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Pilot Plant Procedure for Making PEILSOY
at Los Baños, Philippines

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Procedure:

Comments:

1. Soak clean whole soybeans in water at ambient temperature until saturated (about 4-5 hrs).

a. Soaking time can be extended to 10 or 12 hours without harm. Excessive soaking time may give fermentation and/or hard beans that are difficult to grind

b. Dehulled beans can be used if desired but we see no advantage in dehulling first. In fact there seems to be a slight flavor preference for milk made from beans that have not been dehulled

2. Discard soak water. Remove any defective beans.

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3. Preheat grinding machine.

a. This step is necessary to ensure that the first lot of material ground does not fall below 80°C

b. We use a Rietz Disintegrator but other grinding machines, including motorized stone grinders and large Waring Blenders have proved satisfactory.

c. We preheat by passing boiling water through the grinding machine. Other methods of preheating should be satisfactory.

Grind beans at ambient temperature with boiling water. Temperature of bean-water slurry must never fall below 80°C. (180°F.).

It is advisable to hold the slurry at 80°C. or higher for about 5 minutes before proceeding to the next step.

Ratio is 1 part by weight of dry beans plus 10 parts by weight of water. This is approximately equivalent to 1 volume of soaked beans to 3 volumes of boiling water.

5. Boil for 5 to 10 minutes.

- a. Beans should not be over 55°C. before entering grinder or protein solubility will be lowered.
- b. Beans should be ground to a fine state in order to obtain maximum extraction of protein.
- c. We grind with slightly less than the required amount of water and adjust to correct weight by adding water to the slurry. For example: 5kg. dry beans will be adjusted to a final weight of 55 kg (5 kg. beans + 50 kg. water). This is done after step 5.
- d. Beans and water should be metered continuously into grinder. (We do this by hand using 2 operators, one pouring beans and the other pouring water).
- e. Sometimes foaming is a problem. We control this by using Dow Corning antifoam spray A.

The foam is controlled at Cornell by injecting live steam into the grinding machine. As soon as the foam cools it collapses.

- a. This is best done by injection of live steam because heated metal surfaces burn easily.
- b. This step removes traces of volatiles that sometimes appear. It causes a slight flavor improvement but is not essential providing the metering of beans & water is done carefully.

6. Filter off insoluble residue.

- a. We use a plate and frame filter press. Other equipment such as centrifuges should be satisfactory.
- b. Insoluble residue should be squeezed as dry as possible in order to extract maximum yield of milk.
- c. We consider the filter cake to be cattle feed because it is high in crude fiber, although it contains more than 20% protein. Some people like to incorporate it in cookies, candies etc.

7. Formulate

- a. We add 7% sucrose and 20 parts per million of Polak essence of vanilla in order to achieve a smooth well-rounded flavor. No other additives are used in PHILSOY.
- b. Many other flavors can be used successfully, butter flavor, chocolate, strawberry etc.
- c. Minor nutrients such as calcium, vitamin A etc. can be added at this point if desired.
- d. If a higher fat content is desired it is added as an edible oil and emulsified with the soymilk at this point.

8. Fill into 7 oz. bottles and seal.

- a. Allow room for expansion of milk in bottle during processing.

9. ^{sterilize} Process in steam 12 mins at 250°F. (15 lbs. pressure)

- a. We would prefer to process in water and cool in water but are waiting on additional heat transfer data to establish a safe process time for a water cook.

10. Cool in air.

Hot bottles are under pressure and constitute a potential hazard. Care must be taken to minimize handling of hot bottles. Operators should wear safety glasses and waterproof aprons.

General Notes

a. The sterilization in the bottle is sufficient to inactivate anti-trypsin. If a fresh product is desired that has not been sterilized, it is necessary to maintain the milk at near the boiling point for approximately 30 minutes in order to destroy the antitrypsin.

b. The sterilized PHILSOY keeps well in storage at ambient temperature for several months. Our taste panel detect a loss of flavor after 6 months storage at ambient temperature although the taste is still acceptable.

c. A "cream line" sometimes forms after one or two weeks storage. This can easily be dispersed into the milk by shaking manually.

d. When the bottles are stored in direct sunlight for several weeks continuously there may be some separation. There may be some separation after 8-10 months storage in the dark at ambient temperature. (Ambient temperature at Los Baños is usually 75° to 95°F. Extreme annual temperatures are 65° and 100°).

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