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GRASSES.

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Grasses and Other Forage Plants.

OCTOBER 10, 1888.

T. L. BRUNK, HORTICULTURIST.

The forage question in Texas is one of the greatest importance. The millions of cattle and horses roaming over her vast prairies generally indicate that if they were more properly fed by nutritious plants that the stock-raiser would be more generously remunerated, and the markets would be filled with a better grade of stock. With this vast interest in view, it was thought that the Station here could undertake no problem more practical than that of testing forage plants. The plots were laid out on a piece of ground having an even soil of a dark sandy loam about a foot underlaid with a stiff blue clay formation. All, except the first two mentioned below, were raised from the seed, which was sown in rows one foot apart. This season has been one very favorable to forage growth on account of the unusual rainfall and humidity of the air. The summer drouth was shorter than for several years past, and it may be that the estimates of this season's growth could not be wholly relied on for other less favorable seasons. The first thirty-nine were sown March 8, and the rest on March 13. No shade plant was mixed or sown with any of the tests, neither were any of them mixed. To make this bulletin of more general value, it was thought best to add a few observations and quote some of the experiences of others in different parts of the State, so far as we have been able to learn, on those grasses that appear to have such value as to come into more extended cultivation.

1. *Paspalum dilatatum*. Roots of this and the next species were received from C. N. Eley, Smith Point, Tex. The sets started rather slowly, but by the middle of May the growth covered the whole plot. By July 18 some of the stems measured five feet in length. Each plant stooled out heavily, as many as thirty-two stems from a single set. It stood the drouth admirably and grew some all summer long. If cut about the 10th of June for hay it will make considerable and very good fall pasture. It is a

perennial, and according to H. W. Johnson, of Dodge, Walker county, it spreads rapidly and is relished by all kinds of stock.

S. B. Wallis, living near Galveston, says: "I consider this the most valuable of all grasses with which I am acquainted; it is a perennial, and grows here all the year round, furnishing excellent green feed for stock at all seasons, except that the green blades freeze in our very coldest weather. The grass has very strong roots and grows in the longest drouth almost as fast as when it rains."

C. N. Eley, Smith Point, says: "It is easily subdued by cultivation, and is not inclined to encroach on cultivated lands. It is best propagated by roots or sets, the seed not being reliable." Two-thirds of the seed on our plot was worthless. This point concerning the seed we would like to test further, if those interested will send us the seed from different parts of the State. This grass, with many others, is figured in Bulletin 3, of the Botanical Division of the Department of Agriculture, which can be had by writing to Dr. Geo. Vasey, Washington, D. C. This grass will do better on loams than on sandy soils, as the roots do not run deep enough to stand grazing on sandy soils. It is said by some that even Bermuda will not run it out.

2. *Paspalum plati-caruli* (Louisiana Grass). This grass is much smaller than its preceding near relative, never over a foot tall and having very slender, slightly flattened, stems, with spikes of flowers much like Crab grass (*Panicum sanguinale*) and Bermuda (*Cynodon dactylon*). It spreads out into a loose mat upon the surface, rooting at every joint. It withstood the six weeks' drouth of this summer perfectly, and covered the whole plot with a tenacious mat of short tender leaves. It is too short for a hay grass, but believe it to be a splendid pasture grass, especially on sandy soils, as it could not be easily torn from the soil by cattle. It seeded well on the plot. Dr. Geo. Vasey says: "The fact of its being a perennial, and seeding freely, of its doing better than many other grasses on poor soil, forming a compact tuft to the exclusion of other plants, and of its being easily killed by cultivation will doubtless recommend it for more extended growth." I am inclined to think that if this grass was mixed with *Paspalum dilatatum* on good loamy uplands it would make splendid hay and pasture lands that would give forage the year around.

C. N. Eley, of Smith Point, states: "It will stand more tramping and grazing than any other grass in this part of the State. As a drouth-resisting grass, it has no equal here, and on dry sandy or

loamy soils its limits of usefulness will only be determined by its ability to stand severe cold."

Wm. F. Gill, of Kerr county, reports it growing in a valley, forming the best sodded piece of land he knows of and undoubtedly the worst tramped. He also reports it growing in patches in the Guadaloupe and Medina valleys, and thinks, with attention, would prove as valuable in that dry country as Bermuda does elsewhere. This and the above species I would quite freely recommend for a thorough trial in most any part of this State, and on most any, except gravelly, soils.

3. *Festuca durinacula* (Hard Fescue). Very light growth, of only about three inches. Shows no signs of being valuable. It is a perennial, but the drouth here killed it.

4. *Festuca elatior* (Fall Fescue). This grass grew eight or ten inches high and became strongly rooted, but nearly all died out during the drouth.

5. *Festuca heterophylla* (Various-leaved Fescue). Germinated poorly, and what did appear died.

6. *Festuca ovina* (Sheep Fescue). None on plot July 18.

7. *Festuca tennifolia* (Slender Fescue). But few plants. All dead.

8. *Festuca pratensis* (Meadow Fescue or English Blue Grass). Became well rooted, but did not survive the hot sun and drouth.

9. *Poa aquatica*. The few that started all dead.

10. *Poa memoralis*. A few scattering bunches; very poor. Dead at this writing, October 10.

11. *Poa pratensis* (Kentucky Blue Grass). Made a good fair start and a medium growth, but nearly all dead at this date.

12. *Poa serotina* (False Red-top). July 18 there were several bunches, and in bloom, about a foot high, but the growth was weak. It has since all died.

13. *Poa trivialis* (Rough-stalked Meadow Grass). A perennial. There were several small weak bunches, about five inches high, but is nearly all dead.

14. *Agrostis canina* (R. I. Bent Grass). It made a good fair growth, but promises no value. Used for lawns in many places farther north. Very little living at this date.

15. *Agrostis vulgaris*, var. *Stolonifera* (Bent Grass). Of no value here. It is said to be one of the best grasses for marshes.

16. *Agrostis vulgaris* (Red-top). Made an excellent growth, but now there is but little living. Not promising. It may do well in some places in Texas, especially in moist bottoms.

17. *Bromus mollis*. This is one of the "chesses" or "cheats" so troublesome in many places to wheat-growers. Did not germinate.

18. *Bromus unioloides* (Rescue Grass). This is an annual that should have been sown in the fall. It gives the most forage in February and March of any grass that we have tried here. The growth of this grass here on the College grounds last winter and spring was heavy, and would make in April about two tons per acre of good hay. I noticed, however, that it did much better in protected places. It is very leafy and tender, and all kinds of stock eat it freely, but it may be due to the absence of other green feed at the season of the year it thrives best. It has been said by good authority that grasses which grow largely during the winter have but a small amount of nutrition during the cold season and that animals do not thrive well on such grasses alone, even if they have access to all they can eat. Some careful analysis may substantiate this opinion. In the plot planted this spring it made a small growth and was dying out when examined July 18. It seeds abundantly, but in drouthy falls does not germinate till very late. It cannot be relied on to produce regular crops where the cool season has irregular quantities of rain. It is recommended by some to be valuable for fall colts, calves, lambs and milch cows. It may be well for every farmer to have an acre or more of this grass for these purposes. Sow thirty pounds of seed to the acre. Cut in April, when in bloom, for hay.

20. *Anthoxanthum odoratum* (Perennial Sweet Vernal Grass). This is an early spring and late fall grass, and is best sown in the fall. It made, however, a growth of about six inches in the plot. Rather shallow rooted. None living at this date, October 10.

21. *Anthoxanthum Puelii* (Annual Sweet Vernal). Much smaller than the preceding species. It made a fair growth, but is not promising.

22. *Aira caespitosa* (Haddock or Bunch Hair Grass). None.

23. *Aira flexuosa* (Wood Hair Grass). None.

24. *Alopecurus pratensis* (Meadow Fox-tail). A perennial which does best in bottoms. On the plot it made a good growth of about eighteen inches, but is now all dead.

25. *Alopecurus agrestis* (Slender Fox-tail). It made a fair start, but did not survive the summer heat.

26. *Agropyrum repens* (Couch or Quack Grass). The scattering growth was just fair. Some yet living. Not very promising.

27. *Sorghum halipense* (Johnson Grass). Growth of six feet

from seed by July. A valuable grass to the South in the proper place. For a permanent meadow, well fertilized every year, it probably has no equal. It should never be put on farms of rotated crops, on account of the difficulty in eradicating it and because there are other grasses that will serve nearly the same purposes, and at the same time can be easily controlled.

28. *Cynodon dactylon* (Bermuda Grass). It came on slowly from seed, but by July covered the whole plot with a thick matting of creeping stems. It is a standard grass in the South for both pastures and lawns. It does not seed well in the United States, but is easily propagated by cuttings of the roots, or rather rooted stems.

29. *Dactylis glomerata* (Orchard Grass). This grass made a strong growth and became well rooted. Nearly all yet living. I doubt, however, that it would stand a long drouth like that of 1886-87. In moist bottom lands, or perhaps on some of the black-waxy lands, it will probably do well. It is said by some to make excellent winter grazing in many parts of the South.

30. *Cynosurus cristatus* (Crested Dog's-tail Grass). Came up rather scattering. Made a fair growth, but nearly all dead now. It is said to do well on dry sandy calcareous uplands, but from our test it does not promise to be of any value to this climate.

31. *Phleum pretense* (Timothy). This is the universal hay grass of the North. It made about as heavy a growth as the average first season growth in the North, but is now nearly all dead. It does not promise here to be of much value.

32. *Phalaris ruginacea* (Red Canary Grass). This perennial grass made a foot and a half of thrifty growth, and is all living at present. It stooled freely and shaded the whole plot. It has strong creeping root stocks similar to quack grass (*Agropyrum repens*). It is a native grass of the South, and is said to be especially adapted to reclaiming marshy lands, where it flourishes best. It is rather rough and gets woody with age. Dr. Phares, of Mississippi, says that it should be cut before it is in bloom; that it can be cut two or three times during a summer, and that it should not be allowed to fruit or bloom because it is subject to the fungus disease known as *ergot*, which is very fatal to cattle eating it. It is thought by some to be a good ensilage crop. It can be propagated by either roots or seed, the latter at the rate of twenty-five pounds to the acre. It has not seeded yet on the plot. There are so many better grasses for uplands that I would not recommend it for cultivation in quantity.

33. *Holcus lanatus* (Meadow Soft Grass, or European Velvet Grass. It has been called Texas Velvet Mesquit Grass). It appeared scatteringly over the plot. All dead at this date. It does not promise to be of any value in this section. Dr. Phares, of Mississippi, says that this grass has made larger growths in many of the Southern States than in the Eastern States or in England; that it is not preferred by cattle, and is by no means the best of our grasses; that it is best sown in the fall.

34. *Setaria Germanica* (Hungarian Grass; German Millet or Bengal Grass). It made a good, fair growth, such that would produce about one and a half tons to the acre. But I would not recommend this millet, as the Italian millet (*Setaria Italica*) grows larger, produces more to the acre, and has a much larger fruiting head. Several acres of the Italian millet was raised here on the farm and produced heavily. In one field it was mixed with cow-peas and cut together as a hay crop.

35. *Ammophila arundinacea* (Beach Grass, Sand Grass. (*Calamagrostis renaria* of old books). Failure. Said to be a most useful grass to resist the assaults of the ocean waves in binding together the loose sands of the beach. Of no agricultural value here.

36. *Arrhenatherum avenaceum*, Beauv; *Avena elatior*, L. (Tall Oat Grass). Scattering; not promising any value. Grew about two and a half feet high. Said to be a hardy perennial that stands the severest solar heat and drouth. Some still living.

37. *Avena flavescens* (Yellow Oat Grass). Scattering growth; some yet living. A perennial native of France. Some regard it a most excellent pasture grass. Not worthy of attention here.

38. *Lolium Italicum* (Italian Rye Grass). This grass made a good appearance during its growth. It is said to be an annual, which is said by Dr. Phares to reseed itself well. It grew about sixteen inches high and covered the plot. In bloom July 10. It is said to do better if sown in the fall, and to do well in most Southern States. Dr. Vasey calls it *Lolium perenne*, var. *Italicum*, thus indicating—and he also states so—that it is a perennial. "It occupies the same place in Great Britain that Timothy does with us," says an intelligent writer, "and is there esteemed on the whole higher than any other species of grass. It is mainly adapted to irrigated meadows, and in these it is undoubtedly superior to any other grass of Lombardy, Italy." Those prepared to irrigate may find this grass of much value.

39. *Lolium Perenne* (English Rye Grass). A perennial that

made a thick heavy growth of leaves, but died before blooming. It was less thrifty than the preceding.

On March 13, the following were sown:

40. *Trifolium hybridum* (Alsika Clover). Made an excellent growth. By September 3, after a drouth of about six weeks, about one-third of the plants were dead. Now, October 10, all dead.

41. *Trifolium incarnatum* (Crimson Clover). Made a good heavy growth. Firmly rooted, but by September 3 was all dead.

42. *Trifolium pratense* (Large Red or Pea-vine Clover). Stems over two feet in length and numerous; covered the ground. On September 3 two-thirds dead. October 10, very few living.

I could not recommend any of these foregoing clovers to farmers from results of growth here.

43. *Trifolium repens* (Common White Clover). Made a very good growth and nearly covered all the space between rows, but all dead at this date. I have found it growing spontaneously in some parts of the state.

44. *Medicago lupulina* (Yellow Trefoil or Black Medick). Medium growth; deeply rooted; all dead at this writing. "It is a biennial or perennial," says Dr. Beal, "and in habit much resembles white clover." Dr. Phares says: "It is of too little value to require special notice."

45. *Onobrychis sativa* (Sainfoin). But few plants on the plot. Very long top root, but light amount of foliage. It is said to produce but little foliage the first year, but improves in quantity with age. It is raised in France mostly for sheep, and is said to do best if mixed with some grass. On a large plot on a piece of land here that remained very wet this spring it germinated fairly well, but was soon choked down by grass and weeds. It will need further testing before a definite opinion can be offered.

46. *Pennisetum spicata*, *Syn. Penicillaria spicata* (Pearl, Cat-tail or Egyptian Millet). Made a growth of eight feet. In bloom July 5. It tillers freely and produces an immense amount of forage and seed, which is said to be more than any other grass, except Teosinte (*Euchlaena luxurians*). If cut a number of times during a season it will aggregate a total length of twenty to thirty feet of growth. It is best, according to Dr. Phares, not to plant it too thick, as it produces so much foliage that it would cover the ground too thick to dry well, and besides would thus injure the stubble so as to check it too much for the following years' growth. It may be planted in the spring, as soon as the ground is

sufficiently warm enough to bring it up promptly, in drills two feet apart or the same as drilled corn. One peck of seed to the acre in drills or two pecks broadcast. Prof. Gulley is of the opinion that it is not of the value that has been credited to the plant. We would like to hear from those in the State that have tried it.

47. *Euchlaena euxurians*—*Syn. Reana luxurians* (Teosinte or Guatemala Grass). According to Peter Henderson this is a perennial, but had better be treated as an annual, as it feeds too heavily on the soil to raise it successively and profitably on the same ground. It made a heavy, luxuriant growth of over nine feet; looks much like corn. It can be cut several times a year with profit. Stools out freely, making from ten to thirty stocks from a single plant, and is undoubtedly one of the most prolific and drouth-proof forage plants that is grown. The chief draw back in its culture is that it takes a long tropical season to produce mature seed. So far it has ripened seed only in Southern Florida within the United States, so far as the writer can learn. It may be that this obstacle can be removed by developing early flowering kinds by a series of selections. J. C. Elston, Johnston county, in Farm and Ranch of June 1, 1888, writes that there is nothing that stock likes better, and that it is a fine forage plant. I should not hesitate to advise every progressive farmer to try a small plot of this valuable grass to test its qualities. Seed can be procured of most any of our large seedmen. We bought ours from J. M. Thorborn & Co., New York City.

48. *Melilotus alba* (Sweet Clover, or Bokhara Clover). This weedy plant has recently become prominent as a forage plant in the Gulf States. The writer has seen it growing so tall and dense in roads not much travelled as to almost obstruct the passage. It is classed as a useless weed in the Central and Northern States, except for pasturage, its merits have been overlooked. It is not relished by stock at first, but they soon acquire a relish for it when properly cured. Grown with Johnson grass it is classed by some of the dairy farmers of Mississippi and Alabama as first among hay plants. Here it made a promising growth of about three feet, blooming and seeding freely. It survived the drouth quite satisfactorily. It is now highly prized for hay and soiling. It requires good rich soil to luxuriate profitably. I believe it a plant also well fitted for building up a soil by plowing it under as a green manure.

49. *Phalaris intermedia* (Canary Grass). This is an annual, about eighteen inches in height. The growth was rather light as compared with *Phalaris intermedia* var. *augustata*, which came up

spontaneously here in places and reaching a height of over three feet with an abundant amount of foliage. This latter grass is well worth a trial. If sown in the fall it will give early spring pasture and a splendid crop of hay by April 21. It is an annual, but will reseed itself in cultivated ground. I believe this grass is destined to hold an important place among the forage plants in the South.

50. *Lespedeza striata* (Japan Clover). This valuable plant has made its usual good record with us. It has completely covered the ground and the drouth did not seem to affect it at all. As this plant has such a high nutritive value, and stands the drouth so perfectly, it deserves the high commendation it has received wherever it has been tried as a pasture grass. I believe it to be one of the best pasture plants for most any soil, especially poor ones. After animals once learn to eat it they relish it. A few acres of this leguminous forage plant was put out on the farm here and has made a good stand, notwithstanding a heavy growth of crab-grass. Geo. Echols, Longview, Gregg county, says. "It appeared here four years ago, and it now has possession of all the open idle land. It seeds abundantly and grows so densely that it forms a mat. It flourishes with Bermuda grass so that the hay mowed is about half and half." The writer has observed this clover growing along the road sides and spreading rapidly about Tyler, Tex.

51. *Medicago sativa* (Alfalfa, Lucerne or Brazilian Clover). A growth of about eighteen inches on plot. It makes a very leafy and strong growth in many small volunteer patches over our campus. It is certainly drouth-proof here. Since fall rains have set in it is starting out nicely. Probably not as valuable as Japan clover, as it does not seem to stand the warfare of some grasses.

52. *Lotus corniculatus* (Bird's-foot Clover). This plant bears a yellow flower. It made a very handsome growth of about sixteen inches. It is yet living and starting out as thriftily as the Alfalfa, which plant it resembles. It may come into considerable importance as a forage plant.

53. *Sorghum vulgare* (Millo Maize or Doura). We grew a small amount of this plant on the grounds here and found it to be perfectly able to stand the drouth and produce a large amount of forage, but notwithstanding its good growth and production of two or three crops of forage per season, I believe that common sorghum (amber or orange cane) produces as much or more forage, of a greater nutritive value, and resists drouth equally as well. The Millo produces a large head of nutritious seeds that are used by

some as oat meal, and said to be much better. G. W. Norsworthy, of Jasper, Tex., says: "I consider it very fine forage, both for horses and cattle. My stock prefer it to fodder. The only objection against it is that it is troublesome to cure in wet weather. All kinds of stock and fowls are very fond of the grain, and I think it fully equals corn."

From the fifty-three species tried here only the following, of those that last over summer, can be said to have survived the drouth satisfactorily and produce a profitable growth:

Millo Maize.

Bird's-foot Clover.

Alfalfa.

Japan Clover.

Sweet Clover.

Teosinte.

Pearl or Cat-tail Millet.

Red Canary Grass.

Bermuda Grass.

Paspalum plati-cauli.

Paspalum dilitatum.

Johnson Grass.

Of the annuals that are good hay plants are the following:

Large and small Canary Grasses.

Hungarian Millet.

Italian Millet

Rescue Grass.

Those of the above best fitted for permanent pastures are: *Paspalum plati-cauli*, Bermuda grass, Japan clover and perhaps Johnson grass and *Paspalum dilitatum*. Bermuda makes also a good quality of hay and a fair amount of it. Johnson grass makes a good quality and without doubt the largest yield if properly fertilized. *Paspalum dilitatum* makes a good hay and pasture grass, and it may be that if this grass was mixed with the large Canary grass, and perhaps Japan clover, the combination would make two excellent crops of hay per season, a good summer and fall pasture and a considerable winter pasture. This, however, remains to be fully tested. I am much inclined to the belief that to attain the most profitable results from a piece of ground devoted to forage culture, we must use mixtures. Some of the annuals like canary grass and rescue grass will thrive and grow among the roots of many perennial grasses, and at a season when the perennials make their smallest growth, if any at all. These annuals are

mature and gone by the time *Paspalum dilitatum* or *P. læve* simply gets started to grow. If the annuals are allowed to ripen some seed before they are cut they will reseed themselves—which will be about the 20th of April—and by the middle of June or July 1st a second crop can be cut of the *Paspalums*.

During the coming year we will test many native species of grasses that give promise of becoming valuable in some way to man. There are several that have been cultivated to some extent that we did not try this year which we wish also to add to our list. The following is a partial list we desire to test, which we believe to have some peculiar value:

Poa arachnifera (Texas Blue Grass). Said to be a splendid winter grass; is propagated from seeds or sets put in some time in fall or winter. We had this grass on our list last spring, but failed to get seed.

Panicum Texanum (Colorado Grass or Texas Millet). A native annual valuable for hay, and said to have many points superior to other grasses.

Panicum crus-galli, var. *muticum* (Barn-yard Grass). A stout annual that made two growths here from two to four feet this season; a hay grass.

Phalaris intermedia, var. *angustata* (Tall Canary Grass). An annual two to four feet high; of excellent hay qualities.

Bouteloua oligostachya (Running Mesquit). Excellent lawn and pasture grass.

Bromus unioloides (Rescue Grass). We had this grass in our test plots, but it should be sown in the fall to make a fair test.

Paspalum laeve. For hay and pasture. Larger than *Paspalum dilitatum*.

Paspalum pubiflorum (Pasture Grass). Forms a heavy, leafy matting on the surface.

Eleusine Indica (Yard or Crow-foot Grass). Pasture and hay; stands drouth; very successful and quite tender. Very common bunch grass of yards.

Sporobolus Indicus (Smut or Bunch Grass). Grows all summer; seeds well; easy to subdue. Good if cut young, but gets wiry as it gets old. Fair for hay and pasture.

Chloris verticillata. Forms a good sod; probably good for lawn and pasture; creeps on surface; proof against drouth.

Chrysopogon nutans (Indian Grass). Early spring pasture and hay; three to four feet tall.

We desire to try all the native grasses that grow in the different

parts of the State that stock eat and seem to be of some value, either for peculiar soils or altitudes or for special purposes. To expedite this matter, we hereby solicit the co-operation of stockmen and those interested in forage plants, by sending us any grass or plant used for forage or that may grow wild and is relished by stock, with notes and observation. Specimens should be first dried between newspapers, and then numbered to agree with the notes, and sent by mail. In every instance send the full plant-flower, stem, leaves, and part or all of root. These specimens will be identified and the names and other information returned to the sender.