SUMMARY

New varieties and strains of alfalfa are constantly being developed in the United States. The University of Wyoming Experiment Station is engaged in testing these varieties at different locations within the state to determine their adaptability to Wyoming conditions and their hay yield with respect to such standard varieties as Grimm and Cossack.

The tests in Wyoming thus far show that, in areas where wilt is not a problem or where the stand is in a short rotation and will be plowed in three to four years, Atlantic and Meeker Baltic are the highest-yielding varieties. However, the seed of Atlantic is not in good supply at this time.

Ladak has yielded as high as any other variety in 2-cutting areas. It has the additional advantage over Atlantic and Meeker Baltic in that it is partially wilt-resistant. However, because of its slow recovery after cutting, it is not a high-yielding variety in 3-cutting areas.

The wilt-resistant varieties are ordinarily used in long-term rotations, pastures, or meadows where it is desired to maintain a maximum stand for a long time.

Of the three alfalfa varieties which are classed as high in wilt resistance (Ranger, Buffalo, and Turkistan), Ranger has consistently yielded a greater tonnage of hay than either of the other two.
Alfalfa Variety Trials in Wyoming

by
Robert Lang
Associate Agronomist

INTRODUCTION

Alfalfa is one of the most important farm crops in Wyoming. Its growth for hay is confined primarily to the irrigated sections of the state, although some alfalfa for hay is grown in dryland areas with the most favorable rainfall. In addition to its importance as a hay crop, alfalfa is used extensively in crop rotations, particularly in the irrigated sections, as a soil-building crop. It is becoming increasingly important too, in seeded pasture or hay mixtures both in dry and irrigated areas of the state.

Frequently in the past, alfalfa has been planted without proper consideration of the variety which is best adapted to the area and to the particular needs of the ranchman or farmer concerned. Several new varieties of alfalfa have been developed in recent years and these varieties vary considerably in their adaptation to Wyoming conditions, resistance to alfalfa wilt, and hay yield under a given set of ecological and management conditions. Consequently it is important that the proper variety be selected for the area in order to attain the maximum in forage yield.

REVIEW OF LITERATURE

There are many publications dealing with alfalfa variety tests in various states and regions of the United States. The following brief review was taken from a selected few publications of recent date or pertaining primarily to areas having climatic conditions somewhat similar to those found in the alfalfa-producing areas of Wyoming.

Yield tests of various alfalfa varieties and strains were conducted in Nebraska by Tysdal and Kiesselbach. They state that

"In the early days of alfalfa growing little attention was paid to the origin of the seed or to the identity of the variety. Through Experiment Station tests and farm experience, however, striking differences as to the

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growth habits, adaptation, and yield of varieties and regional strains have come to be recognized."

Early studies show that "Cossack yielded more than any of the other varieties although it was closely followed by Baltic and then by Grimm. In the test of the common alfalfas planted in 1922, the western Nebraska dryland strain gave the highest average yield but it was very closely followed by Kansas Common, a western Nebraska irrigated strain, and by Russian. In fact a number of varieties were so close in average yield that they could not be considered significantly different. When their stand survival and disease and cold resistance are considered along with their yield, however, certain differences become apparent which make it less difficult to choose the better varieties for this section.

"The regional strains of Common alfalfa were very different in their response as to both yield and survival. At the end of six years there was 40 percent difference in stand survival between the more northern Commons and the southern Commons." In a test of "15 lots of Turkistan seed from Turkistan a few showed fair results but most of them were very poor with respect to yielding ability."

In regard to regional adaptation of various alfalfa varieties, Westover reports that

"The common alfalfas vary considerably in hardiness, depending mainly upon the conditions under which a particular strain has developed. Their range of adaptation covers much of the United States, the northern and more cold-resistant strains being best suited for growing in the Northern States and the southern nonhardy strains for the Southern States. In general, common alfalfa may be expected to give fairly satisfactory results in the latitude in which the seed has been grown for several seed generations. Even the hardiest strains of common alfalfa are not dependable where the winters are particularly severe. The hardier variegated alfalfas are much to be preferred under such conditions.

"The Grimm, Cossack, Baltic, Canadian Variegated, and Hardigan varieties are more cold-resistant than any of the common alfalfas and may be used to advantage from about the fortieth parallel northward and at higher altitudes farther south. There are many areas within this region where soil and climatic conditions are particularly favorable to the growth of alfalfa and where some of the common alfalfas may be used to advantage, especially in short rotations, the seed being somewhat cheaper. Even under these more favorable conditions, however, the variegated alfalfas have generally been somewhat more productive in the northern half of the United States. They have usually been inferior to the common alfalfas in the South.

"Ladak alfalfa is adapted to the part of the country lying west of the

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Mississippi River and from Kansas northward, being especially valuable for
the cold, dry conditions in the northern Great Plains and for areas where
bacterial wilt is prevalent. In limited tests Ladak has succeeded fairly well
in Northern States as far east as Ohio, but from this point eastward it has
not compared very favorably with other variegated alfalfas. It is not
adapted to the southern half of the United States.

"Turkistan, Hardistan, and Kaw alfalfas are recommended for wilt-
infested soils west of the Mississippi and from Kansas northward. They
have not generally given good results in the Eastern or Southern States.

"Peruvian alfalfa, like strains of common alfalfa grown in the South-
west, can be used to advantage only where the winters are mild. The section
to which this alfalfa is adapted includes the greater part of California, ex-
cept the mountainous portions, southern Arizona, southern New Mexico,
southern Texas, and the coastal region of the South Atlantic and Gulf
States."

COOPERATIVE REGIONAL ALFALFA RESEARCH

A system of cooperative uniform alfalfa nurseries was initiated in 1937
wherein the United States Department of Agriculture and the various state
experimental stations cooperate in testing new varieties, strains, and crosses
of alfalfa. Under this procedure the same varieties or strains are planted
in nurseries of each cooperating state within a region and tested for hay
yield and other desirable agronomic characteristics. In this manner, data
from a large number of stations are collected for each variety or strain for
each year; its adaptability to a region or portion of a region may be deter-
mined in a few years of testing.

The 1942 Mimeographed Report of the Uniform Alfalfa Nurseries3
showed that, at the northern stations with climatic conditions similar to
those of Wyoming, Ladak, Atlantic, and Baltic were the highest forage-pro-
ducing varieties tested. Many new alfalfa crosses and selections are now
being tested by the various states cooperating in the uniform alfalfa nur-
sery program in a constant search for higher-producing and more desirable
varieties of alfalfa.

VARIETY TRIALS IN WYOMING

A uniform alfalfa nursery consisting of 25 varieties and strains was
planted at the Laramie Station in May 1941. Yield data were collected
through 1945. Another uniform nursery of 16 of the newest alfalfa strains
and crosses was planted in 1947. Yield data from this nursery are cur-

3 Tysdal, H. M. Report of the Uniform Advanced Alfalfa Nurseries... U. S. D. A.
Agricultural Research Administration. 1942.
rently being collected to determine if any of these new strains may be superior to the standard varieties.

In spring 1945 a nursery consisting of the five most promising varieties from the Laramie trials, with Grimm and Cossack as checks, was planted at the Torrington Substation. In spring 1947 an identical nursery was planted at the Powell Substation to test these varieties at lower elevations and in 3 cutting areas. In addition, alfalfa nurseries were planted in the spring of 1950 at the Gillette and Archer Substations to test the varieties under dryland conditions.

FIG. 1—A portion of the Laramie Alfalfa Nursery. Ladak Alfalfa in Foreground

EXPERIMENTAL PROCEDURE

All of the alfalfa nurseries were planted on well-prepared seedbed in randomized plots with from 5 to 7 replications. Plots were harvested when the alfalfa was between one-tenth and one-fourth in bloom, and the green weight of each plot was recorded immediately after cutting. The yield for each plot was calculated in terms of tons of hay per acre on a 12 percent-moisture basis. This determination was made by the standard procedure of oven-drying a small weighed sample of green hay from each plot to determine the percentage of dry matter, then basing the pounds of dry mat-
ter per plot upon the percentage of dry matter determined in the sample. The hay yield of these small plots was then calculated in terms of tons per acre at 12 percent moisture.

RESULTS FROM THE LARAMIE STATION

Twenty-five varieties and strains of alfalfa were included in the 1941 nursery at Laramie, Wyoming. Three varieties were outstandingly high and two were very low in average hay production over the 5-year period of study. The three high-yielding varieties were Meeker Baltic, Ladak, and Atlantic; the two lowest-yielding were a Kansas selection (No. 147) and Argentine. (See Table 1.)

Meeker Baltic is one of the variegated alfalfas very similar in appearance to Grimm. The variegated flower colors range from almost black to white, although there seems to be a greater percentage of the lighter colors such as yellow and white than is normally found in a field of Grimm. This variety is winter-hardy but is quite susceptible to bacterial wilt of alfalfa and consequently should be used in relatively short-term rotations on most irrigated land where wilt is prevalent.

Ladak is likewise a variegated alfalfa. Although the flower colors range from very dark purple to white, most fields of Ladak will be found to contain a high percentage of light colors such as yellow and white. This variety was introduced into the United States from the province of Ladak, Kashmir, in northern India. The introduction was made by the United States Department of Agriculture in 1910.

Ladak is considered to be of about medium wilt resistance. Stands of this variety may be maintained over a longer period of time in wilt-infested areas than can stands of Meeker Baltic.

Ladak has been found to produce a very heavy crop for the first cutting and to be very slow in recovery after cutting. Consequently it should be used in areas where only one or two cuttings are obtained per year, as the experimental data show that many other varieties will give a greater total hay production in the 3-cutting areas of the state.

Atlantic, a variegated alfalfa variety developed at the New Jersey experiment station, is one of the promising new varieties. As previously stated, it was one of the three highest-yielding varieties tested at the Laramie Station.

This variety has been found to make rapid recovery after cutting and to have some wilt resistance (more than Grimm or Baltic), although it
<table>
<thead>
<tr>
<th>Variety</th>
<th>1941 Tons per acre</th>
<th>1942 Tons per acre</th>
<th>1943 Tons per acre</th>
<th>1944 Tons per acre</th>
<th>1945 Tons per acre</th>
<th>Tons per acre average per year</th>
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</thead>
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<tr>
<td></td>
<td>1st cutting</td>
<td>2nd cutting</td>
<td>1st cutting</td>
<td>2nd cutting</td>
<td>1st cutting</td>
<td>2nd cutting</td>
</tr>
<tr>
<td>Meeker Baltic</td>
<td>1.56</td>
<td>3.20</td>
<td>2.20</td>
<td>2.79</td>
<td>2.07</td>
<td>2.00</td>
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<td>Ladak</td>
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<td>2.90</td>
<td>2.20</td>
<td>2.92</td>
<td>2.20</td>
<td>1.95</td>
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<td>2.10</td>
<td>2.56</td>
<td>2.09</td>
<td>2.04</td>
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<td>2.50</td>
<td>2.43</td>
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<td>2.10</td>
<td>2.40</td>
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<td>2.52</td>
<td>1.96</td>
<td>1.99</td>
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<td>1.26</td>
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<td>2.20</td>
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<td>2.11</td>
<td>1.88</td>
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<td>A-114 Nebraska</td>
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<td>1.84</td>
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<td>Kansas Common</td>
<td>1.20</td>
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<td>2.10</td>
<td>2.32</td>
<td>1.98</td>
<td>2.09</td>
</tr>
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<td>Wyo. Common</td>
<td>1.10</td>
<td>2.60</td>
<td>1.90</td>
<td>2.61</td>
<td>2.02</td>
<td>1.89</td>
</tr>
<tr>
<td>Turkistan</td>
<td>1.09</td>
<td>2.90</td>
<td>2.00</td>
<td>2.57</td>
<td>1.91</td>
<td>1.98</td>
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<tr>
<td>A-8 Kansas</td>
<td>1.08</td>
<td>2.50</td>
<td>2.10</td>
<td>2.48</td>
<td>1.98</td>
<td>1.90</td>
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<tr>
<td>Buffalo</td>
<td>1.21</td>
<td>3.10</td>
<td>2.10</td>
<td>2.39</td>
<td>1.74</td>
<td>1.76</td>
</tr>
<tr>
<td>A-163 Nebraska</td>
<td>1.29</td>
<td>2.70</td>
<td>2.00</td>
<td>2.18</td>
<td>1.95</td>
<td>1.97</td>
</tr>
<tr>
<td>Orestan</td>
<td>1.28</td>
<td>2.70</td>
<td>1.90</td>
<td>2.42</td>
<td>2.20</td>
<td>1.73</td>
</tr>
<tr>
<td>A-106 Nebraska</td>
<td>1.10</td>
<td>2.70</td>
<td>1.90</td>
<td>2.38</td>
<td>1.95</td>
<td>1.89</td>
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<tr>
<td>A-165 Nebraska</td>
<td>.96</td>
<td>2.60</td>
<td>2.00</td>
<td>2.36</td>
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<td>1.90</td>
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<td>N. Mex. Common</td>
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<td>2.00</td>
<td>2.10</td>
<td>1.80</td>
<td>1.77</td>
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<tr>
<td>A-162 Nebraska</td>
<td>1.02</td>
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<td>2.00</td>
<td>2.40</td>
<td>1.97</td>
<td>1.64</td>
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<tr>
<td>A-147 Kansas</td>
<td>1.22</td>
<td>2.20</td>
<td>1.90</td>
<td>2.16</td>
<td>1.72</td>
<td>1.75</td>
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<tr>
<td>Argentine</td>
<td>1.44</td>
<td>2.30</td>
<td>2.00</td>
<td>2.00</td>
<td>1.83</td>
<td>1.34</td>
</tr>
</tbody>
</table>

* Plots planted in 1941. Only one cutting obtained.  † Killing frost June 15, 1944. Only one cutting obtained.  ‡ Severe hailstorm July 10, 1945. Only second cutting obtained.
could not be classed as a wilt-resist variety. It will probably be well adapted to either a 2 or 3-cutting area in somewhat longer rotations than Grimm or Baltic.

Atlantic alfalfa is of such recent origin that there is very little seed available at the present time. However, its high-yielding ability should make it a popular alfalfa variety in many areas of Wyoming when a sufficient supply of seed becomes available.

Of the two lowest-yielding varieties, the strain Kansas 147 was a composite of selections from Kansas Common and has not been released as a variety. The strain of Argentine alfalfa, which was the lowest in forage production, was not winter-hardy, and the stand was found to have been reduced to 68 percent of the original in a 5-year period.

The alfalfa nursery planted at the Laramie Station in 1947 has not been in production long enough to show which strains are definitely superior. However, several crosses and selections give promise of being superior to most of the standard varieties such as Grimm, Cossack, and Ladak.

FIG. 2—Harvesting the Alfalfa Nursery at the Laramie Experimental Farm
RESULTS FROM THE TORRINGTON SUBSTATION

The Torrington alfalfa nursery consisted of the seven varieties Ladak, Meeker Baltic, Atlantic, Grimm, Cossack, Ranger, and Buffalo. This nursery was harvested for only two years before it became necessary to abandon it because of the encroachment of grasses into the nursery area. A new nursery of the same varieties was established in 1948. The testing is to be carried on for at least five years.

The 2-year results as shown in Table 2 indicate that the highest hay-producing varieties are Meeker Baltic, Ranger, and Atlantic. As has been previously mentioned, neither Meeker Baltic nor Atlantic are wilt-resistant. Ranger, however, is high in wilt-resistance and would be expected to continue a high hay yield over a longer period than would either Atlantic or Meeker Baltic.

It may be further noted from Table 2 that Ladak, which was one of the highest-yielding varieties at Laramie, where two cuttings were normally obtained, was the lowest-yielding variety at Torrington, where three cuttings are obtained.

<table>
<thead>
<tr>
<th>Variety</th>
<th>1946</th>
<th>1947</th>
<th>2-yr. average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeker Baltic</td>
<td>9.92</td>
<td>5.87</td>
<td>7.90</td>
</tr>
<tr>
<td>Ranger</td>
<td>8.32</td>
<td>7.52</td>
<td>7.92</td>
</tr>
<tr>
<td>Atlantic</td>
<td>8.76</td>
<td>6.10</td>
<td>7.43</td>
</tr>
<tr>
<td>Grimm</td>
<td>9.42</td>
<td>4.50</td>
<td>6.96</td>
</tr>
<tr>
<td>Buffalo</td>
<td>7.84</td>
<td>5.54</td>
<td>6.69</td>
</tr>
<tr>
<td>Cossack</td>
<td>7.24</td>
<td>5.86</td>
<td>6.55</td>
</tr>
<tr>
<td>Ladak</td>
<td>7.04</td>
<td>5.92</td>
<td>6.48</td>
</tr>
</tbody>
</table>

TABLE 2—HAY YIELD IN ALFALFA NURSERY, TORRINGTON SUBSTATION

RESULTS FROM THE POWELL SUBSTATION

Two years of data from the Powell Substation (See Table 3) indicate little difference in yield between the varieties Atlantic, Grimm, Meeker Baltic, Cossack, and Ranger. Greater differences may be expected to develop as the trials continue. The non-wilt-resistant varieties have not had sufficient time to become badly thinned out from this disease.

Ladak and Buffalo were the two lowest-yielding varieties at the Powell Nursery. As has been previously mentioned, the slow recovery after cut-
ting and low hay yield on the second and third cuttings, makes Ladak poorly adapted to 3-cutting areas. Buffalo, which is a newly developed variety, is a selection from Kansas Common that is highly resistant to bacterial wilt of alfalfa. It is, however, better adapted to the southern latitudes and has not proved to be a high hay producer in any of the Wyoming tests.

**TABLE 3—HAY YIELD IN ALFALFA NURSERY, POWELL SUBSTATION**

<table>
<thead>
<tr>
<th>Variety</th>
<th>1948</th>
<th>1949</th>
<th>2-yr.' average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mecker Baltic</td>
<td>5.23</td>
<td>4.80</td>
<td>5.01</td>
</tr>
<tr>
<td>Ranger</td>
<td>4.88</td>
<td>5.16</td>
<td>5.02</td>
</tr>
<tr>
<td>Atlantic</td>
<td>5.38</td>
<td>5.00</td>
<td>5.19</td>
</tr>
<tr>
<td>Grimm</td>
<td>5.30</td>
<td>5.03</td>
<td>5.16</td>
</tr>
<tr>
<td>Buffalo</td>
<td>4.13</td>
<td>4.40</td>
<td>4.26</td>
</tr>
<tr>
<td>Cossack</td>
<td>5.13</td>
<td>5.06</td>
<td>5.09</td>
</tr>
<tr>
<td>Ladak</td>
<td>4.97</td>
<td>4.69</td>
<td>4.83</td>
</tr>
</tbody>
</table>

**ACKNOWLEDGMENT**

The author wishes to acknowledge the helpful cooperation of Leon Paules, Superintendent of the Torrington Substation, and of Dale Fritz, Superintendent of the Powell Substation, for their care and interest in the alfalfa nurseries on their stations. Credit is also due Robert F. Eslick, who is now with the Montana State Agricultural College, for planting and collecting the first year's data on the alfalfa nursery at the Laramie Experimental Farm.
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