Soymeal Separation- Protein from Carbohydrates Procedure

Name_____
Date_____

Background:

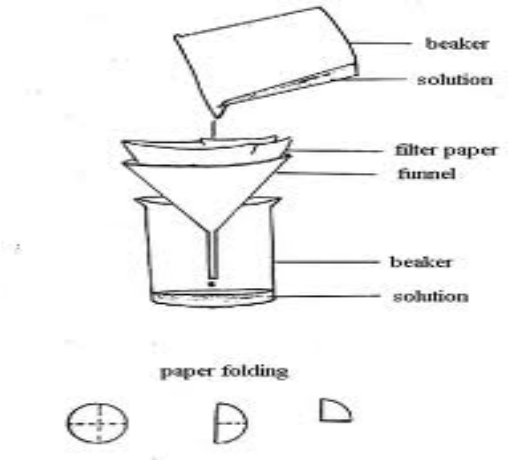
Soy protein concentrates are prepared by removing soluble sugars (carbohydrates) from soybean meal flakes. The remaining components are mainly proteins and insoluble sugars. When soluble sugars are removed from the soybean meal, the protein content of the resulting soy product is increased and the undesirable sugars, which cause flatulence, are eliminated. Flatus is gas formed in the gut by bacterial fermentation of non-digestible carbohydrates. Sucrose and the total non-digestible sugars each constitute about eight percent of the soybean meal flakes.*

The separation of the carbohydrates from the protein in soymeal is possible because the carbohydrates are soluble in a 50% ethanol/water solution and soy protein is not. (There is a very small amount of soluble soy protein.)

Procedure:

1. Weigh a 200 ml beaker. Record the mass. _____
2. Add about 20 g of dry soybean meal to the beaker. Record the exact amount. _____
3. Add 50 ml of 50% ethanol/water solution to the soybean meal and stir. Let sit for a few minutes, stirring occasionally. Describe the appearance of the liquid.

   Does the meal appear to be dissolving? _____



4. Weigh another 200 ml beaker to use to collect the filtrate liquid as shown above. Carefully filter the liquid portion of your slurry into a setup such as shown above. (A Buchner funnel without filter paper may also be used and may be quicker.)

To set up a Buchner filter: use a ring stand with a Buchner filter to separate the solids from the liquids. Pour the liquid fraction through the funnel, leaving as much of the soymeal in the beaker as possible.

5. Obtain another 50 ml of the ethanol/ water and add it to the soymeal beaker. Stir for two minutes. Observations? _____
   Is there any indication that more carbohydrates are separating from the soymeal? _____
6. Filter the soybean meal protein from the ethanol/water solution through the filter. (If using the Buchner filter, use filter paper that has been wetted with ethanol before filtering the second time.)
7. Press the liquid out of the meal as best you can, using a gloved hand. Allow the carbohydrate/ethanol/ water solution to evaporate in a fume hood. When evaporation is complete, find the mass of the carbohydrates and soluble proteins obtained.
   OR
   Place the soybean meal in the oven at 100 ^{O}C for several hours, preferably on a piece of foil so that it can be spread out. (If an oven is not available, let it sit for several days for complete evaporation. Stir daily.)
8. When evaporation is complete, weigh each beaker and weigh the now dried soybean protein.
9. Calculate what portion of the soybean meal was dissolved in ethanol/water solution (the carbohydrate/soluble protein portion) and what part of the meal remains after drying (the insoluble protein portion.)

Questions and Analysis:

1. Describe the two parts obtained from the separation process. Describe the appearance of each.

2. Draw a flow chart in your lab notebook that depicts what occurred during this separation process and how you could test for what was obtained. Which parts will you test for proteins, carbohydrates, etc.

3. Perform the test and record the results below.

4. Summarize the results from these tests.

Extension: Research the modern method of doing this separation, isoelectric separation, and explain it to your class?

*"Protein Separations," retrieved from Separation Sciences: Food R&D Center on 14 Jun 2013 at http://foodprotein.tamu.edu/separations/protein.php