LUCERN GROWING IN THE FAR WEST

Success Achieved in Handling This Valuable Home Crop.

PRACTICAL SCHOOL LESSONS.

Given at State Normal on Leguminous Plants by Agricultural Experts.

Reported by J. H. Paul.

In pursuance of the plan to bring elementary agriculture into the work of the common schools of Utah, Prof. Hogenson of the Agricultural college continued his series of interesting lectures on Monday, before the nature study sections of the fourth year Normals at the state university. His topic was lucern, or alfalfa. His object was to show its importance to the agriculture of this state and the desirability of making it a subject of school instruction. The advantage of studying and working with lucern and other home products over a professed study of foreign productions was clearly though incidentally illustrated.

LEGUMINOUS PLANTS.

The classes had already made experimental observations and outlines for school lessons upon lucern, sweet clover, white clover, sweet peas, and red clover, observing particularly their structure, appearance, mode of growth, devices for securing cross-fertilization, etc., and had learned something of the peculiar value of these pod bearers as collectors of free nitrogen.

The lecturer stated that the lucern, or alfalfa, is by far the most important leguminous crop grown in this part of the country. It not only furnishes an excellent hay, but it starts growth early in the spring, grows so quickly and keeps green so long that it provides green forage from early spring till late fall. Besides this, it acts as a good fertilizer in improving the fertility of the soil by adding the element nitrogen.

HISTORY OF NITROGEN.

Lucern is one of the oldest plants under cultivation. It is a native of western Asia and was well known to the Medes and Persians. When Xerxes invaded Greece about 450 B. C., he brought lucern with him and so introduced it into Europe. At the time of the Christian era, it had become well established in Roman agriculture, where it was known as "the best of fodder plants." Pliny the elder speaks of it not only as a good food for animals, but mentions also that it improves the soil upon which it is grown. From Rome it spread into Spain and France. At the time of the Spanish invasion, it was brought into South America and Mexico. From South America in 1854 it was brought into California. The plant received little attention there at first, but in 1874 a demonstration of its worth aroused the interest of the people. A Mr. Miller had sown hundreds of acres of lucern in one of the rich valleys of California and was fattening thousands of cattle upon it. His success led to its rapid spread until the plant made its way to Utah and surrounding states. It has steadily made its way eastward, and in 1886 the first field was sown in Ohio. In an early day it had been introduced into the eastern United States before it came to California. In 1791 it was brought from Europe to New England, but it made little headway, and during the rapid westward expansion of agriculture, it was soon forgotten until it made its way eastward from California.

USEFUL FACTS ABOUT LUCERN.

Lucern is a deep-rooted plant. Its root system consists of a single top root running down from one to 10 feet and then dividing into a few branch roots. Sometimes several branch roots set out from the top root near the crown. The main roots are very smooth and free from fibrous roots. Some root hairs are found in the first surface foot of soil and also at the extremities of the roots.

Lucern, or alfalfa, as it is everywhere called in the east, has the power of taking the free nitrogen from the air, of using it in its growth, and of storing the nitrogen in large quantities in the soil to be used by succeeding crops. It does this by means of bacterial organisms which, under favorable conditions, develop upon its roots.

If we examine the small roots of a lucern plant, we shall notice small oval knots, or nodules, on them. These nodules are the homes of the bacteria, or microscopic plants, which have the power of taking the nitrogen from the air and storing it in the plant and in the soil.

The lucern leaves, which contain a large percentage of the mineral matter held by the plant, are very easily lost in handling, so that great care should be taken to have the hay in just the proper condition before attempting to move it from the field or stack. The leaves have about 60 per cent of the toral nitrogen contained in the part of the plant that is above ground.

COMPOSITION OF LUCERN.

Lucern and all of her feeding "stuffs" may be said to contain the following combination of substances in the form of food stuffs: (1) water; (2) dry matter, which consits of ash and organic matter, the latter containing protein in the form of albuminoids and amids, also fats and carbohydrates, which consist of nitrogen free extract, and crude fiber. We shall speak of these in the order given.

WATER AND ASH.

The amount of water in a plant varies greatly according to the stage of development of the plant, being most abundant in young plants and becoming less as the plant matures. The dry matter is that part of the plant which remains after the water has been driven off.

Ash is the mineral matter which is left after the plant has been burned. The organic matter is that portion of the plant which is destroyed by burning.

ORGANIC OR FOOD PARTS.

Protein is the name of a class of compounds containing nitrogen. They may be divided into albuminoids and amids. The albuminoids are the nitrogenous substances which go to make up the flesh of the body. The amids are nitrogenous compounds soluble in water. They are found principally in immature plants.

The fats are the reserve materials which the plant may draw upon in case of need.

The carbohydrates consist of combinations of the elements carbon, oxygen and hydrogen. They are the heat producers in the animal body. The nitrogen free extract consists of the starchy part of the plant. The crude fiber is the woody part of the plant, and is the least digestible of the food constituents of which the plant consists.

THE AVERAGE COMPOSITION.

The following figures give the average composition of lucern, fresh from the field, air dry and water free.

	Ash.	Prot.	Fat.	Fiber.	N.F.E.	Water
Fresh	2.83	4.61	.89	7.25	12.27	72.14
Air dry ...	9.80	15.15	2.90	23.84	40.30	8.50
Waterfree	10.18	16.60	3.20	26.12	44.15	00

The above table is compiled from the analyses of fourteen experiment stations.

WHEN TO CUT LUCERN.

The value of a crop of lucern depends upon three factors: first, the composition; second, the digestibility; and third, the amount of each constituent presnt. If we consider the yield, lucern increases in dry matter to the end of the season, the heaviest gains being made at the time the buds are unfolding. During the first weeks of bloom we have the highest percentage of albuminoids, which are easily digested. After early bloom, as the plant grows older, its food value, pound for pound decreases. To obtain a large amount of dry matter and the largest percentage of albuminoids, other proteids and fats, and the lowest percentage of fiber; lucern should be cut in early bloom when only from 5 to 10 per cent of its blossoms have appeared. We get then a larger yield, which contains a higher percentage of the most valuable nutrients, a larger percentage of leaves, and a greater proportion of digestible matter than if it is cut at any other time.

HOW TO GROW IT.

Lucern is not suited to all soils and climates. It appears to be best adapted to the irrigated regions of the west, where the moisture can be controlled, and where the plant gets a maximum amount of sunshine and a minimum amount of shade.

The discing of a lucern field destroys all surface rooted plants but does not injure the deep rooted lucern. The cutting and splitting of the crowns invigorates the growth and thickens the stand. The first few months of the life of lucern is its most critical period. The young plants should be cut often during the first year, not for the sake of the hay but to destroy the weeds, and to strengthen the lucern plants. The young plant is easily checked by lack of moisture and killed by frost. Before planting the land should be deeply plowed in the fall. In the spring the disc harrow should be freely used to smooth the soil and to conserve the moisture. Mulching is quite generally practised in the west, where the conservtion of soil moisture is of the utmost importance. About two or three inches of the soil on top should be kept as loose as possible. In Wisconsin a mulch is made of the last crop, which is left on the ground during the winter. Manure, also, may serve as a mulch to protect the roots from the destructive action of freezing and thawing.

LOWING AND SEEDING.

In the western states it is almost entirely spring sowing that is practised, May being the favorite month during which the seed is sown. The best way to sow lucern is with a press drill, covering the seed from an inch to an inch and a half in depth, and pressing down the surface so as to draw up water from beneath by the action of capillary attraction. The quantity of seed to sow per acre depends upon the soil and the conditions under which the lucern is to be grown. To obtain the highest yield under arid farming conditions, six, eight, or ten pounds per acre is sufficient. In irrigated districts, from 15 to 20 pounds per acre may be sown to advantage.

QUICK HARVESTING.

In an experiment carried on at the Colorado station to determine the losses in cutting and curing lucern, the following results were secured: Lucern left out 15 days after cutting, lost 27 per cent; lucern left out one week, lost 10 per cent; lucern raked the same day as cut and hauled to the barn the next day, lost only 5 per cent of its weight.

AS A BEEF PRODUCER.

The average annual beef product from an acre of lucern is 706.6 pounds. To produce an equal weight of beef from other kinds of hay would require 9,575 pounds of timothy, 11,967 pounds of red clover, and 10,083 pounds of corn fodder. The Kansas station claims that cattle can be fattened 50 per cent cheaper by the use of lucern than by that of other fodders. It also produces milk cheaper than any other cow food. Lucern is considered an excellent food for horses, cattle, sheep, pigs, and poultry. There are two kinds of lucern—common and Turkestan. The latter was brought from Asia a few years ago by the United States department of agriculture. It is claimed to be better than the common kind.

Clover, peas, beans and many other leguminous plants are grown in our state, but the crop just discussed is by far the most important.

SCHOOL WORK ON LUCERN.

In the school room the lucern plant should be closely examined as to its method of growth, its leaves, flowers, seeds and root system. The seed ought to be tested to determine its germinating power and compared with seeds of other plants so that they will be known. Plants ought to be dug up roots and all, and the roots examined for the nitrogen forming nodules which are upon them. Lucern, peas, beans and other leguminous seeds should be planted and their methods of germination and growth should be noted. Samples of seeds and the whole plants of all legumes grown in the state should be selected and studied both in the school room and in the field during different stages of growth. It is good to make a theoretical, geographical study, as the schools do, if the growing of cotton and other products not raised here; but it is better to make an actual examination of the wonderful, more valuable, more available plants at home which furnish the wealth and the conditions of life for ourselves.

BEST NITROGEN COLLECTORS.

Lucern, cowpeas, sweet clover, soy beans, red and alsike clover are the best of the nitrogen collectors.

Of the multitude of leguminous plants of economic importance, the Michigan station has found that the following indicated some value as green manures, especially on sandy soils: the lupines, kidney vetch, goat's rue, crimson clover and the vetches, while the following gave some promise as a food supply for stock: crimson clover, seradella, sanfoin and Japan clover. For various reasons the following indicated no value for Michigan: sweet clover, fenugree, Astragalus sinensis, sulla, peanuts, goobers, Cicer arietinum, and lentils. We have many native leguminous plants in Utah, making the virgin soil naturally fertile.

IMPORTANCE OF NITROGEN.

Nitrogen is the most important food of plants, because it is the most difficult for them to get and the most expensive for man to supply. It exists free in the atmosphere, and hence in the soil, which normally contains a good deal of air. But soil nitrogen cannot be used by plants until it is changed to the form of nitrate nitrogen by the nitrifying bacteria.

Atmospheric nitrogen cannot be used by any agricultural plants, excepting legumes, and even leguminous plants have no power to obtain nitrogen from the air unless their roots are provided with the proper nitrogen-gathering bacteria.

As a rule each important agricultural legume must have its own particular species of bacteria.

BACTERIA OF THE SOIL.

Two great classes of bacteria are, first, the nitrifying, and, second, the nitrogen gathering bacteria. The nitrifying bacteria have the power to form nitrates. The nitrogen found by analysis of the soil itself consists mainly of organic compounds, in which nitrogen is united with other elements, chiefly carbon, hydrogen, and oxygen. The latter three are found in the soil as partially decayed vegetable or annual matter—that is, organic matter, formed by the growth of some organism either plant or animal. Since in these forms called nitrates, when dissolved in water the nitrogen can be absorbed by the roots of plants, it is important to know that there are at least three different kinds of bacteria, and also three different steps or stages involved in the process of nitrification, the nitrogen being changed from the organic compounds first into the ammonia form, second, into the nitrite form, and third into the nitrate form. During the process the nitrogen is separated from the carbon and other elements composing the insoluble organic matter, and is united or combined with oxygen and some alkaline element, as calcium, to form the soluble nitrate, such as calcium nitrate, which is one of the most suitable compounds of nitrogen for plant food. Calcium is the alkaline element contained in lime or limestone. The name calcium nitrate indicates just what elements this compound contains; namely, calcium, nitrogen, and oxygen. In the names of compounds the ending -ate always means oxygen.

FORMATION OF NITRATES.

The nitrate thus formed may be calcium nitrate, megnesium nitrate, potassium nitrate, or even sodium nitrate, depending upon which of these alkaline elements is present in the most suitable form. If no alkaline element is present in available form, then no nitrates can be made in the soil. One of the reasons for applying ground limestone to soils that are deficient in lime is to furnish the element calcium in suitable form for the formation of nitrates in the process of nitrification. Ground limestone is calcium carbonate ($CaCO_3$), a compound containing one atom of calcium (Ca), one atom of carbon (C) and three atoms of oxygen (O_3). This is the same form of lime that is contained naturally in limestone soils— and these soils are noted for great productiveness—and it is generally the most economical form of lime to use for correcting soil acidity and promoting nitrification.

In the formation of nitrates, there is required, not only the presence of calcium, or some other alkaline element, in suitable form, but also a good supply of the element oxygen; for calcium nitrate, $Ca(NO_3)_2$, contains one atom of calcium (Ca), two atoms of nitrogen (N_2), and six atoms of oxygen (O_3)$_2$, in each molecule as indicated in the formula, $(CaNO_3)_2$. Magnesium nitrate, $(Mg(NO_3)_2$, potassium nitrate, KNO_3. (K is from the Latin word Kalium, which means potassium), and all other nitrates, also, contain oxygen, the supply of oxygen for the formation of nitrates in the soil comes from the air, which consists of about 20 per cent oxygen, 78 per cent nitrogen, and 2 per cent of other elements and compounds, as argo, carbon dioxid, CO_2, water vapor, H_2O, etc. One of the important effects of cultivation, or tillage is that it permits the air more freely to enter the soil, and thus promote nitrification.

THE PLANT'S FOOD.

Among the 10 essential elements of plant food, carbon has no commercial value because plants get it free from the air, and the hydrogen and oxygen from soil water. Calcium, magnesium, iron and sulphur are always sufficiently abundant in soils for plant growth. But nitrogen phosphorus, and potassium being present in limited amounts while required by plants in considerable quantities, have market values and are sold as fertilizers.

HIDDEN DANGERS.

Nature Gives Timely Warnings That No Salt Lake City Citizen Can Afford to Ignore.

DANGER SIGNAL NO. 1 comes from the kidney secretions. They will warn you when the kidneys are sick. Well kidneys excrete a clear, amber fluid. Sick kidneys send out a thin, pale and foamy, or a thick, red, ill-smelling urine, full of sediment and irregular of passage.

DANGER SIGNAL NO. 2 comes from the back. Back pains, dull and heavy, or sharp and acute, tell you of sick kidneys and warn you of the approach of dropsy, diabetes and Bright's disease. Doan's Kidney Pills cure sick kidneys and cure them permanently. Here's Salt Lake City proof:

Mrs. M. J. Steven, living at 1217 West Third South St., Salt Lake City, Utah, says: "For over thirty years I suffered from kidney complaint, and there has been times when I really thought I would have to give up. My back ached almost constantly, the secretions were irregular in action and I suffered from headaches, being often so dizzy that I could not attend to my household duties. At last I learned of Doan's Kidney Pills and procured a box at F. J. Hill's drug store. I am now feeling better than I have in a long time and trust that others may learn of the curative powers of Doan's Kidney Pills through my endorsement."

For sale by all dealers. Price 50 cents. Foster-Millburn Co., Buffalo, New York, sole agents for United States.

Remember the name—Doan's—and take no other.

AID FOR AMERICAN COLLEGE FOR GIRLS.

New York, Jan. 28.—Their attention called to the needs of the American college for girls at Constantinople by Miss Helen Gould, prominent women of this city yesterday at a meeting in Miss Gould's home subscribed more than $100,000 for the institution, some of the buildings of which were destroyed by fire two years ago. Miss Gould's visit to the school last year resulted in her becoming so interested in it that she accepted honorary membership in both junior and senior classes and influenced Dr. Mary Mills Patrick of the college to come to America to present its needs. Yesterday Miss Patrick, at the Gould home on Fifth avenue, addressed 100 invited guests, prominent in social and educational work on the needs and aims of the college. As a result a large sum was promised, Miss Gould contributing $10,000; Miss Grace H. Lodge, $10,000; John H. Converse, Philadelphia, $10,000, while a society woman of Boston, who requested that her name be withheld, pledged the sum of $50,000. On the strength of the money raised yesterday the work of renovating that part of the college damaged by fire will be begun at once.

WOMEN SUFFRAGISTS.

Those of New York Preparing Monster Street Parade.

New York, Jan. 28.—New York women who are interested in obtaining for themselves the right to vote are planning a monster street parade in order to show their strength. The recent visit of representatives of the "militant suffragists" of England has created renewed interest among the advocates of equal suffrage in New York and several open-air meetings have been held in Madison Square Garden at which women have spoken in support of their cause. At a general meeting to be held today arrangements will be made for the parade, which is in contemplation. It is hoped to have a very large turnout of women to parade through the principal streets, bearing banners announcing their principles in the hope that this may be the means of interesting more women in the campaign and showing men that women are determined in their efforts to secure quality before the law.

GAMBLING BOMB 15.

Exploded on Roof of a Chicago Billiard Hall.

Chicago, Jan. 28.—What the police term "gambling bomb No. 15," although its victim protests his innocence of violation of the gambling laws, was exploded on the roof of the billiard hall in the rear of Edward Brennan's saloon, 6310 Cottage Grove avenue, last night.

Brennan, who believes the explosion was aimed at him, declares that he knows no reason why he should be singled out.

Besides shattering the roof of the billiard hall, which was unoccupied, and throwing the occupants of Brennan's saloon into a panic, the explosion caused damage to two other saloons adjoining Brennan's saloon on either side.

The police were unable to obtain clew to the perpetrators other than that a man had been seen to run from the billiard room and dash south in the rear alley prior to the explosion.

Investigation on the roof disclosed the remnants of a tin can, which is believed to have been filled with gunpowder or to have contained a small quantity of dynamite. The damage resulting, other than the destruction of the roof of the billiard hall, was confined to shattered window panes and the breaking of glassware, dashed from shelves and bars by the shock.

CUBS' FOOD.

They Thrive On Grape-Nuts.

Healthy babies don't cry and the well-nourished baby that is fed on Grape-Nuts is never a crying baby. Many babies who cannot take any other food relish the perfect food, Grape-Nuts, and get well.

"My little baby was given up by three doctors who said that the condensed milk on which I had fed her had rruined the child's stomach. One of the doctors told me that the only thing to do would be to try Grape-Nuts, so I got some and prepared it as follows: I soaked 1½ teaspoonfuls in one pint of cold water for half an hour, then I strained off the liquid and mixed 12 teaspoonfuls of this strained Grape-Nuts juice with six teaspoonfuls of rich milk, put in a pinch of salt and a little sugar, warmed it and gave it to baby every two hours.

"In this simple, easy way I saved baby's life and have built her up to a strong, healthy child, rosy and laughing. The food must certainly be perfect to have such a wonderful effect as this. I can truthfully say I think it is the best food in the world to raise delicate babies on and is also a delicious healthful food for grown-ups as we have discovered in our family."

Grape-Nuts is equally valuable to the strong, healthy man or woman. It stands for the true theory of health "There's a Reason." Read "The Road to Wellville," in pkgs.