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Native and Introduced Forage Plants

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In Connection With the South Dakota Agricultural College.

JAPANESE MILLET.

NATIVE AND INTRODUCED FORAGE PLANTS.

DEPARTMENTS OF CHEMISTRY AND BOTANY.

BROOKINGS, SOUTH DAKOTA.

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NATIVE AND INTRODUCED FORAGE PLANTS.

DEPARTMENTS OF CHEMISTRY AND BOTANY.

JAS. H. SHEPARD, Chemist. D. A. SAUNDERS, Botanist.
W. H. KNOX, Assistant.

The materials for this Bulletin have been collected and the analyses have been made during a period extending over several years. In reality this work is a continuation of that commenced in Bulletin No. 40 of this Station.

Prof. Thomas A. Williams, now deceased, continued the collection of native grasses, etc., after Bulletin No. 40 was issued. Before he had severed his connection with this Station he had collected the following plants:

Carex pennsylvanica, Stipa comata, Trifolium alexandrium, Panicum miliacium, var. Sibericum, Polygonum ramosissimum, Ornithopus sativus, Festuca octiflora, Carex laxiflora, Elymus sibericus, Muhlenbergia ambigua, Spergula arvensis, Hordeum pusillum, Heirochloe borealis, Calamagrostis montanensis, Vicia villosa, Eragrostis abysinica, Lupinus luteus and Spartina gracilis.

The descriptions and analyses of these will appear in the following pages excepting that of the Siberian Millet. Owing to the fact that the origin and authenticity of the seed sample are in question, the description is omitted. The sample of forage was a typical one of the variety of Siberian Millet, consequently, the analysis is here given:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	12.66	.....
Ash	5.55	6.35
Ether Extract	1.54	1.76
Crude Fibre	23.58	27.00
Crude Protein	7.19	8.23

ANALYSIS—(*Continued*).

	Air Dry Substance.	Water Free Substance.
N.-free Extract	49.48	56.65
Total Nitrogen	1.15	1.32
Albuminoid Nitrogen	1.13	1.29

During the several years that the analyses were in progress, several other samples of Millet were analyzed. Some of these have proven themselves not adapted to our conditions, while others have proven identical with varieties collected elsewhere. The Black Vernoe and the Black Kirghez are the same as the Black Voronezh, which is grown as a grain crop. The hay of these varieties was analyzed, and the analysis of the Vernoe is here given, since it will throw some light on the value of the hay produced by the valuable grain Millets like the Tambov and Black Voronezh:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.60	.....
Ash	7.60	8.05
Ether Extract	2.29	2.42
Crude Fibre	27.24	28.85
Crude Protein	8.37	8.86
N.-free Extract	48.90	51 82
Total Nitrogen	1.34	1.41
Albuminoid Nitrogen	1.18	1.26

Italian Millet, *Chaetocholoa Italica*, was also grown on our Station plats, and the hay was analyzed. The results differ but little from the foregoing.

A number of the Brome grasses have been investigated and their analyses are given. It is worthy of note that Bromus Inermis has no rival in the same family.

It is hoped that the information which this bulletin carries will be a welcome addition to the working library of the stock grower and feeder.

WEAK SPEAR-GRASS

(*Poa debilis.*)

A soft, smooth, slender, weak, light green, tufted perennial, one to two feet high, stem rounded; leaf blades flat or folded together, one to four and one-half inches long, one-twelfth inch wide, or less, erect, smooth beneath, rough above; panicle slender, oval or long pyramidal, two to six inches long, open, often nodding at the top; the branches erect or ascending, sometimes spreading; spikelets two to four flowered, one-twelfth to one-sixth inch long, their pedicils longer; empty scales unequal, acute, the first one nerved, shorter than the three nerved second one; flowering scales one-sixth inch long, obtuse, sparingly webbed at base, five nerved, the nerves naked.

A native of woody ravines in the Northeastern part of the State. The hay is of only medium value as shown by the following analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.02	.....
Ash	8.12	8.55
Ether Extract	1.94	2.04
Crude Fibre	38.24	40.26
Crude Protein	4.12	4.34
N.-free Extract	42.56	44.81
Total Nitrogen	.66	.70
Albuminoid Nitrogen	.22	.23

GROVE MEADOW GRASS

(*Poa alsodes.*)

A soft, smooth, weak, light green tufted perennial, eight inches to two and one-half feet high; sheathes usually longer

than the internodes; leaves rough, two to eight inches long, one-sixth to an inch wide; panicle three and one-half to eight inches in length; the branches spreading or ascending, one and one-half to three inches long; spikelet branch at the ends; spikelets two to three flowered, about one-sixth inch long; scales very acute, the empty basal ones unequal, the lower one nerved, the upper three nerved; flowering scales one-sixth inch long; webbed at the base, the midnerve pubescent near the base, the marginal nerve naked, the intermediate ones very faint.

A native of woods and thickets in the Northeastern part of the State, and from thence Eastward. The specimens for analysis were gathered near Bigstone late in June. The forage is of but medium quality as shown by the analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	4.14	.....
Ash	6.38	6.66
Ether Extract	1.55	1.61
Crude Fibre	35.37	36.90
Crude Protein	4.31	4.50
N.-free Extract	48.25	50.33
Total Nitrogen	.69	.72
Albuminoid Nitrogen	.66	.69

TEFF

(*Eragrostis abysinnica.*)

A branching, leafy annual, two to four feet high, with widely spreading, capillary branches of many spikelets. Dr. F. Lamson-Scribner says of it: "In Northeastern Africa where the grass is apparently native, the grain is used extensively for food, being made into bread which possesses a slight but agreeable acid taste. There are two varieties cultivated, a white and a red variety, the former being much

superior to the latter and used only by the higher classes. It is sometimes grown in gardens for the elegant panicles which are used in bouquets." This grass grows readily from seed, which is produced abundantly, and may be of some value for hay in parts of the South and Southwest. The seed from which the sample was raised for analysis was obtained from the United States Department of Agriculture. The grass made a fair growth but did not prove to be worthy of further trial in the Northwest. The hay is of medium value as shown from the analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	7.76	.....
Ash	6.35	6.88
Ether Extract	2.21	2.40
Crude Fibre	27.80	30.14
Crude Protein	6.60	7.16
N.-free Extract	49.28	53.42
Total Nitrogen	1.05	1.14
Albuminoid Nitrogen	.96	1.03

SLENDER FESCUE

(*Festuca octoflora.*)

An erect, slender, sparingly branched annual or biennial, four to eighteen inches high; sheathes shorter than the internodes and sometimes pubescent; stem leaves two to five in number, erect, slender, mostly two to three inches in length; raceme or simple, panicle often one-sided, one to six inches in length, contracted, its branches erect or rarely ascending; spikelets six to thirteen flowered, often becoming brown when old; empty glumes involute so as to appear subulate; flowering glumes usually very scabrous, acuminate into an awn nearly as long as the scale or sometimes awnless.

An inhabitant of dry, sandy soils, more abundant in the Central and Western part of the State. A small inconspicuous and comparatively rare grass forming an insignificant amount of the native forage. The forage is of excellent quality as shown by the following analysis:

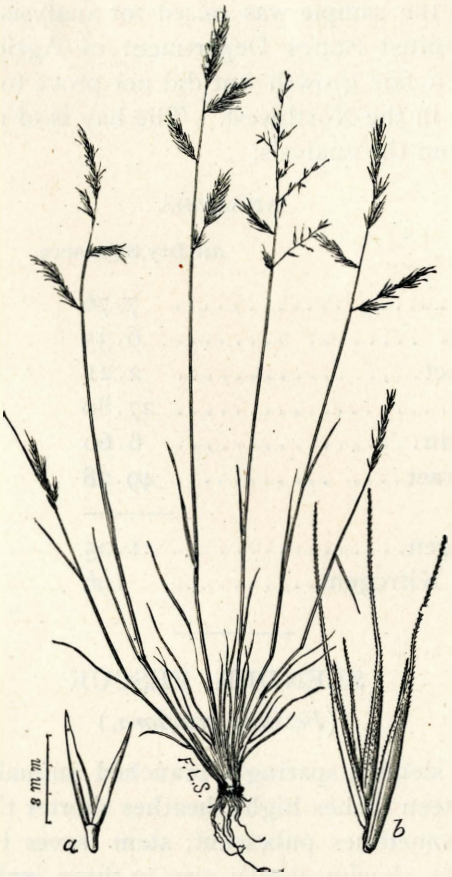

FIG. 1--SLENDER FESCUE.
(After Scribner, U. S. Dep. Agr.)

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	7.54	.....
Ash	6.88	7.44

ANALYSIS—(*Continued*).

	Air Dry Substance.	Water Free Substance.
Ether Extract	2.28	2.47
Crude Fibre	27.23	29.45
Crude Protein	9.39	10.15
N.-free Extract	46.68	50.49
Total Nitrogan	1.50	1.63
Albuminoid Nitrogan	1.21	1.30

WESTERN CORD GRASS, SLENDER CORD GRASS

(*Spartini gracilis.*)

A tall, erect, smooth, simple perennial, one to three feet high; leaf blades rough above, very smooth below, a foot or less in length, narrow attenuate in a long delicate tip; spikes four to ten in number, nearly sessile, one to two inches long, appressed, more or less peduncled; spikelets one-fourth to one-third inch long; outer scales acute, scabrous hispid on the keel, the first half the length of the second and about equalling the obtuse palet. In low, moist, alkaline soils, common from the Missouri River westward, occasional east of the River. A much smaller and more delicate grass than the common Cord Grass or Marsh grass (*Spartina cynosuroides*) but of about the same value as a forage plant. The forage is only of medium value as shown by the analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	8.27	.....
Ash	9.32	10.16
Ether Extract	2.34	2.55
Crude Fibre	29.22	31.86
Crude Protein	4.91	5.35
N.-free Extract	45.94	50.08
Total Nitrogen	.79	.86
Albuminoid Nitrogen	.74	.80

KALM'S BROME GRASS

(*Bromus kalmii.*)

An erect, rather slender perennial with a drooping panicle; stem leaves few and distant, two to seven inches long, one-third inch wide, pubescent, especially at the base; panicle two to six inches in length, open; its branches usually flexuose; spikelets six to ten flowered, one-half to one inch long on slender flexuose pedicels, empty scales pubescent, the first narrow, acute, three nerved; the second longer, broad, obtuse or mucronate, five to seven nerved.

A native grass occurring in woods and thickets in the Eastern part of the State and in the Black Hills. It is too rare to form any considerable amount of forage and produces too small an amount of forage to be worthy of cultivation.

Like all the Brome grasses the forage is very nutritious as shown by the following analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.09	.....
Ash	14.82	15.61
Ether Extract	3.48	3.77
Crude Fibre	26.67	28.01
Crude Protein	12.62	13.29
N.-free Extract	37.32	39.32
Total Nitrogen	2.02	2.12
Albuminoid Nitrogen	1.84	1.93

CALIFORNIA BROME GRASS

(*Bromus carinatus linearis.*)

An annual or biennial plant with erect stem, linear leaves, and erect or suberect panicle; stem two feet or more high, slightly pubescent at the nodes, sheathes mostly shorter than the nodes, retrorsely soft pilose; blades flat, mostly narrow, four to six inches long, one-fourth inch broad, thinly pilose

both sides; panicle narrow, pyramidal sub-racemose, three to five inches long, spikelet lanceolate to oblong lanceolate, five to nine flowered.

The specimens for analysis were raised on the Station plats from seed sent to the United States Department of Agriculture by Mr. J. Burt Davy from California. It offers no special features to warrant cultivation in this State. The hay is of good feeding qualities as shown by the analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	6.09	.....
Ash	15.64	16.65
Ether Extract	3.45	3.67
Crude Fibre	25.49	27.17
Crude Protein	13.31	14.17
N.-free Extract	36.02	38.34
Total Nitrogen	2.13	2.26
Albuminoid Nitrogen	1.64	1.74

FIELD BROME

(*Bromus arvensis.*)

A tufted annual or biennial, somewhat geniculate at base; stem nearly or quite glabrous, one to two feet high; sheathes densely soft, pubescent; leaves linear, pubescent, both sides; flowering panicle effuse, broad, apex somewhat drooping; lower rays mostly four to eight; spikelets at first terete, acuminate, becoming slightly laterally compressed when old, seven to eleven flowered, broad, smooth or minutely scabrous throughout, the empty glumes broad, obtuse, the lower subacute three to five nerved; the upper about seven nerved, obtuse; flowering glume broad, obtuse, with the hyaline broad, margin projecting slightly into an obtuse angle just above the middle; apex hyaline emarginate; awn inserted below the apex. A European species sparingly introduced into the

Eastern States. Its annual or biennial habit makes it of little value as a forage plant.

The forage as shown by the analysis, however, is high in nutritive constituents:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	4.50	.....
Ash	9.05	9.46
Ether Extract	2.90	3.04
Crude Fibre	29.87	31.27
Crude Protein	11.81	12.26
N.-free Extract	41.67	43.97
Total Nitrogen	1.89	1.97
Albuminoid Nitrogen	1.56	1.63

SHORT AWNED BROME

(*Bromus breviaristatus.*)

An erect, tufted, short lived perennial, one to four feet high, ascending, smooth and mostly pubescent; sheathes of the leaves pilose-pubescent, blades broad, linear lanceolate, sparingly pilose-pubescent throughout, rather rough or coarse, six inches to a foot long, one-sixth to one-half inches wide; flowering panicle four to fifteen inches in length; its branches erect or ascending, the lower two to six inches long; spikelets five to ten flowered; empty scales, acute, pubescent, the first, three to five nerved; the second, longer, five to nine nerved. A native of the plains from Arizona and Colorado to Alberta, and West to the Pacific Coast. The seed from which the plants were grown for analysis was obtained in Wyoming by the United States Department of Agriculture. The plant is very hardy and stands cultivation well, but produces a much smaller amount of foliage than the smooth brome.

The analysis shows that the hay from this grass compares with that of any of the Brome grasses:

FIG. 2--SHORT AWNED BROME.
(After Shear, U. S. Dep. Agr.)

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.74	.....
Ash	11.46	12.15
Ether Extract	5.32	5.64
Crude Fibre	22.18	24.17
Crude Protein	15.87	16.83
N.-free Extract	38.83	41.21
Total Nitrogen	2.54	2.69
Albuminoid Nitrogen	2.03	2.15

DOWNY BROME GRASS

(*Bromus tectorum.*)

A tufted annual six inches to two feet tall, erect from an annual root, simple, smooth and glabrous; sheathes longer than the internodes, at least the lower ones, soft, pubescent, the lower narrow and one nerved, the upper broader and three nerved; flowering glumes lanceolate, acute, scabrous, pubescent, or strongly pilose-pubescent, five nerved.

A native of Europe, quite generally distributed throughout the Eastern States, especially in waste places about cities, in some places becoming a troublesome weed. This grass yielded a comparatively small quantity of hay of fair quality. It is not worthy of further trial in South Dakota.

The analysis shows, as is usual in the case of the Brome grasses, a large percentage of protein:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	4.52	.....
Ash	22.88	23.96
Ether Extract	3.40	3.56
Crude Fibre	23.02	24.11
Crude Protein	17.68	18.51
N.-free Extract	28.50	29.86
Total Nitrogen	2.83	2.96
Albuminoid Nitrogen	1.61	1.69

GIANT BROME

(*Bromus Maximus.*)

An erect or ascending annual, a foot to eighteen inches high, stem smooth; sheath of the leaves pilose; leaves flat linear, one-twelfth to one-fourth inches wide, broad and a foot long, covered with long, coarse hair on both surfaces; panicle erect, narrow; lower branches two to three; spikelets usually five to seven flowered, terete or somewhat laterally

compressed at maturity; empty glumes, smooth, lanceolate, acuminate, strongly one nerved; margin hyaline; upper glumes broader, prominently three nerved; flowering glume five nerved, scabrous, two toothed at the apex.

A European grass sparingly naturalized in various parts of the United States. It produces a small quantity of forage which, according to the analysis, exhibits the usual characteristics of the Brome grasses:

FIG. 3—GIANT BROME.
(After Shear, U. S. Dep. Agr.)

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.62	.....
Ash	12.65	13.82
Ether Extract	3.77	3.99
Crude Fibre	26.60	28.18
Crude Protein	13.00	13.77
N.-free Extract	38.36	40.24
Total Nitrogen	2.08	2.20
Albuminoid Nitrogen	1.12	1.18

WESTERN NEEDLE GRASS

(*Stipa comata.*)

A stout, erect, smooth caespitose, perennial, one to two feet high, sheathes of the leaves longer than the intermodes, smooth or scabrous, the uppermost very long and inflated, enclosing the base of the panicle; leaves smooth or scabrous; the basal, involute, filiform, one-half as long as the stem; leaves three to six inches long, a little broader than the basal ones, involute; panicle six to nine inches long, a little broader than the basal ones, involute; panicle six to nine inches long, loose; the branches three to five inches in length, erect, ascending, naked at base, third scale of the flower having a slender, curled, spiral awn four to eight inches long, pubescent below. A coarse grass, common in sandy soils from the Missouri River Valley westward. In the early spring and summer the foliage is eaten by stock but later in the season it becomes too harsh and tough. The awns are a great nuisance in wool of sheep and cause ulcers in the mouths of sheep and cattle.

When cut, after the needles have fallen, it makes a fair quality of hay. The analysis of needle grass hay follows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.22	.....
Ash	5.67	5.98
Ether Extract	1.85	1.95
Crude Fibre	37.18	39.23
Crude Protein	5.27	5.55
N.-free Extract	44.81	47.27
Total Nitrogen	.844	.89
Albuminoid Nitrogen	.692	.73

SENECA GRASS. HOLY GRASS

(*Savastana odorata.*)

A smooth tufted perennial, one to two feet high, erect, simple, and smooth; flowering panicle pyramidal, two to five inches long, slightly one sided; branches smooth in pairs; spikelets broadly ovate, brown, shining; empty glumes acuminate, second one the longer, membranaeous, translucent. Floral glumes of the lateral florets mucronate or short awned at or near the apex, climate on the margin; floral glumes of the terminal foret smaller, nearly glabrous, hairy above.

A native of northern latitudes in North America, Asia and Europe; abundant in low, moist places throughout the States; the earliest of all our native grasses. The foliage seems to be distasteful to stock and is seldom if ever eaten by it. It is the same as *Heirochloe borealis* of Gray's Manual. It is locally called Sweet Scented Grass.

The analysis follows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	7.04	.....
Ash	8.61	9.26
Ether Extract	3.65	3.93

ANALYSIS—(*Continuea*).

	Air Dry Substance.	Water Free Substance.
Crude Fibre	20.22	21.75
Crude Protein	17.69	19.03
N.-free Extract	42.79	46.03
Total Nitrogen	2.83	3.05
Albuminoid Nitrogen	2.07	2.22

MINNESOTA MUHLENBERGIA

(*Muhlenbergia ambigua.*)

A slender, glabrous perennial, a foot or less in length; sheathes shorter than the internode; leaves narrow, one to three inches long, scabrous; panicle one to three inches long, rigid, its branches one-half to an inch long, dense, appressed; outer scales of the spikelets awn-pointed, unequal, the longer about one-sixth inch in length and exceeding the body on the third scale which is scabrous, villous and attenuate into an awn two to three times its length; a fourth narrow awned scale is nearly always present.

A rare grass known only from the Minnesota Valley and there occuring too sparingly to furnish any quantity of forage. The forage is of fair quality.

The analysis follows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	8.74	.....
Ash	10.52	11.53
Ether Extract	2.36	2.58
Crude Fibre	28.42	31.14
Crude Protein	6.99	7.66
N.-free Extract	42.97	47.09
Total Nitrogen	1.12	1.23
Albuminoid Nitrogen	.89	.97

MONTANA REED GRASS

(*Calamogrostis montanensis.*)

A rigid, glaucous perennial, ten to sixteen inches high, with slender root stocks; sheathes three, nearly smooth, the upper extending half way to the top of the plant; leaves involute, rigid, pungent, pointed, two to seven inches long, scabrous throughout; panicle linear, dense or slightly interrupted, two to four inches long; rays in half whorls, of three to seven; spikelets pedicillate, linear, lanceolate; empty glumes equal or sub-equal, scabrous, first, one nerved, second, three nerved, the lateral nerves obscure; rudiment, one nerved; heavy copious hairs extending to the top of the palet.

A comparatively rare and inconspicuous grass distributed over the greater part of the State.

The analysis indicates a medium quality of forage:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	7.50	.....
Ash	9.26	10.01
Ether Extract	1.84	1.99
Crude Fibre	30.60	33.08
Crude Protein	5.39	5.83
N.-free Extract	45.41	49.09
Total Nitrogen	.86	.93
Albuminoid Nitrogen	.71	.77

FOXTAIL OR PIGEON GRASS SEED.

The cultivated fields of South Dakota are infested by two species of Foxtail, the green and yellow varities, *Setaria viridis* and *Setaria glauca.* Under adverse crop conditions these furnish a considerable amount of forage. The analyses of the hay are given in Bulletin 40, of this Station, pages 42 and 44.

During the past season the seeds of these grasses formed no

inconsiderable part of the screenings of the small grains. In response to numerous inquiries, analyses of the seeds were made. It appears that they are about equal to ordinary millet and their use has the same limitations:

ANALYSIS.

(Green Foxtail.)

	Air Dry Substance.	Water Free Substance.
Water	11.27	.....
Ash	5.49	6.19
Ether Extract	6.02	6.78
Crude Fibre	12.48	14.06
Crude Protein	16.12	18.16
N.-free Extract	48.62	54.81
Total Nitrogen	2.58	2.90
Albuminoid Nitrogen	2.29	2.59

ANALYSIS.

(Yellow Foxtail.)

Water	13.40	.....
Ash	8.16	9.42
Ether Extract	4.36	5.00
Crude Fibre	25.36	29.29
Crude Protein	12.09	13.96
N.-free Extract	36.63	42.33
Total Nitrogen	1.93	2.23
Albuminoid Nitrogen	1.84	2.12

JAPANESE MILLET

(*Panicum crus-galli, var. gigantea.*)

An erect, smooth annual, two to five feet or more high; leaves numerous, one-fourth to one-half inches wide, a foot or more long, smooth and somewhat glaucous throughout; flowering panicle consisting of six to eighteen erect, sessile branches; spikelets ovate, green or purple; densely crowded

in about four rows on one side of the rachis; the third scale of the flower provided with a very short awn, or awnless.

This plant is a variety of the common Barnyard grass and was doubtless obtained from it by selection. It differs from the Barnyard grass in its larger size, more erect habit of growth, closer flowering head, with shorter branches, and the absence or very small size of the awn or bristle so apparent on the native grass.

Japanese millet has been cultivated largely in some of the Eastern States for many years where it is highly prized as an annual forage plant. The last season with us it proved fully as drought resistant as any of the millets, both at the home Station and the Highmore Station, and gave a considerably larger yield of a superior forage.

The analysis of the Japanese millet hay, which follows, shows the forage to be rich in protein with a large percentage of carbohydrates and a remarkably low per cent. of fibre. This grass is worthy of extended trial. To obtain the best results as a hay crop the seed should be sown thickly, 15 to 20 pounds per acre, sowing about corn planting time. For seed, one-third less will suffice. Under favorable conditions two cuttings per year may be obtained. Cut as soon as the head appears.

See title page. The stick showing in the foreground is four feet high.

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	14.71	.....
Ash	8.57	10.04
Ether Extract	2.04	2.39
Crude Fibre	9.70	11.37
Crude Protein	9.69	11.36
N.-free Extract	55.29	64.84
Total Nitrogen	1.55	1.81
Albuminoid Nitrogen	.92	1.07

TAMBOV MILLET

(*Panicum miliaceum.*)

Like all the so called Broom corn millets, Tambov millet has a loose, branching panicle; the plants average about two and one-half feet in height; the leaf sheathes are beset with numerous, coarse hairs: the leaves are few, rather broad and short; the seeds are large, bright, yellow, soft and readily masticated by stock.

The seed was obtained in Tambov province, Russia, by Mr. M. A. Carleton. The crop which furnished this seed was sown during the last week of May and the vegetation period was one hundred and twelve days. It yields about the same amount of grain as corn. It does best on rather low, rich land. It should be sown after danger from frost is over at the rate of from fifteen to twenty pounds of seed per acre. It is cut with a binder and threshed with the ordinary threshing machine.

This grain owing to its high content of protein and high drought resistance will be a welcome addition to our small grains for stock feeding, especially in the case of swine, sheep and poultry. See Plate I., left hand side.

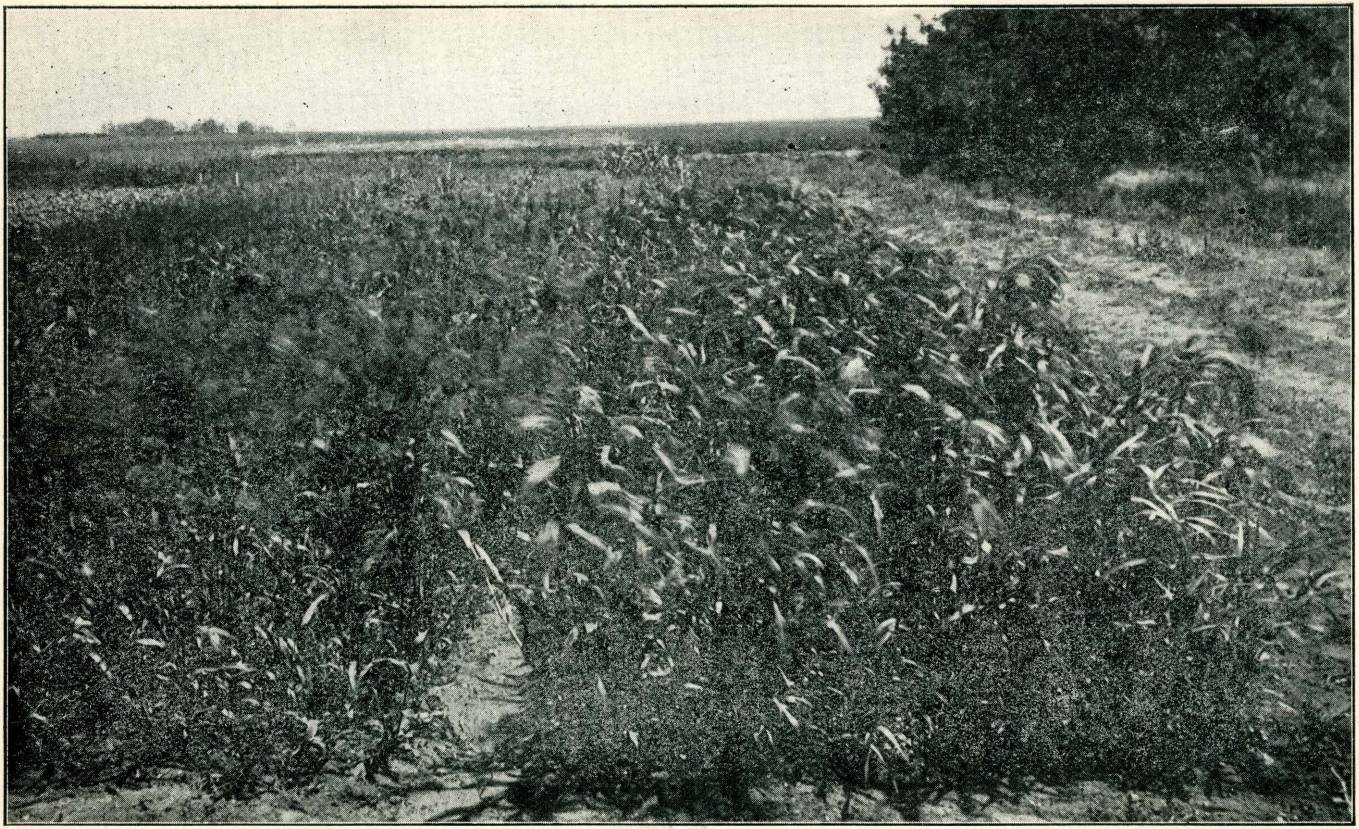

PLATE I—TAMBOV. BLACK VORONEZH.

The analysis of the grain follows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	9.79	.....
Ash	3.17	3.51
Ether Extract	4.36	4.83
Crude Fibre	10.40	11.40
Crude Protein	14.28	15.65
N.-free Extract	58.00	64.61
Total Nitrogen	2.28	2.52
Albuminoid Nitrogen	2.18	2.41

BLACK VORONEZH MILLET

(*Panicum miliaceum.*)

This Millet also belongs to the Broom Corn group of the millets. It stands three feet in height, has a longer, more branching and less spreading panicle than the Tambov millet; The seeds are large and black when ripe. They are also soft and readily eaten by stock: The seed was obtained by Mr. M. A. Carleton in Voronezh province, Russia.

This millet is also used for the grain. It is equal to the Tambov in its essential characteristics. What has been said of the latter applies to the Black Voronezh. See Plate I, right hand, and Plate II.

PLATE II—BLACK VORONEZH.

The analysis follows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	9.54	.....
Ash	3.16	3.49
Ether Extract	4.02	4.44
Crude Fibre	9.84	10.88
Crude Protein	15.68	17.33
N.-free Extract	57.76	63.86
Total Nitrogen	2.51	2.77
Albuminoid Nitrogen	2.47	2.73

SLENDER WHEAT GRASS

(*Agropyron tenerum.*)

An erect, slender, smooth, simple perennial, two to three feet in length; sheathes usually shorter than the internodes, glabrous; leaves three to ten inches long, one-twelfth to one-sixth inch wide, flat or involute, rough; spikes three to seven inches long, narrow and slender; spikelets three to five flowered; empty scales one-third to one-half inch long, acuminate or short awned, three to five nerved, scarious on the margin; flowering scales one-half inch long, five nerved, awn pointed, or short awned, scarious on the margins, often roughened toward the apex.

In dry soils throughout the Northwest it does well under cultivation, giving nearly as large yields as the Brome Grass. It is a close relative of the wheat and is more subject to red and black rust than wheat. The hay is high in nutrients according to the analysis. The hay was gathered from the Station plats which was sown with seed obtained from the Experiment Station at Brandon, Manitoba.

FIG. 4—SLENDER WHEAT GRASS.
(After Scribner, U. S. Dep. Agr.)

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	4.50	.....
Ash	8.37	8.76
Ether Extract	2.90	3.00
Crude Fibre	30.61	32.00
Crude Protein	9.56	10.01
N.-free Extract	44.06	46.23
Total Nitrogen	1.53	1.60
Albuminoid Nitrogen	1.38	1.44

SPELTZ

(*Triticum dicoccum.*)

A simple, erect, smooth annual, two to three feet high; stem and leaves smooth and glabrous; spike short, compact, two to three inches long; spikelets two rowed; the glumes smooth, naked, slightly keeled, with a short, blunt middle tooth, outer flowering scale provided with an awn, two to four inches long, which is beset with sharp prickles.

Speltz was first grown in South Dakota by the Russians who, doubtless, brought it over with them from the Fatherland. It has later been introduced by the Department of Agriculture. In the Northwestern part of the State it is grown about as commonly as oats or barley, but is little known as yet in the Southern counties. It is more drought resistant than barley or oats and under similar conditions outyields either. In this vicinity it has, under unfavorable conditions of culture, given small yields, while even dnring the past trying season, on low land on the College farm, it gave a yield of sixty-three bushels per acre. Its feeding valu is high, especially for milch cows and growing swine. For horses it is not preferable to oats. The grains are enveloped in a more or less persistent husk which constitutes approximately twenty-five per cent of the threshed grain. Three analysis were made, one of the husks, one of the naked grain, and one of the husk and grain as they naturally cohere.

There are good reasons for believing that the Speltz now in general cultivation is in reality, *Emmer* or *Triticum dicoccum* and not "Spelt" or *Triticum spelta.* See Plate III.

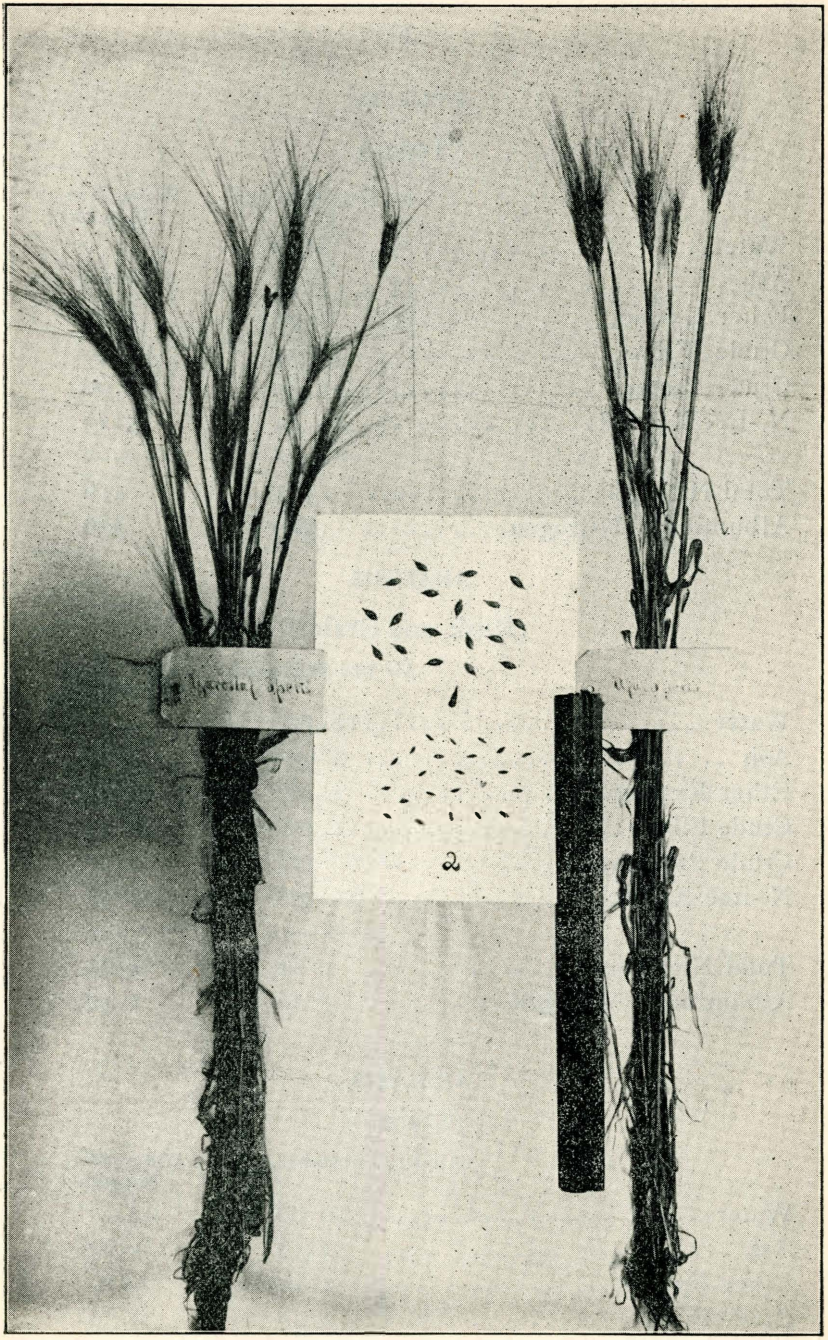

PLATE III—SPELTZ.

ANALYSIS.

(Husks.)

	Air Dry Substance.	Water Free Substance.
Water	8.12	.....
Ash	7.45	8.10
Ether Extract	1.48	1.61
Crude Fibre	39.02	42.46
Crude Protein	2.39	2.60
N.-free Extract	41.54	45.23
Total Nitrogen	.383	.416
Albuminoid Nitrogen	.300	.326

ANALYSIS.

(Husk and Grain.)

	Air Dry Substance.	Water Free Substance.
Water	10.172	.....
Ash	2.956	3.29
Ether Extract	2.467	2.75
Crude Fibre	11.450	12.75
Crude Protein	11.577	12.90
N.-free Extract	61.398	68.31
Total Nitrogen	1.84	2.04
Albuminoid Nitrogen	1.42	1.58

ANALYSIS.

(Grains.)

	Air Dry Substance.	Water Free Substance.
Water	10.86	.....
Ash	1.46	1.63
Ether Extract	2.76	3.09
Crude Fibre	2.26	2.53
Crude Protein	14.64	16.31

(ANALYSIS—*Continued*).

	Air Dry Substance.	Water Free Substance.
N.-free Extract	68.02	76 44
Total Nitrogen	2.34	2.62
Albuminoid Nitrogen	1.79	2.00

HAIRY WHEAT

(*Triticum villosum.*)

A smooth, erect, simple annual, one to three feet high, leaves few and distant, two to four inches long, one-fourth inch wide; sheathes mostly longer than the internodes, smooth; spike compact, one to two inches long; spikelets one-half inch long, the empty scales five nerved, hairy at the base and on the center nerve, provided with an awn one-half inch in length; outer flowering scale five-nerved, hairy on the mid nerve at the apex, tipped with an awn three-fourths inch in length.

The seed was obtained from Russia by the United States Department of Agriculture. The plant does not yield enough forage or seed to warrant its use as an annual forage plant. The forage, however, is very rich in nutrients as the analysis shows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.56	.....
Ash	15.80	16.73
Ether Extract	3.73	3.94
Crude Fibre	23.98	24.33
Crude Protein	19.56	20.71
N.-free Extract	32.37	34.29
Total Nitrogen	3.13	3.31
Albuminoid Nitrogen	1.66	1.75

LITTLE BARLEY

(*Hordeum pusillum.*)

A slender, rather rigid, erect or decumbent at base, smooth perennial; sheathes of the leaves loose, usually shorter than the internodes, smooth and glabrous, the upper often enclos-

FIG. 5--LITTLE BARLEY.
(After Scribner, U. S. Dep. Agr.)

ing the base of the spike; leaves erect, smooth beneath, rough above, one-half to three inches long; spike one to three inches in length; spikelets usually in threes, the central one contain-

ing a palet and perfect flower, the lateral imperfect; scales awned, empty ones scabrous, those of the central spikelet and the lower of the lateral spikelets dilated above the base.

An inhabitant of dry, alkaline soils throughout the State, forming a very small per cent. of the forage of any locality.

The analysis shows a fair quality of hay:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	6.47	.....
Ash	8.11	8.67
Ether Extract	2.29	2.45
Crude Fibre	30.35	32.45
Crude Protein	8.07	8.63
N.-free Extract	44.71	48.80
Total Nitrogen	1.29	1.38
Albuminoid Nitrogen	.914	.98

SMOOTH WILD RYE, AMERICAN RYE GRASS

(*Elymus Sibericus.*)

A glaucous green perennial, two to five feet tall, erect, simple and glabrous; sheathes shorter than the internodes, usually glabrous, rarely pubescent; leaves usually four in number, four to twelve inches long, one-half inch wide, smooth beneath, sometimes rough above; flowering spike three to eight inches in length, narrow, slender; spikelets oppressed to the rachis, three to six flowered; empty glumes, narrowly lanceolate, acuminate or awn pointed, rigid, three to five nerved; flowering glumes smooth or slightly rough, bearing a slender, straight, rough awn, one-half inch or more in length.

A rather common grass in moist soils throughout the Central and Western States. The grass has been under trial

but a short time, but it gives promise of being a very valuable pasture grass. It is fully as hardy and drought resistant as the Brome grass though not so early. The forage is of excellent quality.

The analysis follows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	7.21	.....
Ash	10.38	11.19
Ether Extract	2.00	2.15
Crude Fibre	30.82	33.22
Crude Protein	8.31	8.95
N.-free Extract	41.28	44.49
Total Nitrogen	1.33	1.43
Albuminoid Nitrogen	.96	1.03

BOTTLE-BRUSH GRASS

(*Asperella hystrix.*)

A tall, erect, simple, smooth, perennial grass, two to four feet high; sheathes shorter than the internodes; leaves five to six in number; blades flat, inverted, four and one-half inches long, one-fourth to one-half inch wide, rough above, smooth beneath; spikes three to seven inches in length, spikelets at length, widely spreading, one-third to one-half inch long, exclusive of the awn; empty scales awn like, usually present in the lowest spikelets; flowering scales one-third to one-half inch long, acuminate into an awn about one inch in length.

In woods and thickets in Roberts and Grant counties and from thence Eastward it forms only a comparatively small amount of the forage even of wood and thicket pastures. The analysis indicates a fair quality of hay:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.00	.....
Ash	9.41	9.90
Ether Extract	1.99	2.09
Crude Fibre	36.18	38.08
Crude Protein	6.12	6.44
N.-free Extract	41.30	43.49
Total Nitrogen	.98	1.03
Albuminoid Nitrogen	.87	.91

SEDGE

(*Carex lupuliformis.*)

A glabrous, erect perennial with a smooth stem, one and one-half to three feet tall, leaves much elongated up to one-half inch wide, the upper ones and the similar bracts much overtopping the culm; staminate spike solitary, stalked or nearly sessile, densely many-flowered, often staminate at the top; perigynia yellowish, at first oppressed, later ascending, sessile, much inflated, nerved.

A large and abundant species bordering streams, ponds, and swales and forming a considerable amount of the forage in such localities.

The forage is only of medium quality as shown by the following analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	4.87	.....
Ash	11.26	11.83
Ether Extract	1.54	1.62
Crude Fibre	35.62	37.44
Crude Protein	5.56	5.87
N.-free Extract	41.15	43.24
Total Nitrogen	.89	.93
Albuminoid Nitrogen	.81	.85

EARLY SEDGE

(*Carex Pennsylvanica.*)

A dark or dull green stoloniferous perennial with smooth, slender, erect stems, six to fifteen inches high; leaves very narrow, the basal shorter than or sometimes exceeding the stem; the old sheathes persistent and fibrillose; lower bracts subulate or scalelike; staminate spike sessile or very short stalked; an inch or less in length; pistillate spikes one to three, oblong, few flowered, sessile, contiguous or the lower somewhat distant; perigynia broadly oval, pubescent, one-ribbed on each side, narrowed at the base, tipped with a two toothed beak about one-fourth the length of the body; stigmas three.

An abundant little plant on low prairie from the Missouri River eastward. Altough too small for cultivation, it forms a considerable early forage.

It furnishes exceedingly rich forage as shown by the analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.12	.....
Ash	9.10	9.59
Ether Extract	2.43	2.56
Crude Fibre	25.62	27.00
Crude Protein	15.98	16.84
N.-free Extract	41.75	44.00
Total Nitrogen	2.557	2.695
Albuminoid Nitrogen	1.619	1.706

LOOSE FLOWERED SEDGE

(*Carex laxiflora.*)

A glabrous, pale green perennial with erect or reclining slender stems, six inches to two feet high; leaves one-sixth to one-third inch wide, soft, the basal mostly shorter than

the stem leaves, the bract similar to the stem leaves and overlapping the spike; staminate spike stalked; pistillate, spikes two to four, distant, linear cylindrical, loosely several to many-flowered; flowers thick, all slender stalked, and spreading or drooping, or the upper one erect and sessile; perigynia ascending or obovate, more or less oblique, narrowed at the base, strongly many nerved, tapering into a short, stout, outwardly bent entire beak, stigmas three.

A soft leafy plant, forming, a small amount of forage in woods and thickets. It furnishes a fair quality of forage as shown by the following analysis.

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	6.43	.....
Ash	12.56	13.42
Ether Extract	1.95	2.08
Crude Fibre	21.30	22.76
Crude Protein	9.43	10.08
N.-free Extract	48.33	51.65
Total Nitrogen	1.51	1.61
Albuminoid Nitrogen	1.28	1.36

WILD BUCKWHEAT OR BLACK BINDWEED SEED

(*Polygonum convolvulus.*)

Plant annual, glabrous, scurfy; stem twining or trailing, six inches to three feet or more long. The leaves are ovate saggitate, long petioled, cuminate at the apex, slightly ciliate, one-half to three inches long, flowers small, born in loose axillary clusters, greenish; calyx five parted closely surrounding the achene.

Very abundant in waste and cultivated fields throughout the State. A native of Asia; introduced from Europe into the United States. While it is a troublesome weed in grain crops, in pastures, stock eat it with avidity. But the seeds

are apt to lie dormant in the ground during dry seasons, coming up in crops where their presence is not desired. When cut for hay the vines shrink to an insignificant bulk. The seeds, however, obtained in the screenings of cereals have a significant feeding value. The following analysis gives the composition of wild buckwheat seeds:

ANALYSIS

	Air Dry Substance.	Water Free Substance.
Water	9.28	.....
Ash	2.15	2.37
Ether Extract	3.30	3.63
Crude Fibre	13.25	14.60
Crude Protein	8.36	9.21
N.-free Extract	63.66	70.19
Total Nitrogen	1.34	1.48
Albuminoid Nitrogen	1.32	1.46

BUSHY KNOT WEED

(*Polygonum ramosissimum.*)

Plant an annual, bright or yellowish green, glabrous; stem erect or ascending, usually very much branched, slender, striate, usually rigid, four inches to four feet high; leaves lanceolate or linear, oblong, short petioled one-fourth inches to two inches long, acuminate at both ends, persistent, conspicuously jointed to the sheating ocreae; flowers several together in short pedicelled axillary clusters; calyx five to six parted, greenish white; stamens six or less; achene (fruit) three angled, acute, sometimes protruding beyond the calyx.

A common weed throughout the State in dry soils. It is more abundant if the soils are alkaline. It supplies, however, a very small amount of forage.

It appears from the analysis that the forage is rich in nutrients:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	8.44	.....
Ash	6.78	7.40
Ether Extract	1.75	1.91
Crude Fibre	27.64	30.19
Crude Protein	14.21	15.52
N.-free Extract	41.18	44.98
Total Nitrogen	2.28	2.49
Albuminoid Nitrogen	1.47	1.60

AUSTRALIAN SALT-BUSH

(*Atriplex semibaccata.*)

The Australian Salt-bush is a much branched perennial, which forms a thick mat over the ground a foot or eighteen inches in depth, the branches extending from five to eight feet; one plant often covering an area of fifteen to twenty square feet. The leaves are about an inch long, broadest at the apex, coarsely toothed along the margin, fleshy and somewhat mealy on the outside. The fruits are tinged with red, flattened and pulpy, but become dry as soon as they fall from the plant. The seeds germinate better if sown on the surface which should be planked or firmed by driving a flock of sheep across it. When covered to any depth the seeds decay before germination.

The Australian Salt-bushes produce the largest amount of forage of any of the Salt-bushes. Sheep are especially fond of the Salt-bushes and it appears that a Salt-bush diet tends to produce a superior quality of wool. It is estimated that under favorable circumstances twenty tons of green or five tons of cured forage may be obtained to the acre. It has almost the same nutritive ratio as Alfalfa and seems to have nearly as high a feeding value.

The seed will germinate and the plant make a luxurious growth in the presence of an amount of alkali that would

prevent the growth of cereals or forage crops. As it is drought resistant it will be found to be a valuable accession to the stockmen in the Central and Western part of the State. Although perennial in nature, it will have to be treated as an annual in South Dakota.

The analysis shows a high content of protein and less fibre than one would expect. The high ash content is noteworthy. All the Salt bushes are useful in reclaiming alkali land. It is sown broadcast at the rate of one pound per acre.

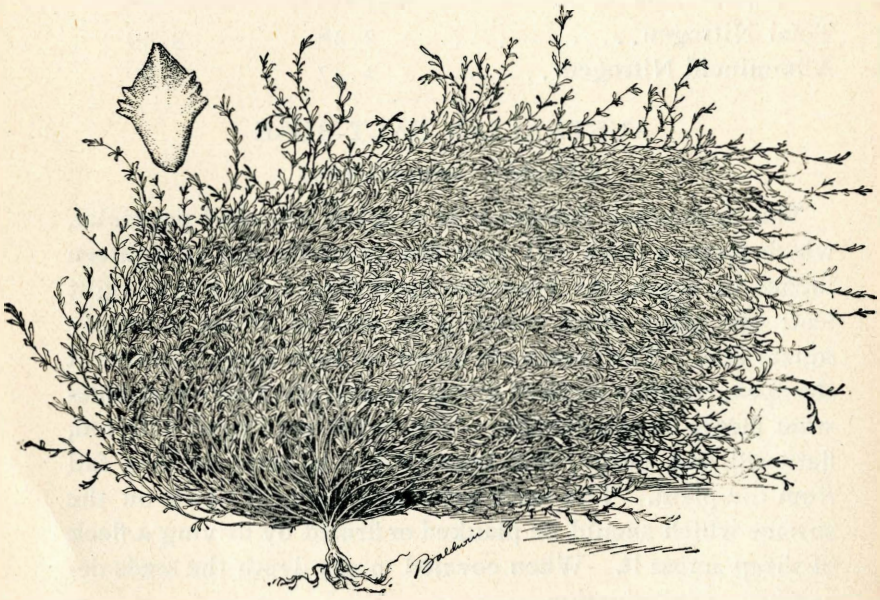

FIG. 6—AUSTRALIAN SALT-BUSH
(After Kennedy, U. S. Dep. Agr.)

The analysis of the forage follows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	7.40	.....
Ash	13.09	14.13
Ether Extract	2.05	2.21
Crude Fibre	25.97	28.04

ANALYSIS—(*Continued*).

	Air Dry Substance.	Water Free Substance.
Crude Protein	18.87	20.39
N.-free Extract	32.62	35.23
Total Nitrogen	3.02	3.26
Albuminoid Nitrogen	2.78	3.00

MEALY OR GRAY SALT-BUSH

(*Atriplex halimoides.*)

A low growing, shrubby, perennial from one to two feet high, with variable ovate lanceolate leaves which are covered with whitish, dust-like scales. The seed is quite large and covered by a peculiarly angled, fibrous coating. It is a native of the Central desert region of Australia. The plant is rather coarser and more harsh than the Australian salt-bush and shows a tendency to become woody, at least at the base, and to lose its lower leaves especially when growing close together. On the other hand, seed sown April 23rd, had produced an abundance of ripe seed by August 1st, while the Australian salt-bush had not yet begun to show signs of seeding and the slender Salt-bush had just commenced to flower. It will probably be a valuable forage plant to the region west of and adjacent to the Missouri River and for all alkaline spots throughout the State.

Owing to the spreading habit of growth a thin seeding will suffice.

FIG. 7—MEALY SALT-BUSH.
(After Kennedy, U. S. Dep. Agr.)

The chemical analysis shows a remarkably high percentage of protein and of ash. The large amount of the latter also indicates a value for reclaiming alkali soils:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	6.90	.....
Ash	16.30	17.50
Ether Extract	3.09	3.31
Crude Fibre	23.36	25.09
Crude Protein	19.44	20.89
N.-free Extract	30.91	33.21
Total Nitrogen	3.11	3.34
Albuminoid Nitrogen	2.99	3.21

SLENDER SALT-BUSH

(*Atriplex leptocarpa.*)

A perennial with low stems from one and one-half to two feet or more in length. It resembles Australian salt-bush in

many particulars, but is smaller and produces less forage. It is widely distributed in Australia, occurring in Western Queensland and New South Wales and in South Australia along the Murray River, sometimes carpeting the ground over considerable areas. Von Mueller says that its drought enduring qualities are remarkable. It is particularly relished by sheep, which browse it down so closely that large tracts of it are often entirely destroyed. The seeds are smaller than those of *A. semibaccata*, somewhat cylindrical in shape, two-pointed at the apex, and slightly swollen at the middle. They are produced in great abundance and germinate readily under ordinary conditions. This salt-bush has been tried in California with good results. It is quite hardy, as regards cold, and withstands a considerable degree of heat. Seed should be sown at the rate of fifteen to twenty pounds per

FIG. 8—SLENDER SALT-BUSH.
(After Scribner, U. S. Dep. Agr.)

acre in spring or autum, preferably after rain, and harrowed in.

This salt-bush is apparently inferior in the quantity of the forage to both the Mealy and the Australian, but will doubtless be of value in the driest parts of the State on account of its extreme drought resistant qualities.

The analysis shows a very rich forage. The protein is high. The ash is also high, pointing to its use in reclaiming alkali soils:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	7.48	.....
Ash	15.55	16.80
Ether Extract	2.35	2.54
Crude Fibre	22.64	24.47
Crude Protein	19.68	21.27
N.-free Extract	32.30	34.92
Total Nitrogen	3.12	3.37
Albuminoid Nitrogen	1.59	1.72

WILD MUSTARD

(*Brassica arvensis.*)

An erect annual, one, two, to three feet high, hispid with scattered, stiff hairs, or smooth, branching above; lower leaves slender, petioled, slightly or not at all pinnated; upper leaves short petioled or sessile, coarsely dentate, the uppermost reduced to lanceolate or oblong entire blades; flower one-half to three-fourths inches broad; pedicel stout, one-sixth inch long in fruit; pods glabrous, spreading or ascending, somewhat constricted between the seeds, tipped with a flattened, elongated, conic beak.

A most abundant weed in nearly all cultivated fields.

The forage is of little value; the seeds are used to a limited extent. They are especially rich in mustard oil. The

protein is also high. This weed is such a pest that neither of these qualities redeems it.

The analysis follows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	5.68	.....
Ash	4.22	4.47
Ether Extract	30.91	32.78
Crude Fibre	7.33	7.77
Crude Protein	29.87	31.67
N.-free Extract	21.99	23.31
Total Nitrogen	4.77	5.06
Albuminoid Nitrogen	2.71	2.87

SPURRY OR SAND WEED

(*Spergula arvensis.*)

Plant slender, glabrous or sparingly pubescent, branching at or near the base, erect or ascending, six to eighteen inches high; leaves narrow linear or subulate, one to two inches long, clustered in two opposite sets, thus appearing whorled or verticillate; flowers small, numerous in loose terminal cymes, pedicel slender, divaricate.

Naturalized from Europe, very common in the Central and Eastern States but rare and local Westward.

An annual plant of a weedy tendency which does not furnish enough forage to the acre to make it of any great value. The analysis shows that the forage possesses abundant nutrients. It is nearly equal to Alfalfa:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	6.84	.....
Ash	12.32	13.22
Ether Extract	5.59	6.00

ANALYSIS—(*Continued*).

	Air Dry Substance.	Water Free Substance.
Crude Fibre	19.30	20.72
Crude Protein	13.82	14.84
N.-free Extract	42.13	45.22
Total Nitrogen	2.21	2.37
Albuminoid Nitrogen	1.48	1.59

BITTER VETCH

(*Lathyrus Sativa.*)

Plant, annual, creeping, one to two feet high; stems angular, two-edged, bearing two narrow opposite wings between the edges; leaflets linear, two to three inches long; flower cream colored; pods smooth, short, somewhat triangular in cross section, having a narrow wing on each side of the dorsal line, containing one to four sharply triangular seeds the size of a large pea.

Inventory No. 5 from the United States Department of Agriculture says of it: "A native of Middle and South Europe which is adapted to cultivation in warm climates. The fodder is superior to that of the Vetches, but the yield is less. In India it is grown as a winter crop, often on heavy, clayey soils which will grow no other legume. Great caution must be used in feeding the seeds of this plant as they are said to contain an alkaloid which is poisonous to domestic animals and to man. It is much cultivated in the Mediterranean regions."

At the Home Station in 1900, seed planted April 21st, produced plants which began to bear August first; the seeds continuing to ripen until heavy frost came. They furnished only about two-thirds as much forage as the common field pea, but produced a large quantity of seed.

At the Highmore Station owing to the extreme drought the seed did not start until June 20th. It made a good

growth from that time on, however, showing itself to be one of the most drought resistant annuals yet found.

The analysis indicates a nutritious forage were it not for the alkaloid.

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	7.71	.....
Ash	6.58	7.13
Ether Extract	2.27	2.46
Crude Fibre	26.81	29.05
Crude Protein	11.86	12.85
N.-free Extract	44.77	48.51
Total Nitrogen	1.92	2.08
Albuminoid Nitrogen	1.86	2.01

SERRADELLA

(*Ornithopus sativus.*)

An annual legume, native of Southern Europe and Northern Africa, with pinnately divided leaves; the leaflets small and narrow; flower in small racemes, pale blue; pod narrow and somewhat disjointed.

It is a plant that may be of value as a forage plant on moist or sandy soils in the Southern States; the forage is much relished by cattle and sheep, and it has about the same feeding value as red clover. It is no more drought resistant than red clover and is not so sure a crop.

The forage is of most excellent quality as shown by the analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	6.83	.....
Ash	14.49	15.55
Ether Extract	2.75	2.95
Crude Fibre	18.58	19.94

(ANALYSIS—*Continued*).

	Air Dry Substance.	Water Free Substance.
Crude Protein	16.22	17.41
N.-free Extract	41.13	44.15
Total Nitrogen	2.595	2.785
Albuminoid Nitrogen	1.836	1.97

YELLOW LUPINE

(*Lupinus luteus.*)

An erect annual, a foot or more in height; the leaves palmately divided; leaflets broad, hairy; flowers in loose racemes, large, bright yellow.

This species is the one most generally used in Middle Europe to improve sandy soils, being used even on sand dumes along the coast. Like the other Lupines, it is fed green and used also for hay. The seed are said to be very fattening, equal almost to oil cake, while the foliage is said to be equal to that of clover and more bulky.

Unlike most legumes the lupines do not do well on ground which is at all wet, or on soils impregnated with lime.

The forage is rich in protein and this explains its great value for stock feeding and for improving worn out soils.

The analysis follows:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	8.26	.....
Ash	7.36	8.02
Ether Extract	2.30	2.50
Crude Fibre	23.75	25.88
Crude Protein	15.02	16.37
N.-free Extract	43.34	47.23
Total Nitrogen	2.40	2.62
Albuminoid Nitrogen	1.66	1.81

EGYPTIAN CLOVER OR ALEXANDRIAN CLOVER

(*Trifolium Alexandrinum.*)

An erect annual plant with narrow oblanceolate leaflets and small heads of flowers; a native of Egypt, which in warm climates and upon rich soil makes an exceedingly rapid growth. Two or three heavy crops may be taken from a field in one season. An excellent clover for the Southern States where cane and cotton may be grown, but not at all adapted to South Dakota conditions. The plant made a very light growth and was killed by frost before any seeds were ripened.

The forage is nutritious as shown by the analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	7.99	.....
Ash	8.29	9.01
Ether Extract	2.08	2.26
Crude Fibre	22.78	24.76
Crude Protein	11.95	12.99
N.-free Extract	46.91	50.98
Total Nitrogen	1.91	2.05
Albuminoid Nitrogen	1.45	1.57

BURR OR SPOTTED CLOVER

(*Medicago maculata.*)

An erect, smooth annual, a foot to a foot and one-half high, with long petioles bearing three obovate or spatulate leaflets which are about one inch long and bear one or more dark spots near the centre. The pod is nearly globose, composed of three to four closely round coils, verticillate veined on the sides, the edges thicker and furrowed between the marginal rows of curved teeth. A native of Europe which has become quite generally introduced into the Eastern and Southern States and on the Pacific Coast where it is of some

value in pasture. It is inferior to Alfalfa and the true Clovers and is not so hardy as either.

The forage is highly nutritious as shown by the analysis:

ANALYSIS.

	Air Dry Substance.	Water Free Substance.
Water	4.82	.....
Ash	22.78	24.14
Ether Extract	2.01	2.11
Crude Fibre	18.94	19.90
Crude Protein	13.06	13.72
N.-free Extract	38.39	40.13
Total Nitrogen	2.09	2.19
Albuminoid Nitrogen	2.02	2.12

BEGGAR WEED

(*Desmodium tortuosum.*)

An erect, annual, leguminous plant with a woody stalk, three to ten feet high, bearing an abundance of leaves above and when in flower tipped with a much branched erect panicle, the lower branches of which are eight to twelve inches long. The seeds are borne in many jointed, prickly pods which break apart at maturity and are distributed by sticking to the bodies of animals or the clothing of people. The plant is hairy throughout and has trifoliate leaves, the obliquely rhomboid leaflets being two to four inches long.

It is a subtropical species; native of West Indies and possibly of Southern Florida. It is adapted to cultivation either as forage or for soil renovation in subtropical regions, but has proved to be of little value in South Dakota.