MINNESOTA FEED SERVICE

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# Using Ladino Clover in Minnesota

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Ladino clover is proving its great value on many Minnesota farms. This highly nutritious, palatable, giant white clover is a comparative newcomer to the list of legumes available for livestock feed production in Minnesota.

Ladino is similar to common or wild white clover in all characteristics, except that the vegetative parts are enlarged. Leaf size, stem thickness, and plant height may be two to four times that of common white clover. Ladino spreads by seed and by thick, fleshy, creeping stems which root at the nodes to form new plants. These stems will vary in size from about the thickness of the lead in an ordinary pencil to just slightly smaller than the pencil itself. A single plant, growing under favorable conditions, may spread to occupy 10 to 12 square feet in a single year.

The seed of Ladino clover is yellow in color and extremely small; a pound contains about 400,000 seeds. These seeds cannot be distinguished from seed of common white clover.

Ladino clover is perhaps the most nutritious of all legumes since only the leaves and flowers are eaten when grazed. Crude protein content above 30 per cent is not uncommon before flowering, while crude protein after full bloom is probably above 20 per cent.

### Adaptation

Ladino clover should be used in mixtures with other legumes and grasses. **It should not be used as the only legume in a legume-grass mixture.** For examples of such mixtures see Extension Folder 182, "Forage Mixtures."

Ladino clover can be grown successfully in combination with reed canarygrass on wet soils, if the canarygrass is grazed or clipped often to prevent excessive shading. Many times an early clipping in the spring will favor Ladino clover production.

When it is in mixtures that will be used for hay only, the percentage of Ladino may be decreased considerably because of excessive shading by the taller growing grasses. Because of its high succulence (80 to 85 per cent moisture), stands with a high percentage of Ladino are difficult to cure for hay.

Ladino clover is best suited to fertile, heavy soils of high moisture-holding capacity. Because of its rather shallow root system, it is best adapted to moist soils and soils that don't dry up early in prolonged dry spells. Even during dry spells Ladino clover responds possibly faster than any other legume in re-initiating its growth. Good stands have been established and good yields obtained on fertile upland soils with well distributed rainfall.

Successful Ladino clover production is found over the entire state. However, the higher rainfall areas of Southeastern, Central, Northeastern and Northern Minnesota seem to provide more favorable conditions for its growth. On poorly drained soils in other areas of Minnesota, Ladino often does well. Ladino will tolerate wet soils better than alfalfa or red clover but not as well as alsike clover.

In order to insure successful establishment and growth, Ladino must be grown under conditions of good soil fertility. It responds well to applications of lime on acid soils—even if it will survive better than alfalfa without the additional lime. A soil test will indicate the needed plant nutrients. Adequate levels of phosphorus and potassium should be maintained through the use of commercial fertilizers.

### Establishment

Like other legumes, special care is needed with Ladino to insure seedling establishment. Since the cost of seed is high and very small amounts are used, get the best seed you can buy. Seed shallow on a firm seedbed. The extremely small seeds of Ladino clover do not contain enough food reserves to push the young plants through the soil to the surface if seeded too deep. A corrugated roller-seeder firms the soil and seeds shallow at the same time. Early spring is the best time to seed. It is desirable to inoculate just before seeding.

### Some Steps for Successful Ladino Clover Production

- Use certified seed
- Inoculate
- Seed early
- Use mixtures
- Seed shallow on a firm seedbed
- Remove companion crop by grazing or cutting for silage or hay
- Graze rotationally
- Allow recovery after grazing and before frost
- Never close-graze or continuously graze

### Not Very Winter-hardy

Ladino is not as winter-hardy as alfalfa and the other legumes. Its shallow roots and the stolans on top of the ground are easily winter-killed. Where the snow cover is light, a majority of the Ladino may kill out the first winter. The surviving plants, however, given favorable growing conditions, can survive and spread rapidly and still contribute to the mixture. It may, under highly favorable conditions for its growth, become so aggressive that it increases the dangers of bloat.

### Remove Competition

It is advisable to remove the companion crop of oats or other small grain just as early as possible, so as to prevent competition for moisture and light in establishment. Grazing, or removing the oats as silage or hay, will favor a more vigorous growth of the young clover plants, lessening the possibility of winter-killing the first winter. If you harvest your companion crop for grain, the straw should be removed from the field.

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# Calcium and Phosphorus in Livestock Rations

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**Editor's Note—Here is the second of a series of discussions on the place of specific minerals in the feeding of livestock.**

## For Sheep—

We refer to calcium and phosphorus as common minerals, yet their purpose in the body is far from common. In addition to the major roles they play in the formation of teeth, bone and milk, they have many less known functions that are extremely vital.

Without adequate calcium, blood would fail to clot and the heart would cease beating.

Phosphorus is an important factor in blood reaction, co-enzymes, and as a necessary nutrient to the micro-organisms in the rumen. It plays an important role in carbohydrate metabolism and the transfer of energy in muscle contraction.

A shortage of either of these minerals would express itself by lowering general production, a decline in milk production, difficulty in conception, poor appetite and low gains.

Are sheep likely to be short of either of these two minerals? A pregnant ewe requires 0.01 per cent calcium and 0.009 per cent phosphorus in her ration. During lactation her requirements for calcium are 28 per cent greater, and for phosphorus 20 per cent greater, than during the pregnancy period.

Would the usual feeds, fed in the usual amounts, normally meet her requirements? Five pounds of alfalfa hay or excellent blue grass hay would adequately meet both the calcium and phosphorus requirements for either pregnant or lactating ewes. However, late-cut or weathered non-legume hay is low in phosphorus and particularly low in calcium. Ten pounds of corn silage is extremely inadequate as a source of calcium and phosphorus for pregnant ewes, and 10 pounds of alfalfa silage is inadequate in phosphorus though adequate in calcium.

As a rule of thumb, phosphorus is the mineral most often lacking in sheep rations. However, if non-legume roughage is being fed to either pregnant ewes or fattening lambs, calcium will often be short. The response from adding calcium to non-legume roughages which are low in calcium is as great as when protein is added.

In lamb-fattening rations the addition of large amounts of phosphorus to the ration have precipitated difficulties with urinary calculi. An overabundance of calcium interferes with the absorption and utilization of phosphorus. An ample supply of Vitamin D (sunlight and sun-cured hay) enhances the utilization and absorption of both calcium and phosphorus.

A mixture of one part common salt (necessary to increase palatability) and one part bone meal or dicalcium phosphate, offered free-choice in a mineral box, is a most acceptable means of guarding these two mineral inadequacies for sheep.

**—R. M. Jordan, Assistant Professor of Animal Husbandry**

## For Pigs—

The National Research Council (NRC) recommends that rations for growing pigs contain 0.65 per cent calcium and 0.45 per cent phosphorus. Since calcium is cheap and most common swine feeds are relatively good sources of phosphorus, the requirements are easily met.

There has been a tendency among many, especially in recent years, to add extra minerals as insurance against deficiencies. The philosophy that if a little is good, twice as much may be much better, definitely does not apply to minerals. The feeding of excess calcium reduces growth rate and may result in parakeratosis (a skin disease).

During the past year we have fed several groups of pigs in which the only variable in the ration was the calcium level. Our basal ration in these experiments contained about 0.6 per cent calcium and 0.5 per cent phosphorus. In the first experiment we added 1.25 per cent ground oyster shell to the basal mixture. This increased the calcium level to slightly more than 1.0 per cent. After 100 days of feeding, the control pigs had gained an average of 154 pounds each and were healthy; the pigs fed the extra calcium had gained only 110 pounds each and 7 out of 11 pigs had developed parakeratosis.

In a second experiment the pigs were fed for only 6 weeks. The pigs fed 0.6 per cent calcium gained 1.21 pounds per day. The pigs fed extra calcium gained only 0.74 pounds per day. There were 3 out of 5 pigs affected with parakeratosis. We have completed two additional experiments in which 2 per cent ground limestone was added to the control ration to bring the calcium level to 1.4 per cent. On this level of calcium feeding, we produced parakeratosis within 3 weeks in some of the pigs and within 7 weeks in 80 per cent of the pigs fed. The addition of zinc to the ration seems to counteract the effects of excess calcium.

It seems to us that in view of this experience, and that of others, the best approach to the feeding of calcium and phosphorus should be to feed only the approximate amounts recommended.

**—L. E. Hanson, Professor of Animal Husbandry**

## For Beef Cattle—

Beef cattle need certain amounts of calcium and phosphorus in their rations, but most of the time the feeds commonly fed contain sufficient quantities to take care of their requirements.

Calcium deficiency in beef cattle is comparatively rare and mild. When a legume hay, such as alfalfa, constitutes a considerable part of the roughage ration, sufficient calcium will be supplied. On the other hand, if little or no legume hay is feed, there might be a deficiency. This deficiency would be more apt to occur in cattle heavily fed on concentrates with limited quantities of roughage. The addition of 0.1 pound ground limestone per head per day would supply them with the necessary calcium.

Phosphorus deficiency is more apt to occur than calcium deficiency in Minnesota. There are a few areas so low in phosphorus that unless the condition is corrected by applying phosphate fertilizer, phosphorus must be supplied in the rations.

Inasmuch as cereal grains have considerably more phosphorus than roughages, phosphorus deficiency is not apt to occur in cattle fattening rations if, in addition to the grain fed, one or more pounds of linseed or cottonseed oil meal is fed.

If there is some doubt about rations for beef cattle having sufficient amounts of calcium and phosphorus, the situation can be taken care of easily by adding one pound of a mixture made up of equal parts of ground limestone, feeding bone meal, and iodized salt to each 100 pounds of grain, or by self-feeding the mixture.

**—A. L. Harvey, Professor of Animal Husbandry**

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## For Dairy Cattle—

Dairy cattle require nearly twice as much calcium as phosphorus. However, they seldom or never, suffer from a calcium deficiency in their rations—except when severely underfed for long periods on low-calcium roughage such as timothy and other grass hays. All roughage, but especially the legumes, is comparatively rich in calcium.

Also if a ration fails for a time to provide enough of this element, the calcium phosphate of the bones is readily mobilized (by means of a hormone produced by the parathyroid glands) to help maintain the calcium content of the blood and tissues.

Unlike calcium, a phosphorus deficiency is perhaps the most common form of mineral deficiency (excepting salt) in dairy herd rations. This is true because all roughage, even the legumes, is comparatively low in phosphorus. And especially true if the roughage is grown on phosphorus-poor soils. Also the farm farm grains—such as oats, barley and corn—which normally make up a considerable portion of most dairy herd rations are only fair-to-low in their phosphorus content.

Furthermore, cattle, unlike for calcium, are not equipped with a mechanism for withdrawing phosphorus from reserves in their bones during periods of shortage. They must depend entirely on their rations for it.

Consequently, a deficient supply of phosphorus in the ration soon leads to a deficient content in their blood followed in order by general unthriftiness, lack of appetite for roughage, depraved appetite, more or less stiffness, marked decrease in rate of growth or in milk production, loss in weight, and in extreme cases by death.

For maintenance of mature cows, an allowance of 1 gram each of calcium and phosphorus in their rations per cwt. of animal is suggested, with an addition of 1 gram calcium and 0.75 gram of phosphorus for each pound of milk produced daily. For pregnant cows, the daily allowance for maintenance of both calcium and phosphorus should be doubled during the last two or three months of the gestation period.

On the extremely rare occasions when a calcium shortage in the ration occurs, a supplementary supply can readily be provided by including more legume roughage, either hay or silage, in the ration. Or by mixing at the rate of 1 or 2 per cent of some calcium-rich products—such as calcium carbonate, marl, or steamed bone meal—in the grain mixture fed.

A phosphorus deficiency, as it progresses, is often complicated by other deficiencies caused by failure of animals to eat enough hay or other roughage to supply needed amounts of calcium, carotene, Vitamin D, and other nutritive factors supplied only by forage. Extensive experiments by the author and associates show that neither a calcium nor a phosphorus deficiency will cause cows to abort nor will it affect their ability to conceive when bred.

The calcium and phosphorus requirements of cattle vary with their age, size and amount of milk produced. The daily calcium allowance suggested for growing 150 pounds calf is about 12 grams. The amount gradually rises to 20 grams at 400 pounds, then slowly drops to 15 grams at 1,200 pounds and above. The phosphorus allowances suggested at the same weights are 8, 15, and 15 grams respectively.

An adequate supply of phosphorus in dairy herd rations can usually be assured by including 20 per cent or more of phosphorus-rich feed—such as wheat bran, cottonseed meal—in the grain mixture fed.

When a mineral form of phosphorus supplement is utilized a product rich in available phosphorus should be selected. Steamed bone meal with about

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# LADINO CLOVER

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### Management is Important

Once established, Ladino clover may easily be injured by continuous and close grazing. Yield can be considerably reduced even if the stand survives such treatment. Best results come when you allow the clover to reach a height of 6-10 inches, graze it to a height of 3 to 4 inches, and then allow it to recover. Avoid close grazing. Remove grazing animals in the fall so that the clover plants have sufficient time to store adequate food reserves to carry them over the winter.

Management which allows these periods of regrowth also favors the more desirable grasses such as brome, timothy and others.

The yield, persistance, and feed value of Ladino clover is favored by growing in mixtures and grazing rotationally.

### Bloat

Ladino clover, perhaps more than any other legume, presents a bloat hazard. The occurrence of bloat can be reduced if a high percentage of the pasture is in grass, by not turning on pasture when the cattle are very hungry, and by insuring ready access to hay, salt and water while on pasture.

**How the forage legumes compare. (Qualities considered outstanding are set in italic)**

| Forage legume | Yield | Winter-hardiness | Drouth resist-ance | Acid-soil tolerance | Wet soil tolerance | Seeding rate in mixtures | Feed value | Palat-ability | Bloat | Ease in establish-ment | Pasture | Time to cut for hay | Value as green manure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALFALFA (Perennial, tall, large seed) | *Excellent* | *Excellent* | *Very good* | Poor | Poor | 5-8 lbs. | *Very good* | Good | Yes | Good | Rotation | Early bloom | Good |
| RED CLOVER (Perennial, tall, medium seed) | Good | *Excellent* | Good | Fair | Fair | 4-6 lbs. | Good | Good | Yes | Good | Rotation | Half-bloom | Fair |
| ALSIKE CLOVER (Perennial, tall, small seed) | Good | *Excellent* | Good | Good | *Very good* | ½-2 lbs. | Good | Good | Yes | Good | Rotation | Half-bloom | Fair |
| SWEET CLOVER (Biennial, very tall, medium seed) | *Excellent* | *Excellent* | *Very good* | Poor | Poor | 10-12 lbs. alone | Good | Poor | Yes | *Good* | Rotation | Early bud | *Excellent* |
| LADINO CLOVER (Perennial, medium height, very small seed) | Good | Fair | Poor | Fair | Good | ½-2 lbs. | *Very good* | *Very good* | Yes | Good | Rotation | ..... | Fair |
| WHITE CLOVER (Perennial, short, very small seed) | Fair | Fair | Poor | Fair | Good | ..... | *Very good* | *Very good* | Yes | Good | Continuous | ..... | Poor |
| BIRDSFOOT TREFOIL (Perennial, short, small seed) | Fair | Fair | *Very good* | Good | *Very good* | 3-6 lbs. | *Very good* | Fair | *No* | Poor | Continuous rotation | Half-bloom | Fair |

# More on 3- vs. 8-Week Weaning of Pigs

L. E. HANSON*

In our previous studies (Minn. Feed Service, Dec. 1954), we were surprised to find that pigs weaned at 3 weeks did not grow as well as pigs weaned at 8 weeks, **after** they were 8 weeks old. Furthermore the pigs weaned at 3 weeks required 7 per cent more feed per pound of gain during the period from 9 weeks to 23 weeks of age than the pigs weaned at 8 weeks. This difference in post 8-week performance is difficult to explain. The pigs weaned at 3 weeks were as heavy at 8 weeks of age, and in all outward aspects looked just as good, as the pigs which were not weaned until 8 weeks old.

We guessed that perhaps the ration fed to the early weaned pigs was lacking in one or more needed nutrients. Thus our early weaning formula was modified during 1955 to include dried whey and a commercial fermentation product. Both ingredients are said to contain unknown "growth factors."

The pigs were managed from birth to 3 weeks of age in a manner similar to 1954 (i.e. all litters were divided at birth and each sow nursed one-half of her own litter and one-half of another sow's litter). All the pigs were affected by a severe infection, most of them when they were 2 or 3 days old, which was brought under control with soluble antibacterial agents. The disease was characterized by severe diarrhea and vomiting. About one-third of the sows also became sick and suffered with diarrhea and/or vomiting. They recovered in a few days without treatment.

One hundred and eighty pigs were saved from 22 Chester White gilts and 90 of them were weaned at 3 weeks. The remaining 90 pigs were allowed to nurse until they were 8 weeks old. The results are summarized in Table 1.

**Table 1. Growth and feed lot data for pigs from 3 weeks to 8 weeks of age, Spring 1955**

| Item compared | Age Weaned 3 weeks | 8 weeks |
|---|---|---|
| No. of pigs started | 90 | 90 |
| No. of pigs at 8 weeks | 87 | 89 |
| Av. initial weight | 9.0 lbs. | 8.9 lbs. |
| Av. weight at 8 weeks | 31.4 lbs. | 32.8 lbs. |
| Av. daily gain | 0.66 lbs. | 0.71 lbs. |
| Feed per lb. gain | 2.16 lbs. | 3.00 lbs. |
| Feed cost per lb. gain | 10.9 cents | 10.5 cents |

* Includes net gain of sows and pigs.

Feed costs were calculated on the basis of prevailing feed prices plus a $10-per-ton charge for grinding and mixing, but with no mark-up for overhead and profit. It is apparent that both systems of management produced pigs economically.

On June 14, when the pigs averaged about 9 weeks of age they were regrouped according to age at weaning. Each group was then reduced to 80 pigs. They were equally divided into 4 lots of 20 pigs each and placed on brome grass pasture. Two rations were self-fed and two systems of feeding with each ration were followed. Thus one-half of the pigs were fed complete mixed rations and one-half were fed by the free-choice method. Table 2 is a summary of the results according to age at weaning.

**Table 2. Growth and feed lot data for pigs fed on pasture from 9 weeks to 23 weeks of age, June 14 to Sept. 20, 1955 (98 days)**

| Item compared | Age Weaned 3 weeks | 8 weeks |
|---|---|---|
| Total no. of pigs available | 87 | 89 |
| Av. weight of all pigs, June 14 | 37.8 lbs. | 38.5 lbs. |
| No. of pigs started | 80 | 80 |
| Av. wt. of pigs started, June 14 | 39.0 lbs. | 40.0 lbs. |
| No. of pigs that finished* | 78 | 79 |
| Av. wt. of pigs, September 20 | 186.0 lbs. | 192.5 lbs. |
| Av. daily gain | 1.49 lbs. | 1.56 lbs. |
| Av. daily feed | 5.5 lbs. | 5.6 lbs. |
| Feed per 100 lb. gain | 368 lbs. | 360 lbs. |

* One pig removed because of a broken leg; one died due to a hernia in the 3-week weaned group. On pig died from overheating in the 8-week weaned group.

The differences in rate of gain and feed efficiency, while slightly in favor of the pigs weaned at 8 weeks, were smaller than those obtained in 1954. Does this mean that we succeeded in correcting the deficiencies in our 1954 early weaning feed formula? The answer to this question is not clear because of the disease problem in these pigs before the experiment started and because we had a much hotter summer in 1955 than in 1954.

For 1954, the feed requirement per 100 pounds gain was 363 pounds and 340 pounds for the 3-week and 8-week weaned pigs, respectively. If we compare those values with the ones obtained in 1955, it appears that the smaller difference for 1955 was due to the increased feed requirement of the 8-week weaned pigs fed last year. It is possible that the stresses exerted by the early disease problem and the hot weather were sufficient to mask the differences that otherwise may have been obtained. Further research will be necessary to clarify this point.

* Professor of Animal Husbandry.

## FOR LIVESTOCK

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15 per cent of phosphorus, and dicalcium and tricalcium phosphates with slightly higher percentages, are standards. These products also contain about 30 per cent of calcium. Any one them should prove satisfactory when included at the rate of 1 to 3 pounds per 100 pounds of grain mixture.

Raw rock phosphate, although rich in both calcium and phosphorus, usually contains 3 to 4 per cent of fluorine and is therefore unsafe for all classes of livestock. Defluorinated phosphates containing 0.1 per cent or less of fluorine are reasonably safe.

It should be stated that the full value to an animal of all the calcium and phosphorus provided is realized only when the ration also contains adequate amounts of vitamin D, or it is provided by ultra-violet irradiation, as by exposure to direct sunlight.

—Thor W. Gullickson, Professor of Dairy Husbandry

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