Better Alfalfa Coming

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WHY DO WE need new varieties of alfalfa? Thousands of farmers in Iowa can give us the answer. We need new varieties because we’re having too much difficulty in maintaining vigorous, productive stands of the old varieties.

Alfalfa is Iowa’s most important legume hay crop. During the past 25 years Iowa farmers have steadily increased their alfalfa from a few thousand to more than a million acres. Similar increases have taken place in the neighboring states just to the north and east.

The center of alfalfa production has shifted from the western states to the Midwest, and this has brought some accompanying difficulties. Seed supplies of the varieties best adapted to Iowa are not always sufficient. In many years there is a critical shortage. Winter injury is a problem that is always with us, and when less desirable varieties are sown, losses from winterkilling become greater. The use of the most hardy varieties, Ladak, Cossack and Grimm, greatly reduces winter losses, but even with these, the presence of ice sheets over flat and depressed areas results in some loss of stand.

Bacterial Wilt

Another hazard, even more serious than winter injury, is bacterial wilt. This disease, caused by an organism (Corynebacterium insidiosum), was first reported in Iowa in 1923, and now is widely distributed throughout the United States. It is especially severe in the north central states and is more serious in areas with plenty of moisture than in dry areas. The wilt-causing bacteria enter the outer portions of the root through various kinds of wounds. Here we can see that wilt and winter injury go hand in hand. Winter injury causes cracks in the outer layer of the root, allowing the wilt organisms to enter. The infected plant becomes less vigorous and more susceptible to winter injury.

After the bacteria enter the root they get into the water-conducting tissues of the tap root where they multiply and eventually clog the conducting vessels. If you strip down the bark of the root, you will find a yellowish or brown slimy discoloration extending along the woody cylinder of the root.

Symptoms in the growing plant include a dwarfing in size, a light green or yellowish color of the leaves, with many fine stems coming from the crown. Occasionally, even in green, apparently normal plants, a wilting of the tips of the stems occurs in hot weather, indicating the presence of the disease.

In central Iowa wilt begins to be serious by the end of the second crop year. It may actually be present at the end of the first crop year, yet yields during the second year usually are not affected greatly. During the third and fourth years, however, the disease increases rapidly, thinning stands of Grimm, Baltic and Common until there may be little left but weeds by the end of the fourth year. Ladak and Cossack persist a little longer than Grimm, but they, too, become badly depleted.

No control measures have been found, although good management practices may help to make the disease less serious. Frequent cutting and cutting in the critical fall period, Sept. 10 to Oct. 10, cause more rapid development of wilt. The only practical control appears to be in using resistant varieties.

Varieties Which Are Resistant To Wilt Show Much Promise

An excellent stand of Buffalo wilt-resistant alfalfa at the left. The plot of Baltic at the right shows mostly grass and weeds with only a few alfalfa plants remaining after 4 years. The original stands of both these varieties were perfect.

Of these four plants, only the one at the right is entirely free of wilt. The other three show varying stages of the disease.

In this 4-year-old stand, Hardistan (left) is winter hardy and wilt-resistant, while Utah Common is neither hardy nor resistant.

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Wilt-Resistant Varieties

Several years ago the United States Department of Agriculture recognized the need for disease resistant and winter-hardy varieties and sent the late H. L. Westover on an exploration trip to Asia to collect alfalfa varieties. Some of the strains which he obtained in Turkestan proved to be resistant to alfalfa wilt. Through a cooperative program between the U. S. Department of Agriculture and the state experiment stations these strains, not entirely satisfactory in themselves, were used in breeding and developing new resistant varieties.

Ranger alfalfa was produced largely by the United States Department of Agriculture and the Nebraska Agricultural Experiment Station. It was developed by breeding and selection among lines tracing to the Cossack, Ladak and Turkestan varieties. It was made up by combining in equal portions seed of five lines, each of which had been tested for wilt resistance, winter hardness, forage yields and seed production.

Much of Ranger’s wilt resistance came from the Turkestan variety. Ranger has been tested widely in the United States and promises to become an important variety, particularly in the western part of the Corn Belt and states farther west. In Iowa it appears to have many of the characteristics of the Turkestan alfalfa, but probably yields a little more forage in the first year after it’s seeded.

Buffalo alfalfa is a wilt-resistant variety developed by the Kansas Agricultural Experiment Station and the U. S. Department of Agriculture. This variety was developed from wilt-resistant plants found in an old field of Kansas Common. Buffalo has the characteristic favorable growth and recovery habits of Kansas Common, is wilt-resistant, and under Iowa conditions appears to have greater winter hardiness than Kansas Common. In a row nursery established in 1937 at Ames, Buffalo persisted for 7 years while Kansas Common was practically gone by the end of the fourth year.

Forage Yields Compared

In 1940, when the first seed of these new varieties was available for replicated field trials, both Buffalo and Ranger were included in a strain trial we established at the Iowa Station. We compared forage yields for 4 years, three crops per year being harvested unless growth was poor in late summer. Comparative yields of forage and estimated stand survival at the end of 4 years for eight varieties included in this experiment are given in the accompanying table.

For the 4-year period, 1941 to 1944, inclusive, the Buffalo variety produced more forage than the others, followed closely by Ranger, with Ladak in third place. You can readily see from the data that the advantage of Buffalo and Ranger in yield came in the third and fourth crop years. This directly reflected the stand of plants as indicated in the stand survival record. After 4 years the stand of Buffalo and Ranger was estimated at 75 percent and 67 percent, respectively, while Grimm had a stand of but 11 percent and Baltic only 2 percent.

We are convinced that during the third and fourth years of the stand the resistance to wilt begins to pay dividends. The forage yields of Buffalo and Ranger during 1943 and 1944 were more than twice as high as those of Grimm, Baltic, Kansas Common and Dakota Common.

A further examination of the data shows that during the first two crop years, Buffalo and Ranger had no advantage in yield over the other varieties. In fact, in this as well as other experiments, Ranger has produced somewhat less forage during the first year or two than has Ladak, Cos-sack or even Kansas Common.

Seed Supply Limited

While limited quantities of commercial seed of Ranger alfalfa have been sold through the crop improvement associations of Montana, Nebraska and other states, there has been a much greater demand than supply.

According to a certified seed report by O. S. Fisher of the U. S. Department of Agriculture, a total of 29,340 pounds of seed were produced in 9 states from 1,715 acres of Ranger alfalfa in 1944. The acreage is increasing each year, and it has been estimated that the seed crop of Ranger in 1945 may possibly reach 100,000 pounds.

Buffalo alfalfa is being increased in western Kansas, but as yet no commercial seed is available. Ninety acres were harvested in 1944, producing approximately 1800 pounds of seed. Much of this seed was replanted for further seed increase, and 400 acres are now in production.

With little likelihood, then, that adequate seed supplies of these new wilt-resistant varieties of alfalfa will be available for several years, demonstration plots are being used to prove their worth to farmers and to seed suppliers.
years, what varieties shall we use in Iowa? A careful study of the table will give the answer.

All of these varieties produced excellent yields during the first two crop years after establishment. We must consider more seriously than we have ever done before the greater use of alfalfa in shorter rotations. When the stand is to be used for 2 years only, or 3 at the most, Ladak, Cossack, Grimm and the northern commons will be satisfactory. Ladak and Cossack are preferred if they can be obtained. If you plan to leave the field for 3, 4 or more years, use Ladak or, better still, the new wilt-resistant varieties, Ranger or Buffalo, if you can get the seed.

### Comparative Yield and Stand Survival of Alfalfa Varieties at Ames, Iowa, 1941-44. Seeded in 1940.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Tons of Hay Per Acre at 12 Percent Moisture</th>
<th>Stand Survival in Percent</th>
<th>Nov. 1, 1944</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1941</td>
<td>1942</td>
<td>1943</td>
</tr>
<tr>
<td>Buffalo</td>
<td>5.57</td>
<td>4.33</td>
<td>3.60</td>
</tr>
<tr>
<td>Ranger</td>
<td>5.39</td>
<td>4.43</td>
<td>3.55</td>
</tr>
<tr>
<td>Ladak</td>
<td>6.25</td>
<td>4.81</td>
<td>3.01</td>
</tr>
<tr>
<td>Cossack</td>
<td>5.78</td>
<td>4.45</td>
<td>2.61</td>
</tr>
<tr>
<td>Grimm</td>
<td>5.60</td>
<td>4.47</td>
<td>2.47</td>
</tr>
<tr>
<td>Baltic</td>
<td>6.11</td>
<td>4.85</td>
<td>2.10</td>
</tr>
<tr>
<td>Kansas Common</td>
<td>5.78</td>
<td>4.59</td>
<td>1.75</td>
</tr>
<tr>
<td>Dakota Common</td>
<td>5.64</td>
<td>4.62</td>
<td>1.94</td>
</tr>
</tbody>
</table>

Differences of 0.23 ton per acre (average yields) are significant at the 5 percent level.

of the stalk is fed into the hammers by the snapping rolls. A section of hammer mill screen is provided to the rear of the cylinder to serve as a concave for the hammers to work against in pulverizing the stalks.

Aside from giving a high corn borer kill, the work of this attachment leaves the stalks in such a condition that they can be readily disked into the soil or plowed under. The material which it turns out is considerably finer than ordinary shredded fodder.

On 16 acres where the machine was used, the ground was double-disked and sown to wheat as soon as the corn was picked. Another 20-acre field was allowed to lie over winter and was then double-disked and sown to oats and alfalfa. In both fields a nice seedbed was obtained—there were no stalks to bother the combine or binder when the small grain and hay crops were harvested.

It appears that the work of this type of pulverizer has many advantages and its use, aside from corn borer control, might be profitable and beneficial for any farmer using a corn picker.

### Indiana “Grinds” Corn Borers

A machine that can be attached to the mechanical corn picker and will kill 95 percent of the European corn borers that are in the stalks at the time of picking—that sounds pretty good.

The agricultural engineers of Indiana Agricultural Experiment Station, Purdue University, report that kind of results in the fall of 1943 and early 1944 in some tests which they made with a machine they have been perfecting in cooperation with the International Harvester Company. The original work in building this machine was done by R. H. Wileman.

The machine is not yet ready for production and it is not available to anyone who might want to buy one. They are not being produced, but the results which these workers at Purdue obtained are promising.

The work in building a machine of this kind was begun in the spring of 1942, and the machine was first tried out in the fall of 1942. On the basis of the experiments made, the machine was changed and improvements made. In the fall of 1943 and the early part of the winter of 1944, it was used on a much larger scale and careful counts made in cooperation with Purdue entomologists to determine just how effective the machine had been in killing borers. A series of nine tests were made under different field and stalk conditions. The first tests were made Oct. 18, 1943 and the last of them for that season on Jan. 25, 1944. The average borer kill for the nine tests was 95.3 percent. The percentage of kill in the nine tests was very close, ranging from 94 to 97 percent.

Briefly, the machine uses the hammer mill principle so that it pulverizes the stalks. The rotation of the hammer cylinder is opposite to the direction of travel of the machine and is adjusted to just clear the ground. With this arrangement the lower part of the stalk is pulverized as the machine moves into it, and the remainder

### When Shall I Cut Clover?

In 1943 some experiments were made at the Iowa Station to try to determine when is the best time to cut medium red clover to get the best yield of forage and seed. The first crop of red clover was cut at six different stages of maturity, starting with the bud stage, June 4, and ending when the clover was mature, July 23. Second crops were cut at three times from these six first cutting stages—the second cuttings being made at three stages of maturity—25 percent in bloom, full bloom and mature seed.

Forage yields of the clover were best, considering both quantity and quality of hay, when both the first and second crops were cut near the full bloom stage. The most favorable cutting time if you want to produce seed, according to this work in 1943, was to cut the first crop for hay in the bud to early bloom stage and then harvest the second crop for seed.

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