a reasonable distance from the processing plant, because dry matter content is low, which makes transport cost high per unit of dry matter. Not all wet byproducts find their way into animal feed. The alcohol, bioethanol and biogas industry is another useful outlet for nutritionally less interesting wet products. The pig industry purchased 3.25 million tonnes of wet feeds in 2006. Main products used in this sector were wheat starch products, steamed potato peelings and whey products. The use of concentrated wheat yeast is increasing. Dutch cattle consumed 1.9 million tonnes of wet feeds in 2006. Here the main products are brewers grains, beet pulp and potato pulp. A relatively new product is distillers grain solubles. The cereal and potato processing industry are the largest suppliers of wet feeds to the Dutch animal sector, taking about 3.5 million tonnes of the total amount of wet feeds sold. Other suppliers of wet feeds are the sugar industry (507,000 tonnes in 2006), Dairy industry (785,000 tonnes), fermentation and alcohol industry (250,000 tonnes) and other products (140,000 tonnes). One third of the volume of 5.15 million tonnes is supplied from other coun-

clever disposal of offal?



Unloading of brewers grains at farm. (Photos: Hans Prinsen)

tries neighbouring the Netherlands (Germany, Belgium, France and UK).

Starch industry products

To obtain starch and gluten from wheat many valuable products for animal feed are produced. During processing starch for human consumption and technical uses a few products are separated that are of interest to be used as animal feed, such as wheat mix or wheat middlings, glucose syrup and concentrated wheat yeast. Wheat middlings has a pH between 2 and 4 which makes it last longer. It needs to be stored in acid resistant silos and to avoid sinking of the solids it needs to be stirred regularly. Wheat middlings have a high energy content and are very suitable for pig feeds. Uptake can be as much as 30% of the daily ration.

Several products arise from the beer making process that find their way into animal feed. Usually barley is used as the main raw material for beer. The best known wet feed from the beer industry are brewers grains, which has 22% dm and is mostly fed to cattle and to a lesser extent to pigs. Brewers grains have a high content of rumen by-pass protein and thus are

a valuable raw material for ruminants. It also has a positive effect on the concentration of volatile fatty acids, which improves the functioning of the rumen. In pigs brewers grains is fed to gestating sows because of the high level of fibre.

Depending on the beer making process pressed middlings can also be left over, which contains on average 28% dm and is sold as animal feed. Brewers do not want too much protein in the process, so the proteins are coagulated and mixed into the brewers grains. In addition, remains of hops are mixed into it. Hops is bitter and negatively influences the uptake by the animals, but nowadays almost all brewers use concentrated hops, in which the bitterness is absent. Yeast in brewing is used to ferment the sugars into alcohol and after this process the yeast is recovered from the process and sold as brewers' yeast for pig feeding. Beer that is unfit for human consumption is sold as feed because of the alcohol content, which has a positive effect on silence in the pig stable.

In maize processing (for starch) a few products are obtained that can be used as wet feeds. One of the products is concentrated corn soak water, which is produced after the maize has been soaked in hot water. When protein (gluten) and starch is removed from the maize kernel the left over fibres are mixed with the concentrated soak water and sold as corn gluten feed.

To obtain glucose from corn starch enzymes are used and to obtain pure clear corn glucose the syrup is filtered. This product is called maize-energy ('maïsinol') and is a high energy product containing dextrose and easy digestible fats which makes it very suitable to feed to young animals.

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Loading of brewers grains at brewery.

Potato products

The potato industry is another important supplier of by products that can be used as animal feed. In the starch industry potatoes with high starch content are used. The potatoes are washed and then mashed, which releases the starch from the cells. The mash is separated in three streams: potato starch, potato juice and potato fibres. Potato starch has in many uses. Potato juice has a high protein content, which is recovered and marketed as potato protein. It is a useful protein source for young animals. Potato fibres are dewatered to a dry matter content of 16.5% and then sold as potato pulp. This product contains ground peels, cell walls, leftover starch and juice. It is used in cattle feed as an energy source.

Potatoes used for (in)direct consumption supply a whole list of by-products depending on the processing steps used. Steamed potato peels occur in a wet work up process where clean potatoes are treated with steam and then are peeled or brushed. Apart from the peels a small layer of starch is removed and because of the steam treatment this starch is well disclosed. The starch content depends on the quality of

Table - Wet feeds for on farm feeding from the cereal, potato and fermentation industry

Product	Dry matter (%)	Share in pig feed in NL (%)	pH	Shelf life (weeks)*
Cereal processing industry				
Wheat middlings	18	100	2.5-3.5	>6
Brewers grains	22.5	10	<4.5	>26
Corn gluten feed / corn soak	42	5	<4.5	26-52
Grain energy products	30	100	3-3.5	<8
Beer yeast	11	100	5-6	<6
Potato processing industry				
Potato pulp	16.5	0	4	>8*
Steamed potato peelings	13	90	<4	>52
Potato scraps	22	0	<4.5	<52
Cooked potato products	35	100	<4.5	52
Potato starch	21	80	3.5-4	26-52
Other potato products	23	50	varies	<26
Sugar industry				
Beet pulp	25	5	<4.5	52
Beet tips / chicory pulp	24	0	NA	52
Whey / milk products	5	100	4	2-3
Fermentation and alcohol industry				
Yeast cell walls	26	80	3.5	8
Mycelium and yeast products	20	50	4.4	<26
Grain rinse, DGS	29	0	4-5	<26
Other products				
Vegetable fats	35	100	<10	<8
Soyproducts	9	100	4	<6
Products from vegetable, fruit and juice industry	9	50	<5	NA

**)Products with a shelf life of more than 8 weeks are usually stored in a open silo system and covered with plastic.*

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A truck driver of wet feed trader Duynie is delivering steamed potato peels to one of the silos of a pig farmer.

the potatoes used.

Potato scraps are produced when the potatoes are cut up and certain parts are unfit for making deep-fry products. The starch in this product is similar to that of the raw potatoes and is difficult to digest by pigs, but an interesting product for ruminants because of the high rumen by-pass content. Potato scraps are tasty and rich in energy.

Cooked potato products are the leftovers from potatoes that have been processed into French fries or other fried products. The product becomes available at start-up and finish of a batch and after sorting of fried products. The fat in the product comes from the cooking oil and nutritional content depends on the type of oil used. The heat treatment is enough to release the starch, which makes the product suitable for pigs.

Potato starch feed is obtained from water that is used when cutting potatoes for fries or crisps. The starch in the cutting water is centrifuged to separate the solid fraction from the water. The product is used in cattle feeding because of the high rumen by-pass

starch content. To make it suitable for pig feed it needs to be heated. Other products from the potato industry are granules and flakes, both by-products from the mashing process. Potato granules have 65% dm content, flakes even higher. Ground-up potato crisps also find their way in pig feed, when they are rejected at the processing plant.

Storage and use

Because wet feeds contain a high percentage of water they are vulnerable to bacterial growth. Good general hygiene in storage of the products is recommended. The huge variety in wet feeds makes it difficult to set a general rule for conservation. There is a critical balance between keeping the product fresh and letting it deteriorate by micro-organisms (yeasts, bacteria en fungi). By adding specific organic and inorganic acids or through natural acidification bacterial growth can be reduced, which contributes to a longer conservation period. Other methods are drying (expensive), salting, or high temperature. Some products are supplied at temperatures as high as 85°C. Such products need to be stored in well insulated tanks.

Wet feeds in pig feeding are solely used by farmers that use a liquid feeding installation and have their own feed kitchen to prepare the mixtures. In cattle feeding TMR (total mix ration) is an excellent system to feed wet feeds. Many products ferment during storage; the content of sugars and starch decreases and the lactic acid, acetic acid and alcohol content increases. Several trials have shown that feeding fermented products and fermented liquid feed have a positive influence on pig performance, although there are different theories on the mechanism of this process. ●

More information on wet feeds is available from Schothorst Feed Research, Lelystad, The Netherlands

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