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# ALFALFA

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# ALFALFA

This plant requires a well-drained soil and will not grow when subject to flood water that stands for any length of time. It is likewise easily killed by running water when the water carries much sediment and is quickly destroyed by back water.

Alfalfa will not thrive on acid soils. This fact has been well demonstrated. Acidity of the soil may be corrected by the application of lime in quantities to be determined by the nature of each case. From one-half to a ton of lime per acre may be required, according to the nature of the soil.

It has often been claimed that alfalfa would not do well where the subsoil is stiff clay or only slightly pervious to water. Experience shows that even here alfalfa will thrive and the roots have been found penetrating the heaviest of clays where but two or three inches of soil are overlying.

Concerning the soils suitable for alfalfa, Prof. W. C. Welborn says: "Alfalfa has not succeeded generally in the Southern States except on the black waxy lands rich in lime, and on the arid and semi-arid lands of all classes under irrigation. These latter soils, having never been subjected to the leaching action of heavy rains, are rich in all the elements of plant food, and especially rich in lime. Much land in West Texas is rich enough to grow alfalfa, but it is too drouthy for a non-cultivated crop that must occupy the land all the year. Great areas of rich land now growing cotton, kaffir corn and milo maize successfully have proved too drouthy for alfalfa. Discing alfalfa after each cutting may serve to save moisture sufficient for alfalfa just as cultivating the other crops enables them to yield bountifully on say a 20-inch rainfall.

"Alfalfa has well-night completely failed on all ordinary sandy, clayey and loamy soils of the Gulf States, so that not an acre of good alfalfa can be found in all those vast regions so far as the writer has seen.

"On account of the heavy losses so frequently suffered by people all over the country in attempting to grow this valuable plant, it is distinctly recommended that only experimental sowings be made outside of the districts that have had their adaptability to alfalfa proved."

Alfalfa is a very heavy feeder. According to analyses made by Harrington of the Texas Station, and others it may be said that dry alfalfa hay contains approximately 2 1-2 per cent of nitrogen, potash and lime, and 1-2 per cent of phosphoric acid. That is, an acre yielding four tons of hay, which is a good crop, will remove 200 pounds of each of the first named ingredients, and 40 lbs. of phosphoric acid. As the nitrogen may be supplied from the air, we need not concern ourselves about the supply of that element, but any crop drawing so heavily on lime, potash and phosphoric acid, is likely to be very exhaustive, and these ingredients may need to be supplied on any soil not rich in them. On the other hand, the plant usually benefits soils of all kinds, provided the potash, phosphoric acid, and lime are renewed. In nearly all soils, alfalfa develops a plentiful supply of nodules on its roots. These are formed by the activities of certain bacteria which have the power of fixing the free nitrogen of the air in such form as to become available to the plant.

The greater part of this nitrogenas to become available to the plant. alfalfa, points to the same conclusion. The greater part of this nitrogen is found in the upper parts of the plant, it is true, and hence when these are constantly removed as hay, the nitrogen will also be removed. The roots contain considerable quantities, however, and hence alfalfa land will be enriched in nitrogen.

In addition to this, the roots of the alfalfa plant descend in many cases to enormous depths into the sub-soil. On this account they are able to procure food materials from strata not touched by the roots of other plants. Furthermore, if the sub-soil is of a tough, or clayey structure, impervious to the roots of the ordinary forage plant, the alfalfa roots will mostly find little difficulty in penetrating it after they have once obtained a foothold. By degrees the stiff soil becomes honey-combed by these rootlets, many of which in time will die, thus leaving channels through which air and water may reach to greater depths, besides adding humus to aid further in the decomposition of the sub-soil. Gradually porous and loose sub-soil will be formed out of what was once hard clay.

## WATER.

Whatever the nature of the soil, suitable drainage, natural or artificial, is of first importance for successful growing of alfalfa. The plant will endure standing water but poorly. Hence the land should be smooth and contain no depressions where water may collect and stand. Otherwise the field will be spotted by the death of the alfalfa in these depressions. On the other hand, if the sub-soil water lies too near the surface, the effects are bad.

## PREPARATION OF THE LAND.

The young alfalfa plant is exceedingly tender, and easily injured by adverse conditions, such as cold, too much moisture, and weeds and grass, especially the latter. For this reason great care must be exercised in the preparation of the seed bed. Many growers recommend beginning the preparation of the land early in the summer, when the seed is to be sown in the fall, in order to get rid of weeds and save moisture. Frequent discing or harrowing will thus mellow the soil and what is of far greater importance for the young plants, will keep down the weeds, the greatest enemy of young alfalfa. The seed may be sown after any crop, such as wheat, oats, corn, etc., provided the land is free of weeds and not too dry.

Many of the soils of Texas which are adapted to alfalfa do not need manuring, but on most, a dressing of well rotted stable manure will be of assistance. Commercial fertilizers, especially those rich in phosphates, may be added to the manure and the mixture should be plowed under while preparing the land. There is, however, great danger of introducing weed pests into the alfalfa by the use of manure, especially of certain kinds of grasses, such as crab grass and Johnson grass. The former is especially injurious to the young alfalfa plant, quickly killing it out.

## TIME OF SOWING SEED.

The time of seeding depends greatly upon the latitude of the locality. In the South, however, there are other conditions which determine the question very largely. The seed should not be sown at a time when the young plants would be liable to frost and ought to be sown when most weed seeds are dormant, and when the moisture conditions are favorable. These conditions are best found during the early fall months. The seedlings will then be large enough to withstand considerable cold weather and will make such growth during the winter as to be able to hold their own against the weeds the following spring.

## SOWING THE SEED.

Seed may be sown broadcast or in drills. The first is the usual method though the latter may be preferred in dry climates where less seed is required. The seed bed should not be too light. Preferably one or two rains should be allowed to compact the soil or else it might be lightly rolled before or after seeding. From 12 to 30 pounds of seed, and even more, per acre are sown, according to the nature of the soil and quality of the seed. If all the seed germinate and live, the lowest figure would be greatly too large a quantity, since the seed are small and a pound contains an enormous number, about 250,000.

## THE SEED.

Alfalfa seed, when fresh and in good condition, is of a bright olive green color, and in form varies from a smooth kidney-shape to a short triangle, with many intermediate forms. The seed has no odor, yet buyers should invariably test it by smelling, since any peculiar odor would indicate the presence of other seed or musty or mouldy conditions. Sweet clover is often found in alfalfa seed and can be detected even when in small quantity by its odor. Large numbers of brown seed in the sample indicate that the seed is old, or else that the olive color was lost during curing. It is wrong to state that all brown seeds are dead. We have found that in alfalfa seeds as old as six years and quite brown, many will germinate, though by no means so readily and vigorously as the fresh. Headden states that his results from six year old seeds show unquestionably that the age of the seed up to six years has nothing to do with the vitality. We cannot agree with him in this. A sample of seed was examined February 10, 1905, in which there were by weight 29 per cent of brown and shrivelled seed. The exact age of the seed was not known at that time, but was certainly at least two years, since the seed was obtained from a party who had already had it one year.

Of two hundred of these brown and shrivelled seed, practically none germinated after ten days test when kept moist in an incubator at 77° Fahr. The plump seed of this sample sprouted as follows: first 100, end of fourth day, 56; end of seventh day, 23; total, 81. Second 100, end of fourth day, 63; end of seventh day, 16, total, 79; which gives an average of 80 per cent for the two samples. A test of another sample of the same kind on October 23rd, 1905, gave the following:

color, and are placed close to the stem, at the base of the leaves. Th flowers are replaced by a top shaped pod or capsule, which is often tip ped by two slender curving horns. Within this pod is a seed. The green ish embryo can be seen to coil several times spirally in the seed.

**Wild Carrot.**—This is a pest very common in Europe, the seeds of whic occur very regularly in imported alfalfa. It has gained a foothold in man alfalfa fields in Texas and appears sometimes in the Texas raised seeds If not carefully watched, it will soon become a noxious pest. The seeds ar small, oval in outline, about 1-12 inch long, and 3-4 as wide, flattened o one side, convex on the other with four ribs on the convex side whic bear a row of short white bristles. The plant is a biennial, tall, stout, an much branched.

**Charlock or Wild Mustard.** This most pernicious weed has appeared o late in alfalfa fields in very many parts of the State. It has evidently bee introduced in alfalfa seed, chiefly that from European sources. The wee is easily recognized by its close resemblance to mustard. Charlock has very rank growth, even on the poorer soils reaching a height of two o three feet. It has a profusion of small yellow flowers, resembling thos of turnips, or mustard, and produces seed in enormous quantities. The see are almost indistinguishable from those of cabbage. They are small, dark brown and nearly or quite spherical in shape. Alfalfa seed which contain anything looking like cabbage or turnip seed should be promptly rejected.

## ANALYSIS OF SEEDS FOR 1906-07.

The Station has examined a large number of samples of alfalfa see during the past season, but the growers and prospective sowers of alfalf have not taken the interest in the inspection of seeds that the matte deserves. As a rule, however, the larger seedsmen of the State have co operated fully with the station and have endeavored to insure pure see to the farmer.

The Texas Seed & Floral Co., Robinson Seed Co., and David Hardi Seed Co., Dallas, Texas; and Wilkins & Biehl, Galveston, Texas, ar seedsmen and importers, among others, who have submitted their alfalf seeds to the Station for inspection.

The following table gives a partial report on samples examined durin the past season. For the purpose of comparison. several of the wors samples have been grouped together; this list is then followed by a lik number of the best samples. It is quite probable that some of thes numbers are duplicates, that is, samples from the same original lot, bu sent in by different persons, without giving the source of seed. The lette below the sample number indicates the source of the seed: I—Imported A—American. In this list the numbers of samples only will be given an for obvious reasons not the names of dealers. Noxious weeds are given i heavy type.

| Sample number. | Kind, character, and number of foreign seeds in one pound. | Pure seed per cent. | Inert matter. | Foreign seed |
|---|---|---|---|---|
| 101 I | BUCKHORN, or Ribgrass 2350; GREEN FOXTAIL 270; LAMB'S QUARTER 270; Red clover 90; DOCK 180: WILD CARROT 275: DODDER 180: Crimson Clover 90; Total 3700. | 97.4 | . 2 | 2.4 |
| 102 I | BUCKHORN 2100; GREEN FOXTAIL 275: YELLOW FOXTAIL 100; MALLOW 350; WILD CARROT 275; CHICORY 275; SOW THISTLE 200; CATCHFLY 200; Rape 100; Cabbage 100; SORREL 200; DODDER 90; CENTAURY 200; LAMB'S QUARTER 275; Total 4740. | 96.6 | . 4 | 3.0 |
| 103 I | BUCKHORN 1365; GREEN FOXTAIL 450; CHICORY 1080; DODDER 175; DOCK 175; WILD CARROT 175; PIGWEED 100; Total 3520. | 98.0 | . 4 | 1.6 |
| 104 I | BUCKHORN 1000; GREEN FOXTAIL 1080; BARNYARD GRASS 200; PIGWEED 200; Red Clover 275; CHICORY 350; DOCK 275; SOW THISTLE 100; WILD CARROT 100; DODDER 200; Total 3780. | 98.6 | . 2 | 1.2 |
| 105 I | BUCKHORN 1635; GREEN FOXTAIL 900; CHICORY 750; DODDER 750; LAMB'S QUARTER 100; CATCHFLY 100; Total 4710. | 98.2 | . 6 | 1.2 |
| 106 I | BUCKHORN 3450; DODDER 300; Red Clover 350; GREEN FOXTAIL 350; LAMB'S QUARTER 350; WILD CARROT 450; CHICORY 100; Red Clover 90; Total 5440. | 98.0 | . 2 | 2.0 |
| 107 I | BUCKHORN 5100; DOCK 290; GREEN FOXTAIL 800; Red Clover 450; Alsike (?) 200; Crimson Clover 90; Vetch 350; DODDER 360; PIGWEED 180; CATCHFLY 180; WILD CARROT 180; CHICORY 90; TORILIS 90; Total 8540. | 96.6 | . 4 | 3.0 |
| 108 A | GREEN FOXTAIL 180; CARELESS WEED 180; Total 360. | 99.9 | .15 | 0.5 |
| 109 A | BUCKHORN 1640; GREEN FOXTAIL 450; AXSEED 90; Clover 90; Total 2270. | 99.6 | . 2 | 0.3 |

| | | | | |
|---|---|---|---|---|
| 112 A | BUCKHORN 820; GREEN FOXTAIL 450; Red Clover 90; Vetch 90; DOCK 180; PIGWEED 90; CENTAURY 90. | 99.0 | . 4 | 0.6 |
| 156 A | BUCKHORN 1190; GREEN FOXTAIL 90; UNDETERMINED GRASS 90; Vetch 180. | 99.0 | . 6 | 0.4 |
| 116 A | GREEN FOXTAIL 3600; OLD WITCH GRASS 90; FESCUE 90; CENTAURY 180. | 99.0 | 0.0 | 1.0 |
| 110 Texas | GREEN FOXTAIL 180; Red Clover 450; LAMB'S QUARTER 270; UNDETERMINED GRASS 180. | 99.0 | 0.1 | .6 |
| 131 New Mex. | GREEN FOXTAIL 180; Red Clover 270; TALL DOCK 180; BUCKHORN 990; LAMB'S QUARTER 90; WILD CARROT 90. | 99.8 | 0.02 | .1 |

It will be seen from these specimens that the poorer samples of imported seed are far more impure than the worst American and that without exception, the poorer grades of imported seed contain dodder. There is also a far larger variety of noxious weed seeds in the imported seed. The subjoined table gives in like manner the analysis of several of the better samples from both countries.

| Sample number. | Kind, character, and number of foreign seeds in one pound. | Pure seed per cent. | Inert matter. | Foreign matter |
|---|---|---|---|---|
| 147 I | Red Clover 90. | 100 | — | — |
| 129 I | No Foreign Seed. | 99.3 | .7 | — |
| 132 I | No Foreign Seed | 100 | — | — |
| 141 I | No Foreign Seed | 100 | — | — |
| 145 I | Red Clover 630. | 99.6 | .1 | .3 |
| 144 I | Red Clover 540; BUCKHORN 360; WILD CARROT 90; G. FOXTAIL 90. | 99.4 | .2 | .4 |
| 151 I | GREEN FOXTAIL 180; Red Clover 90; CATCHFLY 90; Vetch 90. | 99.9 | — | .1 |
| 138 Texas. | No Foreign Seed. | 99.9 | .1 | — |
| 129 Utah. | CENTAURY 90. | 99.6 | .4 | — |
| 119 Texas. | No Weed Seed. | 99.9 | .1 | — |
| 118 Texas. | No Weed Seed. | 97.8 | 2.2 | — |
| 111 | RIBGRASS 1274; Red Clover 180. | 99.0 | .6 | .4 |

A slight consideration of this table will show the importance of careful inspection of seed. It is to be noted that the figures in the column marked: "Pure seed" have no reference to the vitality of the seed.

During the present season, as well as for some years past, a very prominent alfalfa grower of Texas has sold a line of very inferior alfalfa seeds which are mostly imported and a large proportion of which are unsalable in Germany, Canada, and in those states of the Union that have adopted seed laws. We have lately examined six samples of these seeds and find all but one to be of very low grade. Some of them contain dodder seeds in such quantities that no clover or alfalfa could possibly grow on land planted with these seeds. The following is an analysis of six of these samples, made Sept. 1, 1908.

| | Kind, character, and number of foreign seeds in one pound. | Pure seed. Per cent. | Inert matter. p. c. | Foreign seed. p. c. |
|---|---|---|---|---|
| No. 1. I | YELLOW FOXTAIL, 1632; GREEN FOXTAIL, 480; BUCKHORN, 756; CENTAURY, 756; WILD CARROT, 374; LAMB'S QUARTER, 672; DOCKS, 756; RYE GRASS, 374; SOW THISTLE, 96; SELF HEAL, 96. TOTAL IN ONE POUND 5992. | 97.4 | .6 | 2.0 |
| | Of the alfalfa seed left in this sample, after deducting the above impurities, 54 per cent were DEAD. | | | |
| NO. 2. I | BUCKHORN, 9792; GREEN FOXTAIL, 2780; WILD CARROT, 2688; PIGWEED, 1152; Bird's foot trefoil, 1152; red clover, 1152; CENTAURY, 672; SOW THISTLE, 1053; SELF HEAL, 96; CATCHFLY, 192; FESCUE, 96; DODDER, 1056. TOTAL, 22,691. | 94.0 | 1.1 | 4.9 |
| | In addition to the above 42 per cent of the alfalfa seed WERE DEAD. | | | |
| No. 3. I | BUCKHORN, 96; BARN YARD GRASS 288; SUNFLOWER, 182; GREEN FOXTAIL, 96; CENTAURY, 96; UNKNOWN, 288. | 98.0 | 1.2 | .8 |
| | This was a fairly good seed. | | | |
| No. 4. I | BUCKHORN, 19008; GREEN FOXTAIL, 6912; WILD CARROT, 4896; CENTAURY, 3450; SOW THISTLE, 2688; red clover, 756; DOCK, 96; SUNFLOWER, 192; SELF HEAL, 672; Bird's foot trefoil, 192; DODDER, 1922; TOTAL, 38,954. | 91.8 | .2 | 8.0 |
| | After deducting the above impurities, 85 PER CENT OF THIS SEED WERE DEAD. About the only thing in this lot of seed that would sprout were the weed seeds. | | | |
| No. 5. I | DODDER, 30,240; GREEN FOXTAIL, 1200; BUCKHORN, 9120; WILD CAR- | 85.3 | 5.0 | 9.5 |

ROT, 1440; CENTAURY, 3360; SOW THISTLE, 1056; PIGWEED, 2592. TOTAL IN ONE POUND——59,808.

Of the 85 per cent of alfalfa seed present in this sample, 47 per cent were DEAD.

No. 6. I DODDER, 51,638; GREEN FOXTAIL, 12,648; BUCKHORN, 4512; CENTAURY, 3936; PIGWEED, 4810; WILD CARROT, 1728; SELF HEAL, 960; red clover, 192; SOW THISTLE, 96; TOTAL IN ONE POUND——80,746.

After deducting the above impurities, 35 per cent of this seed were DEAD. This and the foregoing were by far the most miserable samples of alfalfa seed that have passed our inspection during the past four years work. The last was offered at $4 a hundredweight wholesale. A hundred pounds contains enough dodder seed to infest every alfalfa field in Texas. These two samples are in reality nothing better than screenings.

Of these six samples, Nos. 1—2—4—5—6 are of such miserably low grade and contain such pernicious weed seeds and in such large amounts, that only the most ignorant farmer could be induced to buy them at any price. It is absolutely impossible for the seller to be ignorant of the pernicious character of these seeds and only depraved standards of business integrity would allow their sale. The presence of such seeds on the markets of the state emphasises the necessity for state control of the sale of agricultural seeds.

## INOCULATION OF THE SEED.

As has been pointed out in the section treating of the benefits which soils derives from alfalfa, the nodules which appear on the roots of legumes, including alfalfa, contain enormous numbers of certain bacteria which have the power to fix atmospheric nitrogen and to deliver this in a condition available to the plant. Without going into the details of this process, it is to be noted that this is one of the most important changes occurring in the soil. The supply of nitrogen in the soil available to plants is constantly being depleted by leaching, denitrification, demands of vegetation and perhaps other means during the ordinary processes of nature. The bacteria above mentioned (and some others), are the sole natural means of counterbalancing this constant depletion. For thousands of years acute observers have noted that leguminous plants made soils richer instead of poorer, without knowing why. We now understand the process in large part and because it is a natural means and entails no great expense, the enrichment of the soil in available nitrogen by means of the activities of these bacteria has attracted the attention of an army of investigators in the field of agricultural biology. When the full importance of these processes dawned upon the minds of these investigators, it was at once seen that the artificial production and cultivation of these organisms, and their transfer to soils in which they were naturally deficient, or inactive, would be of incalculable

advantage. Many efforts have been made during the past two or three decades to introduce artificially plentiful supplies of these active little workers upon the roots of the various legumes used in agriculture. Though the fundamental principles underlying these attempts at artificial inoculation of legumes are undoubtedly correct, their application has not yet proved entirely successful. Much sensational matter has appeared of late in the press and popular magazines concerning artificial inoculation. Farmers have been led to believe that the dawn of the millenium of laborless agriculture has broken. It is true that in many cases, highly satisfactory results have apparently been obtained from the use of some form or other of these "patent" media. These results have been so irregular and so complicated by uncertain and incorrect methods of procedure and non-scientific modes of observation, as to render them of doubtful authority. It has been proven, however, that artificial inoculation may be obtained, where needful, by means of soils known to contain the bacteria from having grown successful crops of alfalfa or other legumes. It will be observed, however, that this method is artificial only in so far as the tranfer of the infected soil from one field to another is concerned. Infected soils thus strewn lightly over those deficient in the requisite bacteria, will, if other conditions are correct, supply the missing organisms. We believe, however, that if the soil is already in good condition, physically and chemically, for the growth of alfalfa, the bacteria will make their appearance, in time, just as those which cause the souring of milk cannot be kept out of this fluid when it is placed under proper conditions. The Texas Experiment Station has shown that young alfalfa presented an abundant supply of nodules in land never before sown to that crop, or any other cultivated legume, on plats which had received a liberal supply of barn-yard manure, whereas adjacent plats treated with "cultures" contained but few or none at all. This may have been due to the bur clover growing abundantly here. This plant is closely related to alfalfa, and the bacteria from it would most likely be in the manure.

## TREATMENT OF YOUNG ALFALFA.

We have repeatedly pointed out the fact that young alfalfa is very liable to injury from untoward conditions when young. Weeds constitute the worst trouble. These should be rigidly kept down by clipping with a cutter bar, raised about four inches. If clipped too closely the young alfalfa plant will be injured. Under the best conditions, where the seed has been sown in the fall, light crops of hay may be obtained during the following summer. The last cutting must be early enough to let the crop go into the winter in a strong and healthy condition. Otherwise it might not endure the cold. Pasturing during the first year is not to be recommended, since, if practiced, the crop may be grazed too close and will be trampled into the ground.

Alfalfa should receive a thorough discing at least every spring, and some growers recommend discing after each cutting. The discs should be set straight enough so as not to cut off the crowns. A kind of roller set with harrow-like teeth is now frequently used for cultivation and is highly recommended by some growers. Harrowing or discing is not only beneficial

to the alfalfa, but keeps down the weeds in large measure. Spotting of the field caused by dying out in places may be remedied by reseeding such places, and the seed should be thoroughly harrowed in.

## PASTURING.

Many good stands of alfalfa have been ruined by over pasturage, especially with hogs and sheep; the latter animals, if in too large numbers, bite the plants too close to the crown and in wet seasons trample them into the mud. All kinds of stock do well on alfalfa, though cattle and sheep are often subjected to bloating. Some growers hold that this is due to pasturing while the alfalfa is wet, while others claim there is no connection between bloating and wet alfalfa. There is no better stock feed than the partially wilted hay. From fifteen to twenty-five pigs can be pastured per acre on good stands of alfalfa. Alfalfa cannot be used to the best advantage without feeding with a ration of grain. Pasturing by rotation is strongly advocated by many growers. By having several fields, the stock can be moved from one to another, thus allowing the alfalfa to recover. Intermittent feeding of green hay and pasturage also has many advocates.

Work animals will keep in condition when fed solely on alfalfa, though sometimes becoming overfed. Occasionally also, horses get "off their feed" when suddenly changed to an alfalfa diet, but usually they readily learn to eat it greedily. One disadvantage arises from the lax condition of the droppings. This makes cleaning of stables as well as of animals somewhat difficult, though producing no other ill effect. A more rational feed, however, would appear to be one in which corn or other grain is given, since a part of the high protein content of alfalfa is lost when alfalfa is fed alone. A suggestion for those parts of the State where milo maize and Kaffir corn are more easily grown would be a ration of these with alfalfa.

Alfalfa can be used for dairy stock without other ration. In California it has been found that feeding a small ration of grain to cows gave a larger yield of milk but not sufficiently so to balance the cost of the grain. When alfalfa is high in price as in Texas, it would be cheaper to feed some grain. Poultry of all kinds thrive on green alfalfa.

## MAKING THE HAY.

The treatment of alfalfa for hay is practically the same as that of the grasses. It is cut when the field is about one-tenth in bloom, or as some growers put it, when the field is just coming into bloom. At this time the percentage of food materials in the plant is high, rapidly decreasing with ensuing age. From one to one-and-one-half tons of hay are usually secured at the first cutting of the season from a good stand of mature alfalfa. The quantity is usually smaller at each succeeding cutting of the year. The number of possible cuttings varies with the latitude, climate and other conditions. From three to six cuttings per year may be secured, the latter number not being unusual in regions of the South where the

plant flourishes. Cuttings are made as early as April 15th, in some parts of Texas. The plant is cut with a mower, preferably as early in the morning as possible, in order that drying and curing may quickly be secured. In regions where danger from wetting from rain or dew is great, only so much as can be certainly cured should be cut at one time, since the hay does not endure wetting. The hay is allowed to dry in the swath without further attention or may be tossed by some form of hay tedder. If rain or dew threatens, it is thrown into windrows, or better, into tall, steep cocks, since the hay does not shed water as readily as grasses. When the danger is past, these should be opened out and thoroughly aired, in order to prevent sweating and heating. In the dryer regions, the hay is taken directly from the windrow or swath and is often stacked in the field. When this is done, the stacks should also be as high and steep as possible and if destined to stand for a considerable time should be topped with grass hay or tarpaulins. In moister regions the hay is best stored in barns. Thorough curing should always be insured, since the hay will heat more readily than that of grasses. The hay is baled as other hay and is coming more and more into demand, commanding a price usually equal to timothy and clover. In all the processes of curing and baling, unnecessary handling must be avioded, since the leaves, which contain a large part of the nutritive substances, are easily shattered, thus materially lowering the value of the hay.

## FEEDING VALUE OF ALFALFA.

Analysis and feeding tests all show that the value of alflafa both green and as hay is higher than that of red clover. It must be borne in mind that alfalfa leaves contain a much higher percentage of nutrient materials than the stem, and are far more readily shattered than those of red clover. Hence the need of cars in handling the hay. Henry's Feeds and Feeding gives comparisons of the percentage composition and the average digestibility of alfalfa and red clover, and in every way alfalfa is superior to the clover.

## GROWING ALFALFA FOR SEED.

Many growers will expect to raise their own seed. To such, the hints here given can only be general. The alfalfa should be cut about the time when half of the pods are brown. If cut too late, some of the seeds will have lost the fresh olive color so desirable in good seed. If too early, many seed will be immature and will cure up green and quite shrivelled. On account of the mode of flowering, it will never be possible to save all the seed that a plant will produce, since when the lowest in the head are ripe, the uppermost are immature or scarcely formed. The crop is harvested in the same way as for hay, though many growers use self binders, which are very satisfactory. The seed is usually threshed from the windrow or cock, after the hay has been thoroughly cured. From five to seven bushels per acre is an average yield. The seed should not be exposed too long to sunlight which apparently causes browning, nor be allowed to heat. The hay after threshing has about one-half the value of the unthreshed, if it has been well cured and the leaves are not lost.

## EXPERIMENTS IN FEEDING ALFALFA.

Vernon and Scott at the New Mexico Station (Bulletin 62, 1907) found that alfalfa makes an excellent feed for pigs when fed with grain, but is poor when fed alone. The largest and cheapest gains were made on a ration of nearly equal parts of alfalfa hay and corn, hay at $7 per ton and corn at $1.33 per cwt. Hogs fed on this ration gave returns of from $24.48 to $34.68 per ton for the alfalfa, as compared with the hogs getting only corn.

At the Kansas Station hogs fed on a ration of alfalfa hay and Kafir corn made a gain of 73 per cent more than when fed on Kafir corn alone. Hogs were also pastured on alfalfa during the summer and fed a light ration of grain. It was found that each acre of alfalfa produced 776 pounds of pork after deducting the probable gain from corn.

At the Oklahoma Station in 1899 (Rep. 1899) two lots of four pigs each were fed for 56 days, one on alfalfa pasture alone, the other lot on pasture and 3.2 pounds of corn and Kafir corn per day. The first lot weighed 62.5 pounds each at the start and gained .3 pounds each day. The second lot weighed 67.5 pounds at the start and made a gain of 1.44 pounds per day, requiring only 2.21 pounds of grain in addition to pasture for each pound of weight gained.

Soule and Barnes at the Tennessee Station, (Bul. 4, Vol. 17, 1904) found that the cost of producing milk and butter could be greatly reduced by replacing a part of the concentrates in the daily ration with alfalfa. One-and-one-half pounds of finely chopped alfalfa hay should be substituted for each pound of wheat bran. With alfalfa hay at $10 per ton and wheat bran at $20, the saving effected by this substitution was $2.80 for each 100 pounds of butter and 19.8 cents for each 100 pounds of milk. Alfalfa fed under the most favorable conditions produced a gallon of milk for 5.7 cents and a pound of butter for 10.4 cents.

The foregoing data have been compiled from reports from some of the various feeding tests that have been made during late years by different Experiment Stations. The reader will readily see the great superiority of alfalfa in feeding all kinds of stock when compared with other forage crops. Very numerous tests of alfalfa have been made with the result that this superiority is fully established. The reader should be cautioned, however, that the large part of this gain depends upon the manner in which his alfalfa hay is cured and also fed. If the hay has lost a great deal of its leaves, or is fed wastefully, the expected gains will in no case be realized.

## ENEMIES OF ALFALFA.

We have already pointed out, in the section of impurities found in alfalfa seed, some of the chief weed enemies of alfalfa, and in the section considering the preparation of the land, the best methods of obviating them. Fortunately, there are as yet but few fungus enemies affecting alfalfa. The chief of these is the leaf spot, or black rust, a disease making its appearance on the leaves as minute black spots. In most cases this trouble is easily controlled by simple mowing. If the disease threatens the destruction of the plant, the mowings should be immediately raked off and burned. Thus the greater number of the spores of the fungus will be

destroyed. A repetition of this treatment will cure the trouble in most cases.

Alfalfa is sometimes killed out in spots by root rot, which is apparently identically the same fungous trouble so common in cotton fields and which also destroys other plants and trees. As yet there is no known remedy for this trouble. The best treatment seems to be to prevent growth of all plants subject to the disease of the affected area for a year or two and then reseed in alfalfa. Possibly in this time the fungus which causes the trouble will have died out of the soil.

An apparently new disease of alfalfa was reported in 1906, by Paddock, of the Colorado Station. In this, the first crop has a short, weak and sickly growth. Most of the stems are discolored or black and many exude drops of juice. Such stems are brittle and easily broken. The disease apparently does not kill many plants the first year, but later on so many plants die that the fields are valueless. The disease runs its course for the season with the first crop. Those plants which have sufficient vigor make satisfactory growth for the second and third cuttings, but a renewed outbreak may be expected in the following spring. Almost nothing is yet known of this blight, consequently remedial measures cannot be discussed, except that it seems to be advantageous to cut the first crop early.

We have numerous complaints of the presence of dodder or love vine in alfalfa, and this is undoubtedly a very serious pest, and one likely to become still more so, as long as farmers continue to sow seed infested with dodder, or as long as cheap seed are preferred to good. This plant is a parasite upon alfalfa, and is produced from minute seed which germinate in the ground but do not take root there. Instead, the young seedlings by a very curious process, creep along the surface of the soil until an alfalfa plant is reached. They then encircle the young stem and thrust suckers into it that quickly appropriate the food materials which should go to the alfalfa. Very shortly a dense mass of yellow or orange colored threads is formed over the entire alfalfa and this soon smothers the host plant. The dodder produces an enormous number of seeds which are quickly and easily shed, thus rapidly infesting the soil. When dodder is observed in the field the best method of eradication is to mow all alfalfa plants about the spots for a distance of several feet, and to carry the mowings immediately to some convenient place where they may be burned when dry. This should be practiced only when the dodder is quite young, and has not yet formed seed, since if the latter is the case, the dodder seeds will assuredly be scattered by the removal of the hay and a bad matter will only be made worse. If the dodder is forming seed, the mowings had best be burned on the spot.

## INSECTS INJURIOUS TO ALFALFA.

By C. E. Sanborn, Prof. Entomology.

There is less injury to alfalfa due to insects, than to any other staple crop in this state. Following is a list of the prevalent injurious forms of insects and methods for controlling them:

Army worm (Heliophila unipunctata Haw).
Boll worm (Heliothis obsoleta Fab).
Fall army worm (Laphygma frugiperda A. & S.)
Fall webb worm (Hyphantria cunea Drury).

Garden web worm (Loxostege similalis Guen).
Grasshopers (Many species).
Striped blister beetle (Epicuata vittata Fab).
Striped cucumber beetle (Diabrotica vittata Fab).
White ant (Termes flavipes Koll).

Control in the first place is a preventive. For the majority of the insects herein mentioned there is no better preventive than the discing of the fields. However, when the Army worm, Boll worm, Fall webb worm, Grasshopper or Striped cucumber beetle become injurious, use the following dust spray: one pound Paris green thoroughly mixed with one pound air slacked or hydrated lime to the acre for plants if less than four inches tall, and when taller, double the spray. Apply with an adjustable dust spraying machine. A hard rain after the application renders the poisoned plants harmless for feeding purposes.

For the Blister beetle, spray with gasoline while they are bunched together in droves. This spray is also fatal to other insects with which it may come in contact.

For the White ant, burn decaying logs and pieces of timber which may be in the field, and pour carbon bisulphide into their ground tunnels.

The gasoline spray has been used and recommended by Mr. A. P. Borden of Pierce, Texas.