

Using Genetic Selection to Improve your GOAT HERD

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INTRODUCTION

Goat books, journals, workshops, conferences and shows have a certain appeal for many individuals. Goats have been around for millennia. In the last year or two, there has been an explosion of interest in goats that doesn't show any signs of abating. Goat producers are seeking methods of improvement in their herds, be it nutrition, herd health, reproduction or genetics. The goat industry in the United States is very diversified consisting of meat, milk and fiber producing breeds of goats. The goat meat industry does not have a structured marketing system as we typically prize in the cattle, swine and sheep industry. Today, we are observing a rapidly growing meat industry in this country with a focus on the Boer goat. A carcass merit buying system, which is not presently available, is needed to reward producers for superior muscled carcasses. When the meat market reaches carcass merit purchasing, performance-related genetic improvement of the goat herd will become imperative. Selection and crossbreeding will be the procedures adopted to increase economic returns.

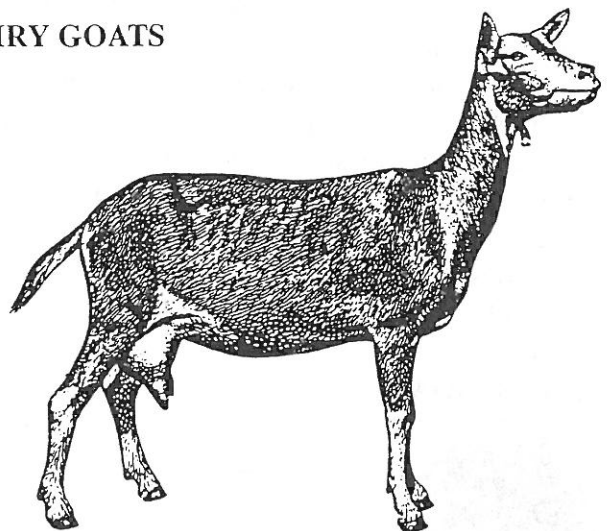
ANGORA GOATS



The USDA grading system for mohair is well defined. All mohair is graded and bagged sep-

arately before marketing. International buyers purchase particular grades and bid on these grades in a competitive world market. World market prices are established in South Africa. There are twenty-three (23) warehouses in Texas that buy and sell mohair. Most Missouri Angora goat producers sell mohair to one of these selected warehouses. To improve the quality and quantity of mohair in a herd, the producer needs to purchase superior breeding stock in grade and weight of mohair. The producer must take advantage of record keeping to achieve optimum results. The cashmere industry also grades fiber and buys accordingly. The smaller the diameter of the fiber, the greater the price. The markets for cashmere are somewhat limited, however, fiber can be stored and sold when the price is right.

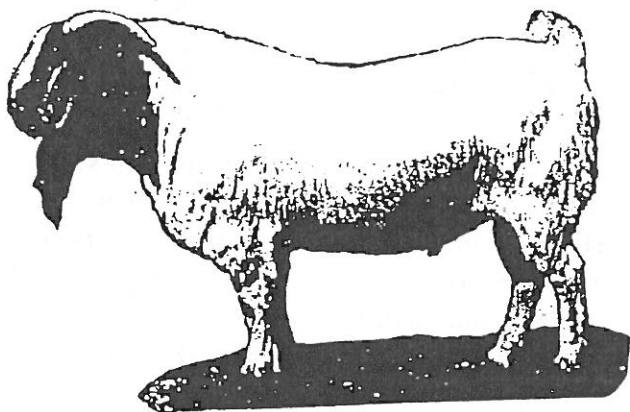
DAIRY GOATS



Dairy goats have the advantage in selection of using the national Dairy Herd Improvement (DHI) program that has been available to them for many years. By measuring milk production, both in quantity and quality, producers can increase milk production by selecting from the DHI gene pool of superior producing animals. The dairy cattle industry increased milk producing animals. The dairy cattle industry increased milk production from a 10,000 lb. rolling herd average to an extra-ordinary

22,000 lb. average over a 40-year period. The dairy goat industry, focusing on milk production can achieve the same progress, relatively speaking, and has in some herds. The reason the dairy goat industry has not improved milk production at the same rate as the dairy cattle industry is because of economics. Dairy goat producers do not have the advantage of profitable milk marketing and in the past, government milk subsidies. Goat milk markets are arduous at best and these consist of either grade C or grade A dairies in Missouri, by state statutes. Grade A goat dairies are constrained by individual marketing of goat milk, which is very time consuming. The shelf life and space of goat milk is limited. Dairy goats are primarily raised for family milk and show. Some producers sell goat milk to livestock producers or use it themselves to raise calves, pigs, lambs and colts. Another factor of restraint is the show ring. The show ring does not provide competition based on milk production. There are specific classes to measure milk production but these are not the heart of the show. The show ring focuses on many traits related to milk production, however, there are only a few shows that use milk records as a percentage of the judging to support the judges oral reasons. The economics is in the show ring placing, especially those goats that place consistently at the top of the class. Herds that consistently win are those that sell higher priced breeding stock.

MEAT GOATS



Using a scale to measure weight gains in kids in a meat goat operation is very useful for selection of superiority in a herd. Keeping good

records of birth weight, 60 - 90 and 120 day weights and causes of death is vital in a goat operation if a producer sets a goal for improvement in selection and profitability.

SELECTION

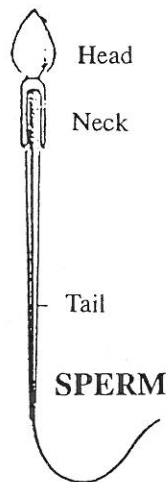
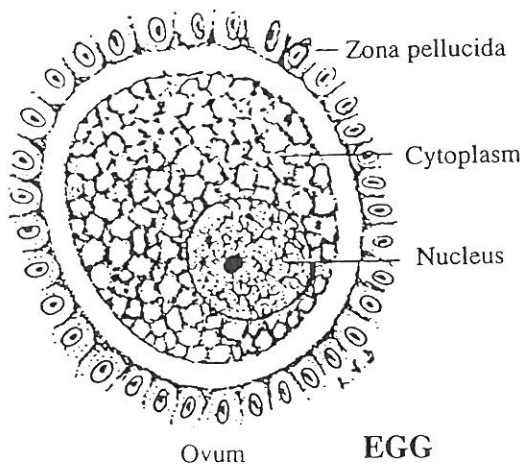
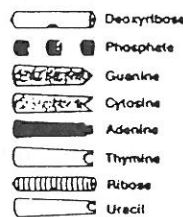
How do producers make improvements in meat, milk and fiber production in a commercial operation? The two tools we have to use in genetics are selection and crossbreeding. There are the two genetic vehicles that every producer can use to improve the productivity of the herd. Selection is the process of identifying preferred superior animals in a population to produce in the next generation. Selection is of two general types. These are artificial selection, exercised by mankind and natural selection that is due to natural forces beyond our control.

Is selection an art or a science? It all depends on the traits being selected. Where records are available for milk, meat and fiber production, increases in performance will best be obtained by using these records. Then, selection is considered a science. If an individual is selecting for a trait that is subjective, such as udder structure, angularity in dairy goats, shape of the head, position of the feet and legs, as some examples, then selection may be defined as an art. Those who develop score cards for these traits are judging subjectively. In other words, it is an individual opinion of which many agree.

The reason I say that is because the judgement of superiority is in the eye of the judge or individual preference. In quantitative traits, defined as measurable traits, a pound is a pound, not an opinion. Using records diligently, a breeder can make genetic progress that can be measured with a scale or a yardstick. All quantitative traits, defined as heritable with many genes involved, are affected by both genetics and the environment. In milk production, at least 25 genes have been identified, contributing to the potential volume and composition. These genes are located on the 60 chromosomes found in goats. Your goat gets one

set of chromosomes from the sire and the other set from the dam. The blueprint of any individual goat, human or mammal is determined at the time of conception, when the sperm penetrates the egg (ova). The sperm and the egg come together to form the full complement of genes which is the blueprint. That blueprint is in the nucleus

of every cell in each goat, sheep, human or mammal. The schematic for the sex cells, egg (ova) in the female and the spermatozoa (sperm) in the male, is diagrammed below:



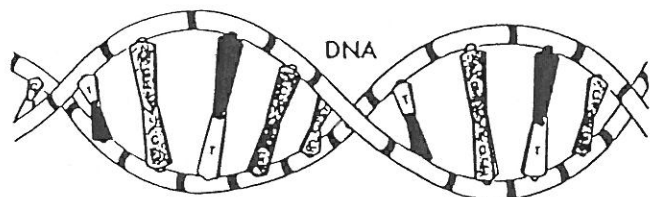
EGG and SPERM

Chromosomes are threadlike bodies that can be seen under the microscope when stained at the proper stage of cell division. The central inner portion of each chromosome contains a long double helical structure called DNA. The DNA molecule contains hundreds of genes. As the chromosomes occur in pairs, so do the genes. The 60 chromosomes found in goats is the same number found in cattle, however, they do not successfully cross. The explanation for that is too detailed to discuss here.

The DNA composition is specific for proteins that code for traits and these determine the

genetic make-up of individuals and all mammals as well as all living things.

The helical structure of DNA is diagrammed below:



The principles of selection should be taken seriously by the goat producer. Selection can have a dramatic effect in the improvement of specific traits. The speed at which we can make changes per generation depends on how much the trait is affected by genes or the environment. That is, for traits that are affected by many genes, primarily economic traits, all play a role. Traits such as coat color and horns may be influenced by only one pair of genes or a relatively few genes but traits such as meat, milk and fiber production are affected by many genes.

Selection practiced by man is defined as artificial selection. Even when man practices artificial selection, natural selection is also involved. By definition, artificial selection employed by mankind is an effort to increase the frequency of desirable genes by identifying superior performance using record keeping such as weight for growth, milk and fleeces. Natural selection, on the other hand, is a force responsible for the survival of the fittest in a particular environment. In natural selection, nature has a tendency to select against the weak animal or those that cannot adapt in a different environment from which they originated, whatever adaptation may be required.

CROSSBREEDING

Crossbreeding is a system of mating often used by the producer of market animals. The main effect of crossbreeding is to take advantage of het-

erosis. Crossbreeding is used to combine the desirable traits of two or more breeds. The Boer goat crossed with Spanish, dairy or brush goats will produce an F1 with combine traits of each breed. The offspring will exhibit maternal and paternal heterosis superior to the original breeds. No single breed possesses all of the possible favorable or desirable genes. Combining genes in breeds, opposite in superior traits will produce offspring specifically measured to display the combined genes. New breeds are formed through this process, such as Pygora and Kinder.

Crossing two breeds will consistently produce like animals. The F1 offsprings are receiving one copy of genes from the dam and the other from the sire. When crossing F1's to produce F2's, the genes segregate and recombine very differently. The F1 individuals mated to F1's will never breed true. To establish a breed when crossing two or three breeds, a standard must be determined and all F2, F3 and F4 individuals that do not conform to the breed standard must be culled. After several generations, the animals retained will transmit like genes because they will become homozygous (carry like genes). An F1 mated to an F1 will never breed true unless the parents had genes in common. The F1 individual is a heterozygous (genes are unlike) animal and carries different genes on the chromosomes (one copy from the dam and the other copy from the sire). With two distinct breeds

exhibiting superiority of performance in different traits, they will each transmit one copy of their genes to the offspring. For individuals to breed true, they must carry the same copy of genes on both chromosomes or on each of the chromosome pairs. Then when the chromosomes go to the poles during cell division and are reduced by one-half, each egg or sperm will be carrying the same or similar set of genes. The complexity of this process cannot be covered in this presentation because of the dynamic process in meiosis and the study of quantitative genetics. It is however, reliable.

SUMMARY

Selection in goats is necessary if a producer's goal is to produce more milk, higher weight gains in meat goats, improved mohair production, higher performing show animals, increased kidding rate or any trait a producer wants to change. Along with the selection of improved breeding stock, a producer must also provide management feeding and a herd health program that will allow the genetic potential to be expressed. Some families within a breed bring genes together in a very complementary way. Crossbreeding can also be used to advantage for traits of physical fitness, especially livability, decreased death losses in kids and growth rate. Using selection to improve a goat herd is critical in profitability in raising goats.



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