

Lecture 7

CHEMICAL TESTS ON DAIRY PRODUCTS

ALKALINE PHOSPHATASE (ALP) TEST

Alkaline phosphatase (ALP) is an enzyme normally present in raw milk and it is inactivated when thermal treatment conditions are slightly higher than those required for the destruction of the pathogenic bacteria. Hence, the chemical test carried out to determine alkaline phosphatase (ALP) concentration in pasteurized milk is used to verify if thermal treatment has been done correctly.

Test principle

The alkaline phosphatase causes the hydrolysis of the Nitrophenylphosphate in a half alkaline and forms a yellow complex whose intensity, measured at 405 nm, is directly proportional to the concentration of ALP in the sample.

LACTIC ACID TEST

Lactic acid is produced by the fermentation of lactose due principally to the microbial activity. Its concentration is correlated to the total bacterial count; hence, a chemical test aimed to determine the concentration of lactic acid is a useful index of the good state of preservation of food. In addition, thermal treatment for example in UHT milk destroys the bacterial charge but does not modify lactic acid concentration and therefore lactic acid value can be used to investigate the "history" of the product. The test can be done even in powdered food as powdered milk, whey and additives after reconstitution with water. This chemical test is used to determine lactic acid concentration in cheese, ricotta, mozzarella, yogurt since its value has to be kept under fixed law limits.

Test principle

Lactic acid, in presence of the lactate oxidase and the peroxidase, reacts with a phenolic derivative and forms a violet complex whose intensity, measured at 505 nm, or at 545 nm, is directly proportional to the concentration of lactic acid in the sample.

AMMONIA CONCENTRATION TEST

Ammonia concentration value is an important index of the good quality of milk and it is applicable to all production phases. In fact, ammonia is a metabolite of the microbial activity and grows as bacteria content in milk increases. In addition, ammonia value that is the last product of the amino acid degradation of soft cheese can be considered an index for the freshness of the product during its commercial life and may be an essential instrument to evaluate its shelf life.

Test principle

The test principle is based on a colorimetric reaction in which the ammonia reacts with a phenolic derivative forming a blue/green complex whose intensity, measured at 700 nm, is directly proportional to its concentration in the sample.

CHLORIDE TEST

Chloride test is used to measure the quantity of salt present in different dairy products as cheese, mozzarella, preservation liquid or in liquids used while processing food (for example: pickle).

Test principle

The chloride ions react with mercury thiocyanate and release thiocyanate ions. The thiocyanate ions react with the Fe(III) giving an orange coloured complex whose intensity, measured at 505 nm, is directly proportional to the concentration of the chlorides in the sample.

MILK UREA NITROGEN (MUN) TEST

Milk Urea Nitrogen (MUN) content is related to the protein content of animal nourishment and is used to define an adequate diet. The chemical test of urea concentration in raw milk may help to detect fraudulent additions done to increase the protein content of milk.

Test principle

The urea is transformed into ammonia from the urease. The ammonium ions react with a phenolic derivative and form a blue-green coloured complex whose intensity, measured at 700 nm, is directly proportional to the concentration of urea in the sample.

HYDROGEN PEROXIDE TEST

Hydrogen peroxide is used as a sanitizer of the machinery used for milk treatment. The presence of hydrogen peroxide inside the machinery may contaminate the milk: the scope of the test is the determination of its presence since it would determine milk contamination. The test is also used to determine an addition of hydrogen peroxide in raw milk, before undertaking pasteurization, to increase its duration.

Test principle

Hydrogen peroxide, in presence of the peroxidase, reacts with a phenolic derivative and forms a pink complex whose intensity, measured at 505 nm, is directly proportional to the concentration of hydrogen peroxide in the sample.

PEROXIDASE TEST

Lactoperoxidase (POD) is one of the most abundant enzymes present in milk. Peroxidase is associated to whey proteins of milk. It is inactivated by thermal treatments with high temperatures (70° C for 15 minutes or 80° for 30 seconds) or by any treatment that overcomes the standard conditions required for a normal pasteurization process. Hence, the persistency of lactoperoxidase in pasteurized milk can be used as a good index of product quality; in fact it is possible to apply a mild pasteurization treatment that will not deactivate the enzyme only to raw milk of good microbiologic quality; in this case chemical-physical and nutritional characteristics of milk will be only partially deactivated.

Test principle

The peroxidase contained in milk, in presence of an indicator and/or hydrogen peroxide, catalyzes the formation of a red colour whose intensity, measured at 505 nm, is directly proportional to the concentration of the peroxidase in the sample.

ESTABLISHMENT AND MAINTENANCE OF A DAIRY ENTERPRISE

Cows are the core of most dairy farm business. They are the animals that provide the milk that you will be selling off for money, and they are also responsible for reproducing other cows that can grow your business. Obviously, the majority of cows that you will rear in your farm should be females. However, if you also wish to make off money selling cows to slaughterhouses, you

might want to retain a male and a few females for breeding. The following are needed in the establishment and proper maintenance of a dairy enterprise:

Capital

Starting your own dairy farm can be a matter of full-time employment, hobby farming or anything in between. Whatever your interest, calculating the cost of getting started in dairy farming is crucial. How much money you need to get started may be a big factor in whether you can jump right into the business in full. However the following should be put in consideration when thinking of cost.

- Take account of what you already have. If you already have pasture land, a barn and adequate fencing, you're off to a good start.
- Decide if you want to purchase a farm or simply lease some land. This is a large portion of the start-up costs for dairy farming.
- Get an estimate on fencing. In case you don't have enough natural barriers to keep the dairy animals contained, so determine how much it will cost you to add sufficient fencing.
- Determine whether you want any buildings or other structures, such as a barn for storing hay or for milking the animals. You may need a large barn, or you may just need a small covered area to protect you and the animal when milking.
- Add to the expected costs the price of purchasing dairy animals, veterinary services, equipment and other supplies. What you need largely depends on how large or small an operation you want to run. For instance, if you're planning to sell milk commercially, you probably need to purchase pasteurization equipment, which can be very expensive.
- Consult with a loan agent, if you're seeking a loan to cover start-up costs, to find out about down payments and loan fees. These administrative costs can quickly add up to significant amounts.
- Calculate the sum of all the associated costs. If the amount is too much for you to afford, start smaller. Go through the steps once more to see if you can find a more affordable solution.

Capital requirements are a common obstacle for dairy startup candidates. Unlike beef cattle operations, dairy cattle operations have substantial equipment requirements as well as barn and acreage demands. You can reduce the upfront capital investment by purchasing silage, hay and

corn from other operations, but there is no getting around an initial investment in milking parlors (or pipelines), milk tanks, barn cleaners and other physical assets.

The size and scope of your herd is another critical consideration. If possible, you'll want a mix of milk cows and heifers to ensure seamless operations. Each year, a percentage of the cows in your herd will need to be culled for productivity and replaced by heifers that have recently delivered calves -- the herd's next generation of producers.

Unless you have abundant financial backing, the best entry strategy is to start small and build your way into a full-time operation. Many aspiring dairy farmers hone their skills and build a herd while working for another farmer, with the understanding that the goal is for the worker to lease a working dairy facility and launch his own operation in a specified period of time.

Equipment

Dairy farms are one of the more expensive businesses to operate and start. You need to have some elaborate equipment in order to pull the business off properly. Some of the more important dairy farm equipment includes:

- **Tractor** This is important equipment for pulling machinery around. Most of the other equipment cannot be operated without this.
- **Hay baler** Responsible for producing bale that is then fed to the cows. Each round bale produced by this machine is enough to feed 25 cows a day.
- **Combine** The machine used to harvest crops for feeding to the cows, or for selling off. If you plan to grow your own cow feeds, you would need this definitely.
- **Storage buildings** These buildings are useful for storing the feeds and the plants that you grow in your farm. There are also specialized buildings that are designed to store cow's manure, as they are good fertilizers for the crops.
- **Milking equipment** This will help make your life easier. Having automated milking equipment in your dairy farm will help cut the time required for you to produce milk from your cows, rather than doing it by hand.

Cattle Fences

Farmers have considerable investments of time and money invested in their farm operation. Many small farmers work all the hours that they can and generally involve their partner/spouse and children in the operation of their farming venture.

But a failure to put up the best fencing for their farm can have disastrous consequences insofar as they run the risk of losing livestock or hens to predators and having to constantly repair, mend and maintain their existing fences.

Types of Fences

Here are 4 types of fences that are commonly used and which have specific purposes that you should consider to safeguard your investment and livelihood.

1. Post and Rail Fencing

Post and rail fencing is very common and a popular choice and will generally comprise a timber post and rail fence with 3 horizontal rails. Generally the timber will be pressure treated and if you are near a busy road you may consider concrete post and rails fencing to ensure that cattle or horses do not break out and cause accidents with motorists with disastrous insurance consequences for you.



Plate 9: Fencing of cattle paddocks

2. Barbed Wire Fencing

This type of fence is illegal in some districts but is incredibly effective but not ideal for all

situations as it can be difficult to work with and cause injury to animals, particularly new born foals or calves.

3. Electric Net Fence

Electric net fencing is very useful to smart pasture management and can be moved around easily as the occasion warrants it; very useful for fencing cattle, goats, poultry and sheep. Electric net fencing has the advantages of being easy enough to set up and will keep out raccoons, deer and other predators. It is also very versatile and portable. However it needs maintenance as it tends to sag and falling tree branches can cause it to fail and you will need to monitor the energizer and ground rods.

4. Woven Wire Fencing

Woven wire fencing is a popular choice among small farmers; it is easy to set up and unlike electric fencing does not require a power source.

Cattle Barn

There are many different designs of cattle barns available .Some plans are designed to work for dairy farm operations. Others are useful for the calving process of a beef cattle operation. In some cases, the barns are built for only seasonal housing of livestock; others are built for year-round use.

Planning a Cattle Barn

1. Determine the design and layout of the cattle barn. Dairy barns are often built as housing for the cattle year-round and also contain a milking parlor and other equipment associated with a dairy operation.
2. Beef cattle are usually allowed to graze on pastureland much of the year. A barn may be built for use as shelter during the calving season or as a loafing shed used to when calves are fed to slaughter weight.

3. Determine the size of the barn. Make sure the building offers enough space to house the cattle as needed for whatever time necessary. The barns may be open on the interior or divided into stalls or pens as needed.

4. Determine the construction method. Pole construction methods are commonly used for barns. Poles, set in the ground, serve as the framework of the barn. Other building methods for barns include concrete blocks and wood frame construction.

Building a Cattle Barn

1. Prepare the building site by leveling the ground and removing all obstructions. Any water lines to the barn should be dug in before construction starts.

2. Set the posts for a pole barn or pour a foundation for a cement block or wood frame barn. This serves as the base for the barn. Use pressure-treated lumber for any components of the barn that will come in contact with the livestock manure.

3. Complete the exterior of the barn by adding wall components and the roof. Use construction techniques consistent with the type of construction being used on the barn. Add insulation to the roof and walls of the barn. Even if the barn is not heated, insulation will help moderate temperatures during adverse weather.

4. Add any interior walls or pens to the barn. These components complete the design of the plan for the barn. Install electric lights and outlets as desired. Keep outlets high enough to be out of the reach of the livestock housed in the barn. Add other items such as feeders or water tanks as needed to the barn. Add any doors or ventilation systems necessary to complete the barn.

Training

For new comers in dairy farming, training is essential component, it is very essential to go for training prior to starting this enterprise. As it is practical aspect and you have to manage all living animals with maintaining their productivity. Nowadays, very few personal are running their dairy farm, in scientific way to enhance the productivity of animals. It is however better to undergo training.