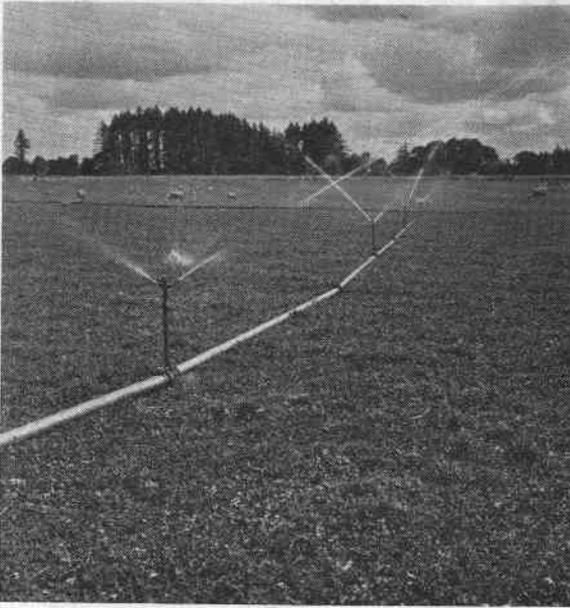


Ladino Clover for Western Oregon

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FOREWORD

The value of ladino clover as a pasture plant has long been recognized in Oregon. The development of seed production in Oregon is further recognition of its value. The adaptations of ladino clover to a wide range of soil and climatic conditions indicated that it should be a valuable addition to the forage resources of a large section of the United States. The present unprecedented demand for ladino clover seed from other parts of the country is evidence that the value of the crop is being recognized elsewhere.

This circular summarizes the principal adaptations and cultural practices for ladino clover. It is hoped that the material presented here may be instrumental in promoting a wider and more effective use of this extremely valuable legume.

WM. A. SCHOENFELD
Dean and Director of Agriculture

Ladino Clover for Western Oregon*

By

H. A. SCHOTH, Senior Agronomist†

LADINO CLOVER, *trifolium repens*, variety *latum*, a native of northern Italy, also known as giant white or Italian white clover, is a very large variety of the ordinary white clover common in lawns and pastures. It is a perennial of medium long life, having short tap roots and surface stems that lie flat on the ground and commonly produce fibrous roots at the joints.

The leaf stalks are long and each carries a single leaf having three large leaflets. The flowers, borne singly on long stems, are similar to those of ordinary white clover but less numerous and three to four times larger. Ladino clover, when grown under similar conditions, usually makes a growth of 8 to 12 inches in height compared to 4 to 6 inches for the ordinary white clover, and an intermediate height for Louisiana white clover. Ladino is not as hardy as the ordinary white clover.

GROWING CONDITIONS

As ladino clover is not a deep-rooted plant, it makes its best growth where there is a constant but not excessive moisture supply in the surface and subsurface soil. It can be grown on rather shallow land provided this land is well supplied with lime, phosphate, humus, and moisture. A larger growth is obtained on the more fertile and deep soils well supplied with moisture during the growing season. This is the case with all clovers.

In western Oregon under irrigation, or where there is abundant moisture, this clover makes especially vigorous growth on soils ranging from the lower sandy loams to the medium heavy types. Under these conditions spring, summer, and fall growth is almost continuous. Ladino is no more tolerant of wet soil conditions than common white clover, and it is especially unsuited to soils that remain saturated during the growing season. On the higher, drier soils the spring and early summer growth is rapid and quite heavy, but as soon as the soil dries out, growth is rapidly reduced. During late summer and early

* These recommendations are based on experiments and observations made under cooperative experimental work carried on by the Oregon Agricultural Experiment Station and the Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils and Agricultural Engineering, United States Department of Agriculture.

Recommendations on fertilization and irrigation are supplied by Arthur S. King, Extension Specialist in Soils, Oregon State College.

† United States Department of Agriculture, Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils and Agricultural Engineering.

fall little forage is produced. Growth through the late fall, winter, and early spring periods is slow, particularly when temperatures of 30 to 40 degrees hold the plants in a semidormant condition. Growth stops when temperatures go below 25 degrees. Experimental observations show that if the soil is dry and frozen and unprotected by snow, continued periods of low temperatures may result in winter injury, particularly if there is overgrazing during late summer and fall. Less winter killing is experienced when the clover is grown with grass than when grown alone.

Preparation of the seedbed. Soil preparation for ladino clover should produce a fine, firm, weed-free seedbed. If the field is to be irrigated by flooding, it will be absolutely necessary to have it well leveled previous to seeding, so that the water can be distributed evenly and with as much uniformity of speed and economy as possible. High places that get insufficient water soon lose the ladino when grazed. In low places where there are pools of water or where seepage accumulates, the clover drowns out.

The use of sprinklers or perforated pipe for irrigating is proving very satisfactory on uneven land and where there is not sufficient water for flooding.

Early preparation of the land to free it of weeds and assure a well settled condition is important. An ideal seedbed is obtained by fall plowing followed in the spring by light working of the surface soil. If the seedbed appears to be too loose, which is a common occurrence, it should be rolled before seeding to prevent planting the seed too deep and to enable the seedlings to become better established.

USE ONLY GOOD SEED. Because ladino clover seed can not be distinguished from that of common white clover, certification is necessary to maintain pure seed supplies. The field inspection required in certification provides a means of accurate identification. Growers are advised to use one of the three grades of certified ladino seed. The specifications follow:

BLUE TAG. Not more than 1 per cent white clover in the field on field inspection. Threshed seed shall be plump, not less than 99 per cent pure, contain not more than .6 per cent of weed seed, and not more than 300 alsike and 54 buckhorn seeds per pound.

Blue Tag seed is recommended for the use of seed growers and others desiring the highest quality of seed.

RED TAG. Not more than 2 per cent white clover in the field. Threshed seed shall be reasonably plump, not less than 97½ per cent pure, contain not more than 1 per cent weed seed nor 2 per cent inert matter, and not more than 216 buckhorn seeds per pound.

This grade is recommended for pasture purposes.

YELLOW TAG. Not more than 10 per cent white clover in the field. Threshed seed shall be at least 95 per cent pure, have a total germination of at least 80 per cent, and shall contain not more than 2 per cent weed seeds, nor more than 2 per cent inert matter. The certification tag shall carry the analysis of seed, showing germination and percentages of pure seed, other crop seeds, inert matter and weed seeds, with the number of seeds per pound of noxious weeds not specifically limited by law. This grade may not contain more than 432 buckhorn seeds per pound.

Seed containing lightweight inert matter or inert matter injuring the appearance of the lot will not be passed in any grade.

Noxious weeds such as dodder, Johnson grass, quackgrass, camelthorn, white top, blue lettuce, bladder campion, wild morning-glory, Canada thistle, knapweed, or Marsh elder are not permitted in the seed of any certified grade.

Seedings sown primarily for seed production should be made only with **BLUE TAG** quality seed. **RED TAG** and **YELLOW TAG** seed may contain some white clover or alsike clover seed that is inseparable from ladino and also various amounts of weed seed and inert matter. These grades are very satisfactory for pasture or other forage purposes.

Two seeding methods. Usually seeding is done by broadcasting, followed by light harrowing. A clover-seed drill that can be gauged to sow shallow and evenly in rather small amounts is an ex-



Figure 1. Sheep on sprinkler irrigated ladino clover pasture.

cellent implement to use. When a drill is used the seedbed should be well firmed. The seed should not be covered more than one-half inch deep.

Five or six pounds of seed per acre planted alone is sufficient if the land is well prepared and comparatively free from weeds. When seeded in combination with other plants the amount of ladino seed is reduced to 3 to 4 pounds per acre, depending on the amounts and kinds of other seeds in the mixture. Under heavy grazing it is important to have many primary or taprooted plants rather than to depend on the less hardy secondary plants established from stolons.

When seeded for pasture purposes ladino frequently is combined with grasses that fit in well as companion plants and that make satisfactory growth under similar conditions. Commonly used mixtures based on experimental plantings are as follows:

<i>Mixture No. 1*</i>	<i>Pounds per acre</i>	<i>Mixture No. 2</i>	<i>Pounds per acre</i>	<i>Mixture No. 3</i>	<i>Pounds per acre</i>
Ladino clover	3	Ladino clover	3	Ladino clover	3
Redtop	4	Perennial ryegrass ...	8	Perennial ryegrass ...	3
Perennial ryegrass ...	3	Orchard grass	4	Timothy	2
Common ryegrass ...	3			Orchard grass	4
				Alta fescue	3
Total	13	Total	15	Total	15

Avoid timothy, white and alsike clover, and lotus in seed crops. These crops should be avoided in any mixture that later may be harvested for seed. Hulled timothy, white and alsike clover, and small lotus seed are practically inseparable from the ladino seed.

Ladino clover in western Oregon, especially in the Willamette Valley, is most successful when seeded in the spring. Seedings may be made from May 1 to July 1, depending on the season, soil, and moisture condition. Any fall seedings should be made early, September 1 to 20. They are not generally recommended. Experiments show that fall seedings when made alone are not as successful as spring seedings. Such plantings made on moist land are likely to heave out during periods of alternate freezing and thawing. When planted with grasses, however, ladino is considerably less injured. Fall-sown ladino in western Oregon frequently is seriously injured by slugs before rapid spring growth begins.

When grown primarily for seed production seedings usually are made alone. Yields generally are larger, there is less material to handle at harvest, and cleaning operations and costs are reduced.

* In mixture No. 1 meadow foxtail, *Alopecurus pratensis*, at 6 pounds an acre, can be substituted for redtop. It is proving very satisfactory in combination with ladino clover. Seed is scarce and difficult to obtain at present, but supplies are gradually increasing.

LADINO VALUABLE FOR PASTURE, SEED, AND HAY

Ladino clover either alone or in combination with other plants is grown for pasture, seed, and hay. It is primarily a pasture plant and as such produces a heavy tonnage of rich succulent feed relished by all kinds of livestock. Where a considerable acreage is grown, the fields should be divided so that rotation pasturing will provide full utilization of the crop. Any fields not used for pasture can be cut for hay or seed.

When used for both pasture and hay, the spring growth is used for pasture, the early summer growth for hay, and later growth for either hay, pasture, or seed.

Pasture. Ladino clover when pastured or fed green may cause bloat in cattle and sheep, although under similar conditions generally it is no worse than alfalfa. In some instances bloat has been quite serious, and it is always advisable to keep this danger in mind. Frequently it is best to keep animals known to bloat easily off of ladino clover pasture entirely. Pure stands of ladino clover are more likely to cause bloat than mixed seedings containing considerable proportions of grass. It has been observed that animals kept continuously on the pasture are less likely to bloat.

Ladino clover should be pastured as evenly as possible but not close enough to injure the creeping stems on the surface of the soil. Rotation grazing is a very desirable practice for this clover, resulting in more even grazing, less waste, and increased production. When given an opportunity to grow unmolested for short periods the clover makes a more rapid growth than when subjected to continual grazing.

Cleaning up a ladino clover field after a period of pasturing by mowing results in even growth and prevents weeds from seeding. Large weeds should be dug out.

Research indicates that ladino clover should reach a height of approximately 4 inches before pasturing begins in the spring. Stock should be removed before the end of the growing season in the late fall.

Close pasturing in the fall is not advisable because stands of ladino clover when grazed too closely, particularly those seeded alone, are injured by severe winter weather conditions. Mixed stands of ladino and grasses, however, can be grazed more closely without quite as much danger of injury. Animals injure the fleshy stolons severely if they are allowed on the field when plants and soil are frozen.

Seed production. In the production of ladino clover seed the spring growth frequently is used for pasture, the stock being taken off the fields about May 15 and the growth from then on allowed to mature. Under some irrigated conditions two sets, or crops, of blossoms are developed to the mature stage before harvesting. Where irrigation water is properly and evenly distributed and the first set of practically mature blossoms is not destroyed or kept wet too long, this practice often results in increased seed yields. A rather long growing season is desirable for this practice.

Some growers use the entire season's growth for seed, producing a succession of flowers that are cut at one cutting in the fall. The crop is ready to cut when 90 per cent of the visible heads are brown and mature enough to thresh when dry. The seed may be harvested with a mower with bunching attachment or swather. As vigorous growing, green ladino is difficult to cut, irrigation water is kept off the land for 10 days to 2 weeks before harvest. As soon as the crop is well dried it should be hulled. The ordinary clover seed huller is considered the most satisfactory for hulling. Satisfactory hulling can also be done with stationary threshers and combines when equipped with clover hulling attachments and properly handled. When not properly equipped or handled there may be considerable loss of seed and rerunning the straw may be necessary to obtain all or most of the seed. It is not practicable to combine ladino clover standing because of the large amount of green material practically always present and the toughness of the heads. Yields will vary



Figure 2. A good stand of ladino clover.

from 100 to 400 pounds of seed per acre, depending on the fertility of the soil, the stand, and the growing conditions under which the crop is produced. If a full stand is maintained more seed is produced as the plants advance in age.

Production of certified seed must include inspection of fields previous to cutting. After removing the crop from the field, irrigation is desirable to stimulate fall growth.

In the Willamette Valley on soils that are deep, fertile, and reasonably well supplied with summer moisture, ladino clover will often make satisfactory growth and produce one or two seed crops and some forage. Usually the production under such conditions is lower than where irrigation is practiced.

Hay. Ladino clover hay is of excellent quality, as it is rich in protein. It is consumed readily by all kinds of livestock. It is particularly valuable for dairy cattle and sheep. Analyses of the hay made by J. S. Jones and J. R. Haag of the Oregon Agricultural Experiment Station, calculated on the dry basis, show a range in protein of 11.8 to 24.2 per cent. The high protein content is found in the more immature clover. The lower percentages are found in hay cut after the blooms begin to mature.

This clover is more frequently used as a hay plant on soils too wet or shallow for alfalfa. When used for hay ladino should be cut when in full bloom because at that time the maximum amount of high-quality forage is available. Because of its fine character and leafiness, curing should be reasonably rapid and the hay should be handled as few times as possible to avoid the loss of leaves. After it is thoroughly wilted the final curing generally is in the shock. Care must be taken not to shock the clover when too green or in too large shocks because molding may take place during the rapid settling of the hay. Three cuttings a year can be made under ordinary moist-land conditions. The tonnage per acre for each cutting is not large because the hay consists mostly of leaves and leaf stems.

LADINO CLOVER REQUIRES HEAVY FERTILIZATIONS

Irrigated pastures containing ladino clover produce large quantities of feed and remove heavy amounts of mineral plant food from the soil. Because of the limited root system, the available supply of plant food in the first foot of soil may soon be depleted and the yields suffer. The use of phosphorus- and sulphur-carrying fertilizers has assisted in maintaining yields. On poorer soils the fertilization pro-

gram should start before seeding with an application of 300 pounds of superphosphate or 125 pounds of treble phosphate and 100 pounds of landplaster per acre. This should be followed by an early spring top dressing in February or March of at least 200 pounds of superphosphate or 75 to 100 pounds of treble phosphate and 75 pounds of landplaster each year. Elemental sulphur may be used in place of landplaster except in the Willamette Valley or on the Coast. Only readily available phosphorous fertilizers should be used. While phosphorus- and sulphur-carrying fertilizers do not always mean increased yields of ladino clover, the response has been so general that they should be given a trial on every farm.

On a few farms, the use of potash fertilizers has given excellent returns in combination with phosphorus. On some shallow soils low in fertility, the application of nitrogen as ammonium phosphate has made possible profitable stands, where phosphorus alone failed.

Ladino clover is more tolerant of acid soil than most legumes. Liming is not necessary unless the soil is extremely acid.

With pasture mixtures the use of nitrogen fertilizers will stimulate the growth of grass. Nitrogen should be used cautiously, however, as it may stimulate the grass to the point of choking out the clover. It should generally be used only in combination with phosphorus- and sulphur-carrying fertilizers. The amount of grass in pastures may be governed by the use of nitrogen fertilizers. If the pasture has too much clover, the proportion of grass may be increased by increasing the amount of nitrogen in proportion to the phosphorus and sulphur. On the other hand, the amount of clover can be increased by applying phosphorus and sulphur alone, or with limited applications of nitrogen.

On the average farm, there is probably no place where barnyard manure may be used more profitably than on the irrigated pasture. Applications should be made early in February or March. The rate should be not more than 8 or 10 tons per acre. It is essential that a good spreader be used in order that the distribution may be even. The use of manure should be accompanied by an application of the equivalent of 300 pounds of superphosphate per acre, as barnyard manure is low in phosphorus. If this phosphorus is not added, it is probable that the grass will soon choke out the clover. An occasional light harrowing to distribute animal droppings will help maintain the palatability of the pasture.

Where liquid manure tanks are used on the farm, the liquid is an ideal fertilizer for irrigated pastures. It can be used safely during any part of the growing season, provided the application is followed immediately by irrigation. The distribution of liquid manure

on the fields in the irrigation water is practiced on some farms and is proving satisfactory where facilities are available for such procedure and irrigation is by flooding. If sprinkler irrigation is used the liquid manure must be absolutely free from materials that may clog the sprinklers. Liquid manure should be supplemented with an application of phosphorus.

Phosphorus and sulphur or landplaster will generally be profitable on seed crops. Manure and nitrogen fertilizers should be used with caution on mixed seedings to be harvested for seed because of the danger of stimulating too much grass growth.

LADINO CLOVER REQUIRES FREQUENT IRRIGATION

Except where considerable natural soil moisture is available, ladino clover for either pasture or seed will require irrigation. In the Willamette Valley and Coast regions this will generally mean the installation of an individual farm irrigation project. The type of irrigation used makes no difference in the growth of the clover, provided it is possible to apply the water whenever needed.

Where surface irrigation is used, the land should be prepared for either the corrugation method or strip-border method. It is desirable to prepare the land in the fall previous to seeding. In western Oregon this will permit early spring seeding and allow the clover to make good growth from the natural moisture in the soil before irrigation is necessary, avoiding many difficulties in the first application of water.

Irrigation water should be available in sufficient quantity to permit applying 4 inches every 2 weeks. While it is not always necessary that water be applied at this rate, yet during the drier part of the summer yields will be reduced unless this much water is used. Irrigation of ladino clover should start early in the spring or as soon as the plants show the effect of lack of sufficient moisture. These indications are evident when the clover plants show a light-green color and the leaves wilt in the heat of the day. In western Oregon the irrigation equipment should be ready for operation early in May. Irrigation often is necessary before May 15. The amount of irrigation will depend on the soil type. Usually an application of at least 3 inches is necessary to wet the soil to the full depth of the root zone. The application of water should be approximately the same regardless of whether it is distributed by surface methods or by sprinkling. Lighter applications will tend to draw the roots to the surface and make the clover more susceptible to drought.

To obtain the best yields from irrigated pasture, growth should be continuous throughout the growing season. If the pasture suffers for lack of moisture at any time it is extremely difficult to bring it back into maximum production that season.

Seed crops will require the same irrigation as pasture except that no water is applied for two weeks to a month prior to harvest.

STANDS MEDIUM LONG LIVED

Good stands of ladino clover on suitable land and properly handled should produce well for 4 to 8 years although it is almost impossible to keep the stands from getting grassy as they get older. As soon as the percentage of grass gets larger than that of clover it may be advisable to break up the sod and plant to other crops unless the quality and quantity of the remaining combination is such that it can be profitably utilized for forage.

The use of ladino clover instead of white clover in pasture mixtures on land reasonably well supplied with summer moisture usually results in increased amounts of pasture. This is especially true in the Coast districts or where irrigation is practiced. Common white clover probably will be more productive on poor, dry soils because little forage can be expected from the ladino plant under such conditions.

Cultivation to destroy weeds and grass is not successful because of the heavy loss of stems and plants because of the shallow rooting system. Stands of ladino clover on sour soils frequently are stimulated by applications of 1 to 2 tons of lime per acre. Many good stands have been obtained, however, without the use of lime because ladino appears better suited to slightly acid soil conditions than some other clovers.