

How wet grass protein concentrate can be stored and used for feeding organic pigs

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Wet protein concentrates, produced by protein biorefining of pasture crops, may be stored for two months before its direct utilization in the feed formulation for pigs - but the temperature and storage is of great significance to the quality.

In Denmark, there is growing interest for production of protein concentrates from pasture crops like clover, grass or alfalfa to feed monogastric animals like pigs and poultry. The intention is to favor the local production of protein-rich feed to decrease the dependency for imported soybeans and soybean meal, which is particularly relevant for the growing organic farming sector. In this context, SuperGrassPork is a Danish project that aims at developing and establishing sustainable production of organic pigs based on feed containing proteins from locally produced resources including organic pasture crops.

The drying of protein concentrate is expensive.

In the protein biorefining process, fresh pasture crops are processed immediately after harvesting with a screw press into a juice and a pulp. The juice is treated with heat or with lactic acid bacteria in order to precipitate proteins and ease their separation. Afterwards, the treated juice is centrifuged to separate the precipitated proteins into a wet protein concentrate. However, the wet protein concentrate still contains a considerable amount of water and needs to be dried. Drying is expensive and requires a lot of energy but at the same time, it preserves the quality of the protein concentrate during storage. The most common drying methods for the wet protein concentrate include spin-flash-drying or spray-drying.

Use of wet protein concentrate directly in feed formulation.

As an alternative, the wet protein concentrates could be directly utilized in the feed formulation avoiding the associated high drying expenses. Logistically, there are three possibilities if the wet protein concentrate is to be directly used in the feed formulation:

1. Prepare the feed formulation, usually as pellets, in the same facility where the protein concentrate is produced.
2. Store the wet protein concentrates for a specific period until the feed formulation is prepared in dedicated factories.
3. Store the wet protein concentrate for a specific period and use it directly in liquid feeding systems.

The first option implies large protein biorefining factories and it is not likely in most cases, while the latter two require that the storage can be done without compromising feed quality.

Storage of wet protein concentrates during a one-year storage trial.

A recent study, included in the SuperGrassPork project, aimed at investigating how the quality of the wet protein concentrates was affected during one-year storage. During summer 2018, alfalfa, red clover and ryegrass were processed in a “protein biorefining” pilot plant located at Aarhus University Foulum (Tjele, Jutland). The resulting wet protein concentrates were vacuum-sealed in plastic bags and stored for one-year under two conditions: room temperature or cool temperature (4°C). After 1, 4, 8 and 12 months of storage, the protein concentrates were analyzed for some specific parameters related to their feeding quality such as the content and composition of protein and fat or the acidity level.

Results from this study revealed that storage of the wet protein concentrates at room temperature is not recommended because of a significant quality loss in the protein concentrates. Such loss of quality is related with degradation of protein, oxidation of fat and changes in the acidity levels. However, the wet protein concentrate could be stored at cool temperature (4°C) for a short period of 2-3 months before a significant quality loss is observed. Therefore, the protein concentrates might be produced in small farms and then vacuum-sealed and stored cool for a couple of months before their use in feed formulation in larger feed factories or for feeding in liquid feeding systems.

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Field with alfalfa



Juice squeezed out from fresh alfalfa in a screw press at the pilot plant.



Separation of proteins after centrifugation of the juice treated with lactic acid bacteria.



Wet protein paste and dry protein paste after spray drying.