

Crop Profile for Alfalfa and Other Hay Production in South Dakota

General Production Information

- During 2000, South Dakota ranked third in the nation in production of alfalfa hay, producing approximately 5.4 million tons of alfalfa hay. Only California, with approximately 7.1 million tons and Minnesota, with 5.6 million tons, had greater alfalfa hay production than South Dakota during 2000. South Dakota ranked second in 1999 (6.7 million pounds).
- During 2000, South Dakota ranked third in the nation in all hay production, with approximately 7.4 million tons of hay produced. This ranking is behind Texas and California in total hay production. Texas produced 8.9 million tons of all types of hay during 2000.
- South Dakota ranked twelfth in the U.S. in hay production other than alfalfa hay during 2000.
- Alfalfa is grown for hay on a statewide basis. Of the nine crop reporting districts in South Dakota, Agricultural Statistics Service data shows that all districts, with the exception of the Southwest, show harvested alfalfa acreage of greater than or equal to 225,000 acres.
- Statewide harvested acres of alfalfa hay are greatest in the Northwest District, with 506,000 acres harvested in 2000. The West Central District (384,000 harvested acres) and the North Central District (354,000 harvested acres) are also significant production areas.
- Statewide total harvested acres of alfalfa hay were 2.65 million acres in 2000, up from 2.4 million in both 1998 and 1999.
- Average statewide yield was 2.05 tons of alfalfa hay per acre in 2000, which was a decrease from the 2.8 tons per acre average yield in 1999. Highest production per acre is in Northeast South Dakota, with production averages of 3.04 tons per acre in 2000. The Southeast district led production in 1999, with 3.91 tons per acre.
- Production acreage of hay crops other than alfalfa is greatest in the Central, South Central and North Central areas of the state, with greater than 638,000 acres harvested

for hay in these combined districts.

- Statewide average yield per acre for other hay production was 1.40 tons per acre during 2000, with a range of average production per acre from a high of 1.87 tons per acre in the North Central to 1.08 tons per acre in the South Central.
- Primary pests of alfalfa and other hay production in the state include alfalfa weevil, grasshoppers, perennial broadleaf weeds, and pocket gophers.
- Average price received for alfalfa hay was \$70.00 per ton in July, 2001, up \$11.00 per ton from 2000 prices. Average price received for other hay was \$45.00 per ton in 2000, up from \$35/ton in 1999.
- Total cash receipts from the sale of all hay in South Dakota during 1999 was \$111,935,000. This total represented 2.6% of the total farm cash receipts for the year.

Cultural Practices

Description:

Alfalfa is a herbaceous perennial forage crop from the plant family *Medicago*. Alfalfa is well adapted to the growing conditions in South Dakota, provided a variety with good winter hardiness is selected. The plant produces several vegetative stems during each growth cycle, with stems originating from a crown. The plant has a deep, branched taproot system. This taproot allows it to produce acceptable forage yields, even under relatively dry conditions. South Dakota is one of the leading alfalfa production states in the United States, annually producing greater than seven million tons of alfalfa hay for all uses.

Cultural Practices:

Alfalfa is generally grown as a perennial crop in the state, with alfalfa fields being kept in production for an average of 5.66 years before replanting (Ruden, 2001). Alfalfa is primarily grown as a dryland crop in South Dakota, but irrigated alfalfa is common in some regions in the state, where feasible. New alfalfa plantings are established most often in the spring of the year, as soon as soil temperatures have risen, usually during April. Fall planting of alfalfa is also quite common. Alfalfa seedbeds are generally tilled fields and must be firm. Alfalfa seed must be placed properly and have excellent seed to soil contact to establish a successful stand. Alfalfa may be clear seeded into the seedbed with or without the aid of selective herbicides or the crop may be planted along with a "nurse" crop, traditionally oats. The nurse crop provides rapid soil protection and chokes out early weed growth. The nurse crop is most often cut for forage at an early stage, usually at the milk stage of reproductive growth,

providing high quality forage and allowing the alfalfa to regrow into the field for later cuttings. Occasionally, selective herbicides are used to kill the nurse crop after a few weeks of establishment. Usually, between 15 and 20 pounds of pure live seed per acre are planted.

Alfalfa is also commonly raised as a mixed forage crop along with a stand of native or improved grass hay. A recent survey by the South Dakota Project of the North Central Pest Management Center (SD-NCPMC) indicated that of the producers surveyed, approximately 68% of the producers surveyed maintained stands of pure alfalfa hay, while approximately 43% also maintained a mixed alfalfa/grass hay production enterprise.

Alfalfa, being a leguminous crop, generally does not require additional inputs of nitrogen for adequate growth. However, addition of phosphate and potassium fertilizers to alfalfa fields can significantly increase forage production and quality.

Alfalfa production systems vary in South Dakota from one end of the state to the other. Alfalfa is a major part of South Dakota's cropping option, both as a feed source for livestock and as a marketable commodity for cash sales. Alfalfa production in South Dakota is generally done for one of three purposes. Some alfalfa producers in the state concentrate efforts toward producing quality hay or dairy quality hay for marketing. Most alfalfa for this purpose is grown in the Southeast and East Central crop districts and under irrigation in the Northwest region of the state. Quality hay production is most often marketed as forage hay; however, some is channeled to processed pellet production. A second focus is alfalfa seed production, which is a small region centered in the North Central district of the state. This area is generally dryland production. The balance of the state produces alfalfa for the third purpose, which is as a feed source for the local livestock industry, which consists primarily of beef and sheep production. Currently, no organic production enterprises were noted in recent surveys.

Alfalfa for hay is harvested in generally one to four cuttings per year, depending on location within the state. Western areas of the state often receive only one cutting per year due to low rainfall, whereas Southeast South Dakota usually can support four and occasionally five cuttings per year. Highest quality hay is taken when alfalfa plants are in pre-bud to early bud.

Pest Management/ Integrated Pest Management:

Pest management strategies for alfalfa production vary across the state as well. The primary goal of the production enterprise will have some determining effect on the vigor at which pest management is approached. In areas where alfalfa is marketed as quality hay or alfalfa products, there is greater interest in managing and controlling pests, such as insects, weeds and diseases. Weed control and seed damaging insects, such as the grasshopper are a greater concern in the seed production areas than they are in the general livestock feed production areas. Producers responding to a recent pest management survey stated that weeds and insects were nearly of equal concern to them in alfalfa production, with diseases and rodent management ranking as lower concerns for them.

The most common pest of concern in alfalfa in recent years is the alfalfa weevil. Populations of this pest have become a major economic concern in the last four to five years for the central north-south corridor of counties in the state. Traditionally, weevils had been more of a problem in the southwest and south central areas of the state. In these areas, producers commonly managed the weevils using cultural/mechanical means including early harvest, light tillage of fields in early spring and burning/flaming fields. In recent years, heavy weevil infestations in the central counties of South Dakota have caused producers to turn to chemical insecticides and early harvest as primary weevil management tools. A biological control program involving release of parasitic wasps for alfalfa weevil was started in 1957 in South Dakota and continued through 1988. There are two strains of alfalfa weevils in the state—eastern and western. Most of the parasitic wasps released were specific to the eastern strain of alfalfa weevil, and with the increase in western weevils, this biological control has been less effective in recent years. In addition, use of insecticides for control of other insect pests of local crops, such as grasshoppers, has also had a negative effect on the population of the parasitic wasps. Other insects of concern include variegated cutworm, potato leafhopper, aphids, blister beetles, grasshoppers, and occasionally lygus bugs.

Weed control has become more of an issue as more quality alfalfa has been marketed by South Dakota producers. The two major time frames for weed control are establishment (primarily annual grass control) and in established stands (to aid in stand persistence). Weeds of concern in established stands include the winter annuals (mustards and the cheatgrasses) and perennial weeds such as dandelion and Canada thistle. Alfalfa dodder is also a concern in the seed growing area.

Alfalfa diseases have not been a major problem to growers. There are, however, localized outbreaks of seedling diseases, foliar diseases (leaf spot), stem/crown rots and wilt diseases. Environmental conditions determine the severity of the problem. Normally drier conditions during the growing season and the long winter dormancy for alfalfa in the state keep diseases in check.

Rodent control, specifically for the pocket gopher is becoming more of a problem for growers of alfalfa in the northern area of the state. Many producers are managing this pest with crop rotation, traps and approved rodenticides.

Alfalfa is a crop in which producers have utilized an integrated approach to pest management for many years. These strategies started well over forty years ago, continue in use today, and will for many years to come.

Insect Pests

Alfalfa Weevil:

The alfalfa weevil has become the primary pest concern for alfalfa producers in recent years. Survey efforts show that for every year since 1998, alfalfa weevils have become a more significant production concern for alfalfa producers (Ruden, 2001).

History:

The alfalfa weevil (*Hypera postica*) was first detected in Utah in 1904. It took about 32 years for the weevil to reach western South Dakota. The first reported infestations in South Dakota were in Southwest counties. An eastern strain of the weevil originating from the East Coast may have entered southeast South Dakota in 1972. The alfalfa weevil is currently present in all counties in the state (Catangui, 2001).

The eastern and western strains are identical in appearance but can be separated by cross mating experiments and by examining their reproductive cells. If cross mated in the laboratory, the alfalfa weevil strains will not reproduce normally. Although two alfalfa weevil strains are present in South Dakota, their management will be identical for all practical purposes. However, strain determination was important during planned releases of parasitic wasps in the 1980's. Some parasitic wasps were efficient predators only on one alfalfa weevil strain and not on the other.

Alfalfa weevils often reach economic numbers in the central north-south corridor of counties in South Dakota. For some unknown reasons, alfalfa weevils are usually not a problem in eastern South Dakota. Natural enemies of the alfalfa weevil may keep it from reaching economic numbers in the east. Parasitic wasps and a bacterial disease are known to parasitize alfalfa weevils in the state.

Biology:

Alfalfa weevils overwinter as adults under soil clods and plant residues in shelter belts, on the field, and along ditches and fence lines. In the spring, these adults emerge from their overwintering sites and start laying eggs in alfalfa stems. Adults are about 3/16 inch long, brown in color, with a dark triangular marking on the back.

The female alfalfa weevil makes a hole on the stem then inserts its eggs. Eggs are bright yellow in color and could be seen with the naked eye if an infested stem is split using a pocket knife or even with bare fingers. Each hole may contain 1-25 tiny eggs. Each female weevil can lay between 500 to 2,000 eggs during its' life span.

In South Dakota, alfalfa weevil larvae can typically be seen in the field from late April to early June. Thus, alfalfa weevils are mainly a pest of first cutting alfalfa in the state. Hatching of the eggs is not simultaneous hence various sizes of the larvae can be seen on the field. Larvae are voracious consumers of leaf tissues. They do not consume entire leaves but rather "skeletonize" them leaving the stems and leaf veins intact. Infested plants take a whitish or

"frosted" appearance when viewed from a distance.

From late May to early June, larvae stop feeding then drop to the soil to transform into cocoons. The cocoons look like tiny white balls made of woven silk and pieces of dried alfalfa leaves. After about two weeks, adult weevils emerge from the cocoons. Adults generally do not cause economic damage on alfalfa although they can make holes on the leaves.

Adults emerging from the cocoons will over winter, then come back to the alfalfa field in the spring of the following year. It takes about three months for an alfalfa weevil to complete its development from an egg, larva, pupa (inside a cocoon), then adult. Adult weevils are hardy and can survive harsh South Dakota winters to start their life cycles anew in the spring.

Alfalfa weevil management includes two primary methods. First, early harvest of the alfalfa crop (generally the first cutting) can greatly reduce the alfalfa weevil numbers, as the food source for the weevil is eliminated for a short time. Care must be taken, however, to monitor the alfalfa field for adequate regrowth, as the weevil larvae remaining will actively feed on leaves of emerging alfalfa stems. The use of insecticides to control weevil populations has also become quite common in recent years. Light tillage in the spring can also significantly reduce weevil populations. Estimates of the number of producers using the various management strategies for weevil control are as follows: early cutting (35%), insecticides (27%), tillage (4%), and flaming (<1%) (Ruden, 2001).

Insecticides- Alfalfa weevil:

| Brand name | Active ingredient | Product per acre | Pre-harvest interval (days) |
|-------------------|--------------------------|-------------------------|------------------------------------|
| Ambush * | permethrin | 6.4-12.8 fluid ounces | 0-14 depending on rate used |
| Ambush 25W WP * | permethrin | 6.4-12.8 fluid ounces | 0-14 depending on rate used |
| Ambush 25W WSP * | permethrin | 6.4-12.8 fluid ounces | 0-14 depending on rate used |
| Baythroid 2 * | cyfluthrin | 1.6-2.8 fluid ounces | 7 |
| Dimethoate 4 E.C. | dimethoate | 0.5-1 pint | 10 |
| Dimethoate 400 | dimethoate | 0.5-1 pint | 10 |
| Dimethoate, 5 lb | dimethoate | 6.4-12.8 fluid ounces | 10 |
| Furadan 4 F * | carbofuran | 0.5-2 pints | 7-28 depending on rate used |
| Imidan 70-WSB | phosmet | 1.33 pounds | 7 |

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|-----------------|--------------------|------------------------|-----------------------------------|
| Lannate LV * | methomyl | 3 pints | 7 |
| Lannate SP * | methomyl | 1 pound | 7 |
| Lorsban 4E | chlorpyrifos | 1-2 pints | 14-21 depending on rate used |
| Malathion 57 EC | malathion | 1.5-2.25 pints | 0 |
| PennCap-M * | methyl parathion | 2-3 pints | 15 (and a 2-day reentry interval) |
| Pounce 3.2 EC * | permethrin | 4-8 fluid ounces | 0-14 depending on rate used |
| Pounce 25 WP * | permethrin | 6.4-12.8 ounces | 0-14 depending on rate used |
| Pounce WSB * | permethrin | 0.1-0.2 pound | 0-14 depending on rate used |
| Sevin 4F | carbaryl | 1.5 quarts | 7 |
| Sevin 80WSP | carbaryl | 1.875 pounds | 7 |
| Sevin XLR PLUS | carbaryl | 1.5 quarts | 7 |
| Warrior T* | lambda-cyhalothrin | 2.56-3.84 fluid ounces | 1-Forage, 7-Hay |

* Restricted Use Pesticide. Always read and follow label directions.

Variegated Cutworm and Army Cutworm:

The variegated cutworm, *Peridroma saucia* (Hubner) is always a threat to alfalfa in South Dakota. Alfalfa weevils are often blamed for the injuries on the alfalfa regrowth that are actually caused by variegated cutworms. During 2001, alfalfa weevil infestations were not as severe as they were in 2000, and it was possible to clearly see the damage that variegated cutworms caused in alfalfa stands. In addition to alfalfa, variegated cutworms will also feed on the leaves of corn, soybeans, turf, and many vegetables in home gardens. This cutworm is most likely to damage alfalfa after the first cutting. Delayed regrowth and brown or bare patches in the field are symptoms of cutworm infestation and damage. Treatment for cutworm infestations is usually through insecticide application.

Variegated cutworms are commonly mistaken for true armyworms which usually occur later in the season, in late June through July in South Dakota. Variegated cutworms are usually a concern in the early season months of April and May. It is important to be able to differentiate between armyworms and variegated cutworms because the word "armyworm" evokes unnecessary fear among growers and the public.

Insecticides labeled for use on alfalfa to control cutworms include Ambush 2E, Baythroid, Lorsban 4E, Pounce 3.2EC, and Warrior. Sevin XLR PLUS may also be used for cutworms on alfalfa. The economic threshold of variegated cutworms on alfalfa is 2-4 larvae per square foot or it may be expressed on the number of days of delayed regrowth that could be tolerated. The thresholds vary with the cutting schedule of the grower, cost of treatment, and the market value of the alfalfa on the field.

Cutworm Insecticides:

| Brand name | Active ingredient | Product per acre | Pre-harvest interval (days) |
|-----------------|--------------------|------------------------|------------------------------|
| Ambush * | permethrin | 3.2-12.8 fluid ounces | 0-14 depending on rate used |
| Baythroid 2 * | cyfluthrin | 0.8-1.6 fluid ounces | 7 |
| Lorsban 4E | chlorpyrifos | 1-2 pints | 14-21 depending on rate used |
| Pounce 3.2 EC * | permethrin | 2-8 fluid ounces | 0-14 depending on rate used |
| Sevin XLR PLUS | carbaryl | 1-1.6 quarts | 7 |
| Warrior T* | lambda-cyhalothrin | 1.92-3.20 fluid ounces | 1-Forage, 7-Hay |

* Restricted Use Pesticide. Always read and follow label directions.

Potato Leafhopper:

History:

The potato leafhopper can become an economic pest in the state in any given year. The potato leafhopper does not overwinter in the state, but migrates in from southern states each year. This migration often limits damage to cuttings after the first cutting of the year. This insect is very small, approximately 1/8 inch long, with piercing-sucking mouthparts. The nymphs of this insect often move sideways and backwards, in a "crab-like" manner. Damage from this pest can look similar to drought, with yellowing occurring on the leaves from the tip downward in a wedge shaped, or "v" pattern. Potato leafhoppers damage alfalfa in several ways. Feeding results in stunting of plants, loss in yield, loss in plant vigor, and especially loss in hay quality. Protein content of the alfalfa can be greatly reduced. Reduced plant vigor can also result in slow regrowth and winter kill.

Potato Leafhopper Insecticides:

| Brand name | Active ingredient | Product per acre | Pre-harvest interval (days) |
|------------|-------------------|------------------|-----------------------------|
|------------|-------------------|------------------|-----------------------------|

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|--------------------|--------------------|------------------------|-----------------------------------|
| Ambush * | permethrin | 3.2-12.8 fluid ounces | 0-14 depending on rate used |
| Ambush 25W WP * | permethrin | 3.2-12.8 fluid ounces | 0-14 depending on rate used |
| Ambush 25W WSP * | permethrin | 3.2-12.8 fluid ounces | 0-14 depending on rate used |
| Baythroid 2 * | cyfluthrin | 0.8-1.6 fluid ounces | 7 |
| Chlorpyrifos 4E AG | chlorpyrifos | 1-2 pints | 14-21 depending on rate used |
| Dimethoate 4 E.C. | dimethoate | 0.5-1 pint | 10 |
| Dimethoate 400 | dimethoate | 0.5-1 pint | 10 |
| Dimethoate, 5 lb | dimethoate | 6.4-12.8 fluid ounces | 10 |
| Furadan 4 F * | carbofuran | 1-2 pints | 14-28 depending on rate used |
| Lorsban 4E | chlorpyrifos | 0.5-1 pint | 7-21 depending on rate used |
| Malathion 57 EC | malathion | 1.5-2.25 pints | 0 |
| PennCap-M * | methyl parathion | 2-3 pints | 15 (and a 2-day reentry interval) |
| Pounce 3.2 EC * | permethrin | 4-8 fluid ounces | 0-14 depending on rate used |
| Pounce 25 WP * | permethrin | 6.4-12.8 ounces | 0-14 depending on rate used |
| Pounce WSB * | permethrin | 0.1-0.2 pound | 0-14 depending on rate used |
| Sevin 4F | carbaryl | 1 quart | 7 |
| Sevin 80WSP | carbaryl | 1.25 pounds | 7 |
| Sevin XLR PLUS | carbaryl | 1 quart | 7 |
| Warrior T* | lambda-cyhalothrin | 1.92-3.20 fluid ounces | 1-Forage, 7-Hay |

* Restricted Use Pesticide. Always read and follow label directions.

Aphids:

The pea aphid and occasionally the spotted alfalfa aphid can potentially damage alfalfa in the state. Spotted alfalfa aphids, the smaller of the two species in body size, is about 1/16 inch

long and has 4-6 rows of spots on the back. This aphid injects a toxin into the plant when feeding, which causes leaf drop. This damage can be severe in seedling alfalfa stands. The pea aphid is larger in size, about 1/8 inch long and yellow to blue-green in color. This aphid can cause alfalfa to wilt, if infestations are heavy.

Aphid Insecticides:

| Brand name | Active ingredient | Product per acre | Pre-harvest interval (days) |
|-------------------|--------------------|------------------------|-----------------------------------|
| Ambush 2E* | permethrin | 6.4-12.8 fluid ounces | 0-14 depending on rate used |
| Baythroid 2 * | cyfluthrin | 0.8-1.6 fluid ounces | 7 |
| Dimethoate 4 E.C. | dimethoate | 0.5-1 pint | 10 |
| Dimethoate 400 | dimethoate | 0.5-1 pint | 10 |
| Dimethoate, 5 lb | dimethoate | 6.4-12.8 fluid ounces | 10 |
| Furadan 4 F * | carbofuran | 1-2 pints | 14-28 depending on rate used |
| Lorsban 4E | chlorpyrifos | 0.5-1 pint | 7-21 depending on rate used |
| Malathion 57 EC | malathion | 1.5-2.25 pints | 0 |
| PennCap-M * | methyl parathion | 2-3 pints | 15 (and a 2-day reentry interval) |
| Pounce 3.2 EC * | permethrin | 4-8 fluid ounces | 0-14 depending on rate used |
| Pounce 25 WP * | permethrin | 6.4-12.8 ounces | 0-14 depending on rate used |
| Pounce WSB * | permethrin | 0.1-0.2 pound | 0-14 depending on rate used |
| Warrior T* | lambda-cyhalothrin | 2.56-3.84 fluid ounces | 1-Forage, 7-Hay |

* Restricted Use Pesticide. Always read and follow label directions.

Grasshopper:

Several species of grasshoppers are capable of damaging alfalfa in South Dakota. Traditionally, grasshoppers are more of a concern in the more arid western areas of the state, but damage on a statewide basis is possible in any given year. The two striped grasshopper, migratory grasshopper, redlegged grasshopper and the differential grasshopper are just a few of the species present in South Dakota. Most of the damaging species of grasshopper in the state overwinter as eggs in the soil. Eggs hatch beginning in May and extending into June, depending on species.

Grasshopper Insecticides:

| Brand name | Active ingredient | Product per acre | Pre Harvest Intervals (days) |
|--------------------|--------------------|------------------------|-----------------------------------|
| Baythroid 2* | cyfluthrin | 2.0.-2.8 fluid ounces | 7 |
| Chlorpyrifos 4E AG | chlorpyrifos | 0.5-1 pint | 14-21 depending on rate used |
| Dimethoate 400 | dimethoate | 1 pint | 10 |
| Dimethoate 4EC | dimethoate | 1 pint | 10 |
| Dimethoate, 5 lb. | dimethoate | 12.8 fluid ounces | 10 |
| Furadan 4F * | carbofuran | 0.25-0.50 pint | 14-28 depending on rate used |
| Lorsban 4E | chlorpyrifos | 0.5-1 pint | 7-21 depending on rate used |
| PennCap-M * | methyl parathion | 2-3 pints | 15 (and a 2-day reentry interval) |
| Sevin 4F | carbaryl | 1-3 pints | 7 |
| Sevin 80WSP | carbaryl | 0.667-1.875 pounds | 7 |
| Sevin XLR PLUS | carbaryl | 1-3 pints | 7 |
| Warrior T* | lambda-cyhalothrin | 2.56-3.84 fluid ounces | 1-Forage, 7-Hay |

* Restricted Use Pesticide. Always read and follow label directions.

Blister Beetles:

Blister beetles do not damage the alfalfa crop directly, but can be of great concern to the alfalfa producer by their presence. Blister beetles are highly toxic when ingested, especially by horses. The beetle contains a toxin called cantharadin. Blister beetles are a pest of later alfalfa cuttings during the growing season, especially in July, August and September. Killing the beetles with insecticide may not solve the problem, as the dead insects still contain the toxin and they may be raked and baled into the hay. The best alternative is to cut the alfalfa with a windrower that does not crush the plants and to selectively market the hay from later cuttings to avoid concerns with feeding potentially contaminated hay to highly sensitive types of livestock.

Lygus Bug:

Lygus bugs and other plant bugs damage alfalfa by feeding on plant buds, flowers and seeds with their piercing-sucking mouthparts. Lygus bug feeding causes alfalfa buds to die and drop a few days after feeding takes place. Feeding on pods also causes damage. Because of this damage, this group of insects is primarily a concern in the seed growing area of the state. These insects have not been of economic significance in recent years, but the threat is still

present. Insecticides for plant bug control include Ambush, Baythroid, dimethoate products, Furadan, Lorsban, malathion, Pounce and Warrior.

Weeds

Weed control is an issue for alfalfa producers, both at the time of stand establishment and in mature alfalfa stands. Concerns with annual grasses at stand establishment and with invasive weeds such as winter annual grasses and broadleaves and perennial weeds in established stands have required producers to use integrated approaches to weed control. Sound cultural weed control prior to stand establishment can greatly reduce concerns with weeds competing with young alfalfa plants during stand establishment. Recent survey efforts from the South Dakota NCPMC project have indicated that less than 5% of the alfalfa producers surveyed use herbicides to control weeds in established alfalfa stands. During stand establishment, producers use various management practices, some of which include cultural methods and/or herbicides to reduce weed competition. Of the producers establishing new alfalfa stands, the following management practices were used: clear seeding without herbicide (33%), clear seeding with a herbicide (55%), nurse crop and clipping of the nurse crop (22%). No producers indicated using a nurse crop and killing the nurse crop with a herbicide after establishment, although this management practice is available for use.

Herbicides- Established Alfalfa Stands

| Brand name | Active ingredient | Product per acre | Pre-harvest interval (days) |
|---------------------|-------------------|-------------------|---|
| Sencor or Lexone | metribuzin | .38-1 lb a.i. | 28 grazing |
| Poast or Poast Plus | sethoxydim | .2-.5 lb a.i. | 7 wet forage, 14 dry forage |
| Pursuit | imazethapyr | .047-.094 lb a.i. | 30 |
| Butyrac 200 | 2,4-DB | .5-1.5 lb a.i. | 30 |
| Treflan | trifluralin | .75-2 b a.i. | Fall application only |
| Kerb | pronamide | .75-2 lb a.i. | 25 |
| Sinbar | terbacil | .4-1.2 lb a.i. | Fall application |
| Diquat | diquat | .25-.5 lb a.i. | Harvest aide- Do not graze or feed |
| Gramoxone Extra | paraquat | .25-.7 lb a.i. | 60 |
| Roundup Ultra | glyphosate | .38-3 lb a.i. | Spot treatment only. 14-forage, 8 wk- graze |

Legume Establishment Without Nurse Crop

| Brand name | Active ingredient | Product per acre | Special Notes |
|---------------------|-------------------|-------------------|--|
| Eptam | EPTC | 2-4 lb a.i. | |
| Treflan | trifluralin | .5-.75 lb a.i. | |
| Pursuit | imazethapyr | .047-.094 lb a.i. | |
| Poast or Poast Plus | sethoxydim | .15-.5 lb a.i. | |
| Butyrac 200 | 2,4-DB | .5-1.5 lb a.i. | |
| Buctril | bromoxynil | .25-.38 lb a.i. | |
| Gramoxone Extra | paraquat | .75-1 lb a.i. | |
| Roundup | glyphosate | .38-3 lb a.i. | |
| Prowl | pendimethalin | .5-1.25 lb a.i. | Do not feed or graze- CRP or set-aside only. |

Herbicides- Grass Pasture and Range

| Brand name | Active ingredient | Product per acre | Pre-harvest interval (days) |
|----------------------|--------------------|--------------------------|--|
| 2,4-D Ester or Amine | 2,4-D | 5-2 lb a.i. | 7 or 14-grazing, 30-harvesting |
| Banvel | dicamba | 5-8 lb a.i. | 7 to 60, depending on rate |
| Tordon 22K | picloram | 125-2 lb a.i. | None-if rate 1qt/a or less; 2 weeks if greater than 1 qt/a |
| Ally | metsulfuron methyl | 004-.012 lb a.i. | None. Do not use on grasses grown for seed. |
| Amber | triasulfuron | 013-.026 lb a.i. | Grazing- none; 30- hay |
| Curtail | clopyralid + 2,4-D | 19 + 1 - .38 + 2 lb a.i. | 14- dairy cattle grazing; 30- hay |
| Stinger or Transline | clopyralid | .12-.5 lb a.i. | Grazing-none |

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|-----------------|-------------------|--------------------------|---|
| Crossbow | triclopyr + 2,4-D | .25 + .5 - 1 + 2 lb a.i. | 14- dairy grazing; 14- hay for non-dairy. Do not cut hay for dairy until next season. |
| Gramoxone Extra | paraquat | .25-.5 lb a.i. | Pasture renovation |
| Roundup | glyphosate | .28-3 lb a.i. | Pasture renovation |

Diseases

Many diseases occur in alfalfa. Leaf spotting diseases, crown and stem rots and wilt diseases can occur. However, very few disease outbreaks are present in South Dakota. Generally, the environmental condition in the state are quite dry throughout the growing season, and this tends to limit the disease concerns. South Dakota also has a long winter dormancy period, further limiting the diseases of alfalfa. Spring blackstem, a cool season leaf spotting disease, can occasionally be a concern, usually during cool Spring and Fall seasons. This disease is generally effectively managed with early cutting of the hay crop. Crown rots become a more significant concern as the alfalfa stand matures and ages. Recent survey efforts by the South Dakota Project of the NCPMC have indicated no treatment for alfalfa diseases within the population of producers surveyed. Due to feeding restrictions, foliar fungicides are only of use on alfalfa for seed production. Seed producers in South Dakota are located in the drier areas of the state with lower disease pressure and have not reported any use of foliar fungicides to manage diseases.

Stand establishment is a major concern, with Pythium and Phytophthora causing serious seedling disease problems. These are generally managed effectively with fungicidal seed coatings. Seed treatment can be an affordable way to facilitate optimal plant populations. Labeled seed treatments are listed below.

Fungicides- Seed Treatment

| Brand name | Active ingredient | Product per cwt seed | Special notes |
|---------------|-------------------|-----------------------------|---------------|
| Allegiance FI | metalaxyl | 0.75-1.5 fl oz (28.35%a.i.) | n/a |
| Allegiance LS | metalaxyl | 1.2-2.4 (17.7%ai) | n/a |
| Apron FL | metalaxyl | 1.5 fl oz (28.35%ai) | n/a |
| Apron XL | mefanoxam | 0.64 fl oz (32.3%ai) | n/a |
| Captan 30 DD | captan | 6.5 fl oz (28.7%ai) | n/a |

| | | | |
|--------------|--------|---------------------|-----------------------|
| Captan 400 | captan | 5-8 fl oz (37.4%ai) | n/a |
| Captan 400 C | captan | 5-8 fl oz (37.4%ai) | n/a |
| 42S Thiram | thiram | 8 oz (42%ai) | Do not exceed 32#ai/A |
| Thiram 50WP | thiram | 8 oz (50%ai) | Do not exceed 32#ai/A |

Vertebrates

The primary rodent of concern to South Dakota alfalfa producers is the pocket gopher. This pest damages the crop by feeding on roots and piling dirt on the surface, but the most significant concern is the equipment damage that can occur from the rough fields and from running dirt mounds through equipment. Control has been through rotation, trapping and selective rodenticides, such as phosphine tablets placed in gopher burrows, use of zinc phosphide baits and strychnine baits (below ground level). Approximately eight percent of producers in a recent survey indicated severe problems with pocket gophers and have treated for these pests, while forty percent indicated slight concern and indicated use of cultural management, trapping, or no treatment.

References

1. AgriGrowth, Inc. 1998. Profitable Alfalfa Management. Various Pages. AgriGrowth, Inc., Hollandale, MN.
2. Anderson, C.A. and S.W. Noyes. 2001. South Dakota Agriculture 2001. South Dakota Agricultural Statistics Service, Sioux Falls, SD.
3. Catangui, M. 2001. Evaluation of Control Practices in South Dakota Alfalfa Weevil. Bulletin Number EEFS 011. South Dakota State University, Brookings, SD.
4. Rice, M.E. 2000. 2000 Insect Pest Management Guide for Iowa Field and Forage Crops. ISU publication # IPM 60. Iowa State University of Science and Technology, Ames, IA.
5. Ruden, B.E. 2001. Alfalfa Pesticide Use and Pest Management Survey. Unpublished to date. South Dakota State University, Brookings, SD
6. Wrage, L and D. Deneke. 2001. Weed Control in Grass Pasture and Range. Bulletin # FS

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