Bulletin 61. December, 1900.

The Agricultural Experiment Station

OF THE

Agricultural College of Colorado.

Bromus Inermis.

—BY—

F. L. WATROUS, H. H. GRIFFIN and J. E. PAYNE.

PUBLISHED BY THE EXPERIMENT STATION
Fort Collins, Colorado.
1901.

The Agricultural Experiment Station

FORT COLLINS, COLORADO.

THE STATE BOARD OF AGRICULTURE.

		Term Expires
Hon. JAMES L. CHATFIELD,	Gypsum,	1901
Hon. A. LINDSLEY KELLOGG,	Rocky Ford,	1901
Hon. B. F. ROCKAFELLOW,	Canon City,	1903
Mrs. ELIZA F. ROUTT,	Denver,	1903
Hon. P. F. SHARP, *President*,	Denver,	1905
Hon. JESSE HARRIS,	Fort Collins,	1905
Hon. HARLAN THOMAS,	Denver,	1907
Hon. P. A. AMISS,	Pruden,	1907
Governor CHARLES S. THOMAS, President BARTON O. AYLESWORTH,	*ex-officio*.	

Executive Committee in Charge.

P. F. SHARP, *Chairman*. B. F. ROCKAFELLOW.

J. L. CHATFIELD. P. A. AMISS. JESSE HARRIS.

STATION STAFF.

L. G. CARPENTER, M. S., - Meteorologist and Irrigation Engineer
C. P. GILLETTE, M. S., - - - - - - - - - - Entomologist
W. P. HEADDEN, A. M., Ph. D., - - - - - - - - Chemist
B. C. BUFFUM, M. S., - - - - - - - - - - - Agriculturist
WENDELL PADDOCK, M. S., - - - Horticulturist and Botanist
R. E. TRIMBLE, B. S., Assistant Meteorologist and Irrigation Engineer
FRANK L. WATROUS, - - - - - - Assistant Agriculturist
LOUIS A. TEST, B. M. E., A. C., - - - - - Assistant Chemist
E. D. BALL, M S., - - - - - - - - Assistant Entomologist
C. H. POTTER, M. S., - - - - - - - - Assistant Horticulturist
* JOSEPH LOWNES, B. S., - - - - - - - - Assistant Chemist
F. C. ALFORD, B. S., - - - - - - - - Assistant Chemist
H. H. GRIFFIN, B. S., - Superintendent Arkansas Valley Substation
Rocky Ford, Colorado
J. E. PAYNE, M. S., - - - Superintendent Plains Substation
Cheyenne Wells, Colorado

* Died Dec. 9, 1900.

Officers.

President BARTON O. AYLESWORTH, A. M., LL. D.

L. G. CARPENTER, M. S., - - - - - - - - - Director
A. M. HAWLEY, - - - - - - - - - - - - - Secretary
W. R. HEADDEN, B. S., - - - - - - Stenographer and Clerk

Bromus Inermis.

F. L. WATROUS.

Referring to this grass, Press Bulletin No. 47, Kansas Agricultural Experiment Station, makes the following statements: "Awnless brome grass or Hungarian brome grass (*Bromus inermis*) is a native of the dry, sandy regions of Europe and Western Asia. It is a perennial, about the size and somewhat the general appearance of Meadow fescue or English blue grass. It spreads by creeping underground stems or rootstocks. It has been tested by many of the experiment stations, from Canada and North Carolina to Mississippi and California. All recommended it highly for dry, sterile, light or sandy soil."

So far as known *Bromus inermis* was first grown in Colorado at the Arkansas Valley Substation in the year 1892. Out of many different varieties, it alone gave sufficient promise to encourage a second trial. In 1894 the home Station at Fort Collins began investigations as to its value, since which time several sowings have been made in a variety of soils and under widely dissimilar conditions. The grass has been grown on heavy clay with scant irrigation, on the same soil with an ample supply of water, on light soil, above irrigation and on heavy soil, approaching "gumbo," with and without artificial watering. Under all these conditions the grass has succeeded to the extent that a thick, heavy sod has been formed, producing an abundance of forage of rather coarse quality, but readily eaten by horses, sheep and cattle. It has never produced hay in sufficient amount to be considered valuable for that purpose, but sown with alfalfa it promises to be of value for horses. In quality it is believed to be equal to orchard grass, or possibly as good as timothy. It is, of course, inferior to Colorado blue stem or buffalo grass, but where successful it will make up in quantity what it lacks in quality in comparison with these two grasses.

Brome grass produces a very heavy sod, which it is extremely difficult to plow when well set. The ground, to a depth of six or eight inches, will be completely filled with a mass of matted, fine roots, so that the sod will be turned over in solid slices, and remaining of so tough a texture that an excessive amount of

preparatory cultivation is required in order to get in suitable condition to receive any other crop. The disk harrow is the only implement known which will finally subdue this sod. As to the effect on soil fertility, nothing definite is known, although a fair crop of flax was grown upon a plot of this sod ground the past season.

In Colorado *Bromus inermis* is specifically a pasture grass, and it may be truly said it is the only tame grass yet discovered which can, with any degree of success, take the place of the departing pasture grasses of the plains. The closest pasturing and severe tramping have had no effect in destroying the sod. After having been gnawed tight to the ground by sheep, it shows growth within a week after stock is removed, even in late fall when nights are frosty. In the spring brome grass affords pasture from two to three weeks earlier than any other grass known to this locality.

Many complaints are heard from various localities respecting the worthlessness of seed, all of which, thus far, has been imported from Europe. The Kansas Experiment Station reports that about ninety per cent. of this seed fails to grow. Experience at this Station last season seemed to verify this statement, though it is too early as yet to speak with precision in the matter, from the fact that brome grass comes up very much thicker the spring after sowing than would have been expected from its appearance in the fall. Whether this is due to some of the seed lying dormant, or to an extension of the root system at some time between fall and spring, has not been ascertained. The fact has been noted elsewhere, and thoroughly proven here, that it is best not to be discouraged over a seeming light stand the first season, but wait until the grass has a chance to show up the following spring before plowing it up or adopting any radical measures.

For spring sowing, brome grass should be sown early in this country if it is to be grown without irrigation. With irrigation it may be handled successfully by sowing at any time during the growing season. It requires a clean, well pulverized seed bed, such as wheat would thrive in, and should be covered from one to two inches in depth. Owing to the light, chaffy nature of the seed, we have been unable as yet to sow it evenly in an ordinary drill, though this would be the ideal way. It has been sown broadcast by hand and harrowed in. The condition of the soil is of more importance than the manner of sowing.

It would not be safe to recommend this grass for indiscriminate sowing. Farmers having portions of land above irrigation, or desiring permanent pasture on almost any kind of land that is not positively wet or boggy, would be justified in trying an acre or two. Sow fifteen to twenty pounds per acre. If successful, it produces a

good quantity of seed the second year, after which the sowing may be extended with small expense.

The grass has done well and is very useful here. There seems no reason why it should not do well elsewhere.

TESTS ON THE GROUNDS OF THE AGRICULTURAL COLLEGE.

On May 17th, 1894, two plats of land comprising one and a fourth acres were sown at the rate of 16 pounds to the acre. This soil was a sandy, clay loam of such a composition as to have been, in its natural state, practically sterile. Owing to its location being such as to render it very difficult to irrigate, it had been allowed to remain untilled. The land was broken up and gotten in as good condition as possible by aid of disk harrow and roller and the seed covered in fairly good shape. It was irrigated once the first season and made a very poor stand, thickening a little the following spring, and finally at the end of four seasons, made a complete stand, since then producing an abundance of foliage or pasture, but was never allowed to head until the past season, when it produced fifteen bushels of seed.

Another acre was sown on May 25th, 1896, on heavy clay soil and was treated as to irrigation in exactly the same manner as contiguous plats of alfalfa. This plat made an excellent stand from the first and made and produced a crop of seed the second season.

April 9th, 1897, a pasture mixture, composed of barley, rye, oats, sandwicke and brome grass was sown on a small plat of ground for sheep pasture. When sheep were removed, bromus was the only crop to recover. Adjoining this plat, the following spring *Bromus inermis* was sown on about one acre of ground. It was endeavored to sow the seed with an ordinary grain drill. Various substances, as bran and dry soil, were mixed with the brome grass seed to give it sufficient weight to feed through the drill. It was found to be impracticable and the drill was discarded. After sowing, furrows were made about this plat so that one-fourth of the plat would not be watered when the rest was irrigated. The stand on this part was never quite so good as on the balance of the plat, though it was so good that a casual observer would not notice the difference. This lot has been pastured for three years with sheep. As there was always more sheep than the pasture would support, the grass was eaten close to the ground several times each year, i. e., when it was eaten so close that there seemed to be nothing left, the sheep were removed and when water was to be had it was turned on this pasture plat. In every instance the grass came up quickly and when a few inches high sheep were turned on again.

This same season another acre plat was sown for pasture. This soil was very heavy clay, probably as near an approach to regular "gumbo" as could be readily found in this vicinity. An excessive amount of work was necessary in order to get this land in shape for seeding. This however was accomplished and an excellent stand was the result. It was irrigated the first two seasons.

The first season after sowing, the grass having a good start in May, six ewes and their half grown lambs were turned on for pasture. It supported this number for about six weeks, when the grass being eaten down very close, the sheep were kept off and fed for a couple of weeks, in which time the grass recuperated and the sheep were turned on again. This plan was repeated twice more during the season, and in October the ground seemed as bare and nearly as hard as an ordinary road bed. The following spring, however, the brome grass made its appearance in March and with the same treatment each year is still thriving and furnishing as much pasture, to all appearance, as at first.

May first, 1899, two acres adjoining the above plat were sown. The ground had been covered during the winter with a very thick coat of coarse manure, so thick was it in fact that owing to the gumbo quality of the land and its persistent sticking to the plow, only about half the manure was covered up, the rest sticking out and producing a very unfavorable condition of seed bed. The seed was sown however, and covered as well as might be. This land became very dry and it was not thought possible that any of the seed could germinate. After all the other crops on the farm had been irrigated there came an opportunity to run the water on this piece, which was done. At the end of that season a few spears of brome grass were visible, but they were so few that it was thought the plat was

an entire failure. Upon examination early in the following April however, so much improvement was noted that it was thought best to let the land alone, at least for one season, and note the result. By June first there was almost a complete stand of grass, so that sheep were pastured there the balance of the season till October, when the sheep being removed, the grass started up again during the warm days and frosty nights of October and November, showing a thicker stand than could be seen in the middle of summer.

Late in May of 1900, about 14 acres of raw, unproductive land was sown to brome grass at the rate of about 15 pounds to the acre. Considering the quality of the land, the lateness of the season, and the pressure of other work, this undertaking was very ill advised, and would seem to have promised nothing but failure from the first. However about half a stand was secured over a good portion of the land, and the coming spring will show what may be expected of this grass under the very worst conditions.

In the spring of 1898 an experiment was tried on a neighboring farm, of sowing bromus on a high knoll, above reach of irrigation. This soil was a good quality of sandy loam, and having never been irrigated is better calculated to receive and hold falling moisture than would soil which had been irrigated. A fairly good stand was secured here and it has gradually thickened since, producing good pasture, and bas been particularly noticed each spring as producing green pasturage at least two weeks before alfalfa or any other grass.

April 9th, 1898, in a small field thickly sown with alfalfa, a strip 8 feet wide the length of the field was sown with *Bromus inermis* seed. Under ordinary treatment for alfalfa, this strip grew well, was cut three times each year and is still engaged in a struggle for supremecy with the king of the Colorado field. As both were thickly sown, neither crop is at its best, which would indicate that thinner sowing would be advisable where both are sown together.

Trials at the Arkansas Valley Substation.

H. H. GRIFFIN, Superintendent.

April 22, 1892, a plat 145 feet long, 67 feet wide, was sown to seed of *Bromus inermis*. An excellent stand was secured, and the records report it growing ten inches tall and producing seed. In 1894 this plat was harvested July 12th, and from the product 208 pounds of cleaned seed was secured. By this time the sod had become very close, and most of the growth made was around the edges of the plat. Wherever it was sub-irrigated the growth was from one to two feet high, but wherever flooded it became sod bound and made almost no growth.

This was about the manner of its growth the succeeding years, until the present Superintendent took charge, in March, 1898. Noting that it was making a very poor showing, a portion was given a dressing of gypsum, and a sharp implement in the nature of a sub-soil plow was run through the other portion to cut up the sod, thinking it might do better were it relieved of the sodded condition. Neither remedy proved to be of any benefit. The only growth of any importance was the narrow fringe around the edges, or on the ditch banks, where it secured sub-irrigation. It does not

seem to withstand flooding. Becoming satisfied that no returns were to be secured by further allowing this to stand, it was plowed up in the fall of 1898. The sod was extremely compact, and much of the season of 1899 passed before it was rotted.

To a field of three acres that had been sown to rye in October, 1894, was added *Bromus* seed on April 9th, 1895, at the rate of twenty-six pounds per acre. The seed was harrowed in, and germination secured by irrigation. A fairly good stand was secured over the greater portion of the field. In 1896-97 it furnished some pasture during a portion of each year. In 1898, when first taking charge of the Station, it was noted that this grass started to grow very early in the spring. It made some growth until about the middle of May, when all development stopped. It remained in about this condition until fall rains occurred, when it made some further growth, but not enough to warrant giving it much consideration. It was also noted that where an application of barnyard manure was given, that the growth was increased considerably. It was further noted that while the grass would withstand considerable drouth without dying out, yet to secure any growth or vigor of plant a considerable amount of moisture was necessary, and this moisture should preferably be in the form of rain. Nine irrigations were given this field in 1897, between March 26th and October 1st. As before stated, where flooded it soon became sod bound. As the returns from this field did not warrant retaining it any longer, it was plowed up in May, 1899, and seeded to corn.

That this grass did not improve the fertility of the soil was apparent from comparisons of adjoining fields, both in 1899 with corn and in 1900 with oats. An adjoining field that had been in red clover, and plowed up at the same time of the *Bromus*, gave fully fifty per cent. greater yield in the two crops above mentioned.

Not being satisfied that the trials had been conclusive with this grass, and thinking that perhaps fall sowing would be of benefit in securing more favorable results, a field of one and one half acres was prepared, which was seeded with seventy pounds of *Bromus* seed, September 7, 1898. This land was irrigated by means of furrows two and one half feet apart through the land, in which the water was run, giving it sub-irrigation as much as possible. A splendid stand was secured, and the grass was up well before winter set in. It was given the best of attention in 1899, and the heavy rains of the summer and fall were conducive to its best development. The results of the year were promising, and it appeared as though this grass, under such conditions, would prove a valuable adjunct to the agriculture of this section. It was pastured but slightly in the fall of 1899, and by the 20th of April, 1900, furnished quite good pasture. One dairy cow was turned upon this lot and pastured for about six weeks. While there seemed to be a

plenty of forage, the cow did poorly. She lost in milk and flesh, so much so that it was necessary to seek some further food to secure good results. Early in May this grass began to fail, and from that time to date of this writing (December 28th) has only lived, making no growth whatever.

The season has been very hot and dry, and under such conditions, which often prevail, the artificial application of water does not seem to be the requisite to produce growth and vigor of plant. Its behavior here tends to show that it is better adapted to a region of lower mean temperature and greater summer precipitation, and that the soil should contain much more clay—what would be termed a stronger soil. It becomes sod bound under irrigated conditions, and soon fails to produce growth of any value. The grass is coarse and very low in nutritive qualities. I see but one place where it may profitably be employed, and that is as a soil retainer on the banks of ditches that are liable to wash. The fact that it thrives where the water is applied in this way, and that it forms such a dense sod, would warrant its use in cases such as above mentioned.

Trials at the Plains Substation.

J. E. PAYNE, Superintendent.

1895. A plat was sown March 22nd on well prepared ground, which was broken in 1894 and thoroughly plowed in March, 1895. This seeding was blown out by spring winds. Later in 1895—June 6th—the same plat was sown to *Bromus inermis*. A good stand was obtained, but grasshoppers destroyed it all.

1896. Seed from an unknown source was used to sow a plat to *Bromus inermis*. The ground was well prepared, and had been cultivated in 1894 and 1895. None grew. The plat was seeded May 2nd.

1897. A plat was sown May 2nd, on well-prepared ground which had been in sorghum in 1894, 1895 and 1896. No stand was obtained—in fact no grass was seen to have grown from this planting. Seed: The same as that used in 1896. It was of unknown origin, but was bought from a reliable seed house.

1898. A two-acre plat was sown on land which had been well cultivated in sorghum and corn during the four years 1894, 1895, 1896 and 1897. Seed furnished by the Department of Agriculture was used. This seed was imported from Russia. A good stand came up, and the grass promised well until late in the

summer, when the dry weather killed much of it which grew on the higher part of the plat. The grass remained green until late in the fall, and stood the winter well. It started in the spring of 1899, about the same time that the Colorado bluestem (*Agropyrum sp.*) started, but the dry weather in the summer destroyed nearly all except that which was in a low place, where extra water collected. This patch threw up a few seed-stalks twelve inches high. The spring of 1900, more especially April, was very wet. The remaining grass thickened and completely occupied the ground where it had secured a foothold (this was confined to about ten square rods which got the benefit of storm-water from the prairie). The seed-stalks grew twelve to twenty inches high, but they were thin on the ground. The main, leafy parts of the plants were too low to be cut by the mower.

1899. Seed sent out by the U. S. Department of Agriculture in 1898 was used to sow a plat on ground which had been cultivated in hoed crops since 1894, with the exception of one year, when it was in barley. Only a few plants appeared, and these died during the dry weather of the summer. This plat was sown April 20th.

1900. Fresh seed, grown in Manitoba, was furnished by the U. S. Department of Agriculture for seeding a plat this year. It was sown on well-prepared ground, which had been cultivated in hoed crops every year except one since and beginning with 1894. Only a few plants appeared, and these died during the summer. This plat was sown April 23d.

NOTE 1.—"Well-prepared ground" means that the land was plowed from five to eight inches deep and thoroughly harrowed until the seed-bed was practically free from clods. In 1898 and 1899 the land was plowed eight inches deep and packed with a sub-surface packer.

NOTE 2.—The choice land of the Farm was used every year except 1898, when a two-acre piece, which represented the wettest and the dryest land on the Farm, was chosen.

NOTE 3.—Seed. The seed used in 1895 and 1898 proved to be good by growing. The seed used in 1896 and 1897 may not have been good, as its origin was unknown. The seed used in 1899 was some which was left from the supply sent by the U. S. Department of Agriculture in 1898. The seed used in 1900 was fresh seed obtained from the Department of Agriculture, which was grown in Manitoba. Also some of the old supply sent by the Department of Agriculture in 1898 was sown. Both these gave about the same number of plants.

NOTE 4.—All seed was sown broadcast and harrowed in with a smoothing harrow.

BROMUS INERMIS SEEN ELSEWHERE ON THE PLAINS.

Only one plat was seen growing. That was on the ranch of Robt. Lucore in the northern part of Lincoln county. I saw this plat in May, 1900. It then showed scattered bunches among the weeds. The grass appeared to be growing well, but was a very poor stand. It was a small plat. Mr. Lucore said that he thought *Bromus inermis* a good grass for his neighborhood, but he did not care to plant any more, even if the seed was furnished him free.

WEATHER AND COMPARATIVE CONDITIONS.

During the six years *Bromus inermis* has been tried here, the rainfall has been as heavy as usual. Native hay has been cut on the uplands every year, except 1900. No year of the six under consideration was as drouthy as were 1893 and 1894.

GENERAL COMMENTS.

1. In common with all so-called drouth-resistant plants, the testing of *Bromus inermis* has proved to be very unsatisfactory here. The failure to get a stand of plants is the greatest difficulty experienced. If rain does not fall at the right time after seeding, we are almost sure to fail to get a stand which will be fair to the plant under consideration. If a stand is obtained, continued drouth before the young plants are strong enough to resist it, may destroy all hope of successful termination of the trial.

2. While we feel that the grass (*Bromus inermis*) is a failure under the conditions existing here, we realize that it might succeed where conditions are not quite so unfavorable. A difference in the distribution of the rainfall might bring success where we have to record failure.

Our experience and observation compels us to recommend to those who think of trying *Bromus inermis* on unirrigated land in eastern Colorado, that they test it on a small scale for a few years, before plowing up buffalo grass to make room for it.