OKLAHOMA

AGRICULTURAL EXPERIMENT STATION.

Bulletin No. 20--June, 1896.

Wheat Experiments, 1895-6.
Food Value of Corn Scorched by Hot Winds.
Fruit Culture in Oklahoma.
Peach Rosette.
The Melon Louse, (*Aphis cucumeris Forbes.*)

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OKLAHOMA

AGRICULTURE AND MECHANICAL COLLEGE.

AGRICULTURAL EXPERIMENT STATION.

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WHEAT EXPERIMENT, 1895-6.

G. E. MORROW, Director and Agriculturist

SUMMARY.

The wheat was grown on the upland prairie of the Station farm—soil of fair quality. The plats for tests of like kinds were close together and much alike naturally. There had been some difference in previous cultivation. None of the land had been cultivated more than four years. The wheat was put in with a press drill, rows six inches apart, except plats for comparison of methods of seeding. The land was put in good condition at time of seeding. The season was fairly favorable. Chinch bugs did some damage, varying much in different plats.

Reasonably early sowing gave the best results. In the variety tests, those sown October 3 to 8 gave much larger yields than those sown October 14. In special trial of different dates of sowing there was steady decline in yield from sowing October 1 up to December 10. The later sowings were much more injured by chinch bugs. No sowing after October 20 gave as much as six bushels per acre.

No important difference in yields came from sowing widely differing quantities of seed per acre, especially in fairly early seeding. A plat sown at rate of three pecks per acre gave nearly as large a yield as one sown at rate of eight pecks per acre.

Yields were not certainly affected by distance between drill rows—six or eight inches. In one case the yields were equal; in one the narrow and in one the wider drill spaces gave best yields. A plat put in with a disc harrow gave as large a yield as adjoining plat drilled.

Bearded varieties averaged larger yields than did smooth or bald varieties. This was due, at least in part, to differences in previous treatment of the soil. Where the soil conditions were most alike the differences were not so noticeable.

Varieties sown October 3 to 4, were harvested May 18 to 21. Those sown October 8 to 14 were harvested May 23 to 28.

The weight per bushel was light in case of all varieties.

Hybrid Mediterranean, Nigger, Missouri Blue Stem, Selby's New Golden and Deitz Longberry gave best yields among the bearded varieties; Michigan Amber, Early Red Clawson, Fultz, German Emperor and Badger the best among smooth varieties.

The rule that a single year's trial is not sufficient on which to base positive conclusions is especially important in this case.

Meteorological Record—July, 1895, to June, 1896.

MONTHS.	RAINFALL	TEMPERATURE.		
	Inches.	Max.	Min.	Mean.
July	3.60	100	59	78.4
August	4.97	97	60	79.7
September	1.50	102	36	75 9
October	1.59	86	26	54.9
November	4.69	78	9	45.9
December	3.38	66	13	38.
January	.55	64	11	39.5
February	.19	77	16	43.7
March	1.21	85	19	46.3
April	.94	91	26	66.3
May	5.93	93	45	73 9
June	7.26	100	49	74.7
Total	35.81			

WHEAT.—*Test of Varieties.*

Seventy-one plats were sown with wheat bearing 65 different names. In a number of cases there was no perceptible difference in varieties having different names. The seed, except of the Fultz and Fulcaster varieties, was kindly furnished by the Illinois Agricultural Experiment Station, the wheat harvest of Oklahoma in 1895 having been very poor. The seed was drilled in long narrow plats for each variety, the drill rows being six inches apart. The land was upland prairie, none of it broken prior to 1891.

It was necessary to make use of three tracts of land, lying close together and apparently of very similar condition naturally but not having had like treatment in the past. Circumstances prevented sowing all the varieties at the same time. Plats 1 to 24 were sown October 3. Plats 25 to 45 were sown October 4. There were rains, aggregating .88-inch on afternoon of October 4 and morning of October 6. Plats 46 to 62 were sown October 8, and plats 63 to 71 on October 14. It would obviously be unfair to compare results of varieties sown under different conditions. It would seem that the varieties in each

of the four divisions indicated might fairly be compared with each other, but there were some unexplainable results. Thus, in the first division, while two plats of Fultz gave nearly equal yields, of between 15 and 16 bushels per acre, a third plat of the same variety gave less than four bushels per acre. The conditions were most favorable for plats numbered from 25 to 44, and next for those numbered 45 to 62.

All the land had been deeply plowed and well disked and harrowed before drilling. As nearly as practicable the seeding was at rate of four pecks per acre. Differences in size of the kernels made marked differences in number of kernels sown on different plats. The weather was favorable during the fall, winter and early spring and the wheat, especially the earlier sown plats, made a most luxuriant growth. There was some slight injury by frost April 2, and a considerable number of "blasted" heads were noticed at the last of that month, apparently caused by extreme heat for the season. It is believed better yields might have been secured had it been practicable to use the plats for pasturage during the late fall and early spring. Fair yields of wheat were secured from fields in the vicinity of the College which had been heavily pastured for several weeks.

Chinch bugs did some damage, not working uniformly over the land. An extraordinarily high wind blew down the wheat shocks and, it is possible, caused slight mixture of sheaves from different plats.

The earlier sown varieties were threshed June 18 to 21; the later June 23 to 29.

The results are summarized in accompanying table. This shows that eleven plats gave yields of from 25 to 29.5 bushels, and four others from 20 to 25 bushels per acre. Forty-seven plats gave an average yield of 17.7 bushels per acre. In all cases the weight per bushel was light—in many cases remarkably so. The yields were calculated at 60 pounds per bushel. Among the varieties which gave the largest yields, Nigger, Michigan Amber and Missouri Blue Stem also did among the best of the varieties tested in 1893-4.

Wheat—Variety Test, 1895-96.

Plat	VARIETY AND SOURCE	Smooth or Bearded	Sown 1895	Headed first 1896	Headed full 1896	Harvested 1896	Height ft.	Height in.	Yield per acre: bu. grain.	Yield per acre: lbs. straw	Weight per bushel
1	Fultz, Oklahoma	Smooth	Oct. 3	April 21	April 30	May 18	2	9	15.1	4782	52.
2	American Bronze, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	2	11	13.8	4800	50.
3	Badger, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	2	10	19.7	4818	50.
4	Big English, Illinois Experiment Statihn	Smooth	O t. 3	April 21	April 30	May 18	3	1	10.6	3000	51.
5	Currell's Prolific, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	3	3	19.4	4600	50.
6	Early Red Clawson, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	3	2	21.8	5327	48.
7	Early Ripe, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	3	3	15.4	4400	50.
8	Extra Early Oakley, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 20	3	4	19.1	4636	54.
9	Ohio Early Ripe, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 20	3	3	12.1	3545	50.
10	German Emperor, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 20	3	3	20.	5182	50.
11	Hickman, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 20	3	0	15.7	4452	53 5
12	Fultz, Oklahoma	Smooth	Oct. 3	April 21	April 30	May 20	2	11	15.7	4632	53.
13	Improved Rice, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 20	3	2	15.7	4452	54.
14	Long Berry, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 20	3	1	13.9	4009	52.
15	Mealy, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 20	2	8	9.1	3727	50.
16	Ontario Wonder, Illinois Experiment Station	Smooth	Oct. 3	April 21	May 2	May 20	3	1	10.	3600	51.
17	Oregon, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 20	2	9	15.	4400	52.
18	Pool, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	2	9	14.5	4000	52.
19	Saskatchewan, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	3	0	15.1	4275	51.
20	Witter, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	2	10	15.	4363	51.
21	Willits, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	2	9	8.5	3090	43.
22	Wyandotte Red, Illinois Experiment Station	Smooth	Oct. 3	April 21	April 30	May 18	2	7	11.8	3327	51.
23	Bearded Monarch, Illinois Experiment Station	Bearded	Oct. 3	April 21	April 30	May 18	2	9	12.7	4000	51.
24	Fultz, Oklahoma	Smooth	Oct. 3	April 21	April 30	May 18	2	7	3.6	2236	48.
25	Fulcaster, Oklahoma	Bearded	Oct. 4	April 21	April 30	May 21	2	8	8.	1650	52.
26	Fulcaster, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	8	22.3	5850	51.
27	Crate, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	9	15.5	3750	52.
28	Velvet Chaff, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	9	17.5	4050	53.
29	Diehl Mediterranean, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	9	13.5	3540	53.
30	Dietz Longberry, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	3	0	27.	6300	52.
31	Fultz, Oklahoma	Smooth	Oct. 4	April 21	April 30	May 21	2	6	20.5	4890	52.
32	Fulcaster, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	8	17.	3600	53.5
33	Golden Cross, Illinois Experiment Station	Bearded	Oct. 4	April 21	May 2	May 21	2	10	19.5	4200	55.
34	Hindoostan, Illinois Experiment Station	Bearded	Oct 4	April 21	April 30	May 21	3	0	18.	4440	54.
35	Hybrid Mediterranean, Illinois Experiment Station	Bearded	Oct. 4	April 21	May 2	May 21	2	9	29.5	6150	54.
36	Lebanon, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	10	8.5	2190	54.
37	Lehigh, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	3	0	25.5	5750	53.5

38	Miami Valley, Illinois Experiment Station	Bearded	Oct. 4	April 21	May 2	May 21	2	8	25.0	4800	53.5
39	Missouri Blue Stem, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	10	27.5	5340	55.5
40	Michigan Amber, Illinois Experiment Station	Smooth	Oct. 4	April 21	April 30	May 21	2	10	28.0	6900	50.
41	Nigger, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	9	29.5	5850	52
42	Pickaway, Illinois Experiment Station	Bearded	Oct. 4	April 21	May 2	May 21	2	9	18.5	4350	55.
43	Rudy, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	11	25.5	5790	52
44	Selby's New Golden, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	2	10	18.5	4800	53.
45	Selby's New Golden, Illinois Experiment Station	Bearded	Oct. 4	April 21	April 30	May 21	3	0	27.3	5100	54.
46	Early White Leader, Illinois Experiment Station	Bearded	Oct. 8	April 21	April 30	May 23	2	7	6.5	1305	53.5
47	Theiss, Illinois Experiment Station	Bearded	Oct. 8	April 21	April 30	May 23	2	9	26.0	1566	51.
48	Reliable Minnesota, Illinois Experiment Station	Bearded	Oct. 8	April 21	May 2	May 23	2	4	13.5	3210	54.
49	Tuscany Island, Illinois Experiment Station	Bearded	Oct. 8	April 24	May 4	May 23	2	9	8.7	1827	51.
50	Valley, Illinois Experiment Station	Bearded	Oct. 8	April 24	May 4	May 23	2	8	20.9	4176	50.
51	Yuba, Illinois Experiment Station	Bearded	Oct. 8	April 24	April 30	May 23	2	8	14.8	3815	52.
52	Landreth, Illinois Experiment Station	Smooth	Oct. 8	April 24	May 4	May 25	2	9	7 0	2218	48.
53	Bail, Illinois Experiment Station	Bearded	Oct. 8	April 25	May 4	May 25	2	9	11.7	2558	52.
54	Early White Leader, Illinois Experiment Station	Smooth	Oct. 8	April 24	May 8	May 25	2	9	14 3	4176	51.
56	Miller's Prolific, Illinois Experiment Station	Bearded	Oct. 8	April 25	May 4	May 25	2	6	9.5	3001	51.
57	Royal Australian, Illinois Experiment Station	Bearded	Oct. 8	April 25	May 8	May 25	2	8	7.0	1566	51.
58	Silver Chaff, Illinois Experiment Station	Smooth	Oct. 8	April 24	May 8	May 28	2	4	5.2	1378	47.
59	Johnson, Illinois Experiment Station	Bearded	Oct. 8	April 24	May 12	May 29	2	4	5.2	1040	44.
60	Rock Velvet, Illinois Experiment Station	Smooth	Oct 8	April 24	May 4	May 29	2	5	12.1	1690	52.
61	Yellow Gipsy, Illinois Experiment Station	Bearded	Oct. 8	April 27	May 6	May 29	2	6	6.2	910	46.
62	Democrat, Illinois Experiment Station	Bearded	Oct 8	April 27	May 6	May 29	2	7	8.7	1820	47.
63	New Monarch, Illinois Experiment Station	Smooth	Oct. 14	April 27	May 11	May 29	2	7	2.6	598	
64	Roberts, Illinois Experimen Station	Smooth	Oct. 14	April 27	May 11	May 29	2	9	3.9	1950	45.
66	Beal, Illinois Experiment Station	Smooth	Oct. 14	April 27	May 11	May 29	2	8	6.0	1040	46.
67	Kentucky Giant, Illinois Experiment Station	Bearded	Oct. 14	April 27	May 16	May 29	2	8	6.0	2210	45.
68	Oregon Swamp, Illinois Experiment Station	Smooth	Oct. 14	April 27	May 16	May 28	2	8	6.5	780	49.
69	Buckeye, Illinois Experiment Station	Smooth	Oct. 14	April 27	May 11	May 28	2	8	8.7	1898	47.
70	Golden Coin, Illinois Experiment Station	Smooth	Oct. 14	April 27	May 12	May 28	2	5	7.8	1170	44.
71	Fultz, Oklahoma	Smooth	Oct. 14	April 27	May 4	May 28	2	9	12.6	2970	52.

WHEAT. — *Quantity of Seed and Time of Drilling.*

Equal sized plats were seeded as nearly as practicable, one each, with 3, 4, 5, 6 and 8 pecks per acre, on October 1. This was repeated October 30 and November 30. The accompanying table shows results. None of the yields after the sowing of October 1 were satisfactory, partly because of serious injury by chinch bugs. Of the first sowing the largest yield was from plat seeded at rate of eight pecks per acre, but there is very little difference in the yields of the plats seeded at rate of 3, 5 and 6 pecks. In case of the later sowings the results are conflicting.

Experiments at other Stations seem to show that wheat thinly seeded may do as well as that with greater quantity of seed, if the sowing be done early and the season be favorable. In such case the thin sown wheat tillers or stools more freely. Under unfavorable conditions larger yields are often secured from thick seeding.

In connection with this experiment additional plats were seeded at rate of four pecks per acre at different dates from October 1 to December 1. The table shows that there is a marked decrease from the earliest to the latest dates.

Quantity of Seed and Time of Drilling.

Plat	VARIETY	Pecks per acre	Sown 1895	Headed first 1896	Headed full 1896	Harvested 1896	Height ft.	Height in.	Yield per acre: bu. grain	Yield per acre: lbs. straw	Pounds per bushel
1	Fulcaster	3	Oct. 1	April 21	April 30	May 28	2	10	18.0	3447	54
2	Fulcaster	4	Oct. 1	April 21	April 30	May 28	2	10	16.6	2824	53
3	Fulcaster	5	Oct. 1	April 21	April 30	May 28	2	10	18.1	3360	55
4	Fulcaster	6	Oct. 1	April 21	April 30	May 28	2	10	18.5	3144	57
5	Fulcaster	8	Oct. 1	April 21	April 30	May 28	2	8	19.2	3560	56
6	Fulcaster	4	Oct. 10	April 21	May 2	May 28	2	7	7.7	1360	52
7	Fulcaster	4	Oct. 20	April 21	May 2	May 28	2	6	3.9	1160	46
8	Fulcaster	3	Oct. 30	April 30	May 13	May 28	2	5	2.3	560	41
9	Fulcaster	4	Oct. 30	April 30	May 13	May 28	2	4	4.0	1360	47
10	Fulcaster	5	Oct. 30	April 30	May 13	May 28	2	4	4.1	1064	44
11	Fulcaster	6	Oct. 30	April 30	May 13	May 28	2	3	5.2	1360	45
12	Fulcaster	8	Oct. 30	April 30	May 13	May 28	2	3	3.0	704	44
13	Fulcaster	3	Nov. 30	April 30	May 15	May 28	2	3	1.6	1040	38
14	Fulcaster	4	Nov. 30	April 30	May 15	May 28	2	4	1.0	304	37
15	Fulcaster	5	Nov. 30	April 30	May 15	May 28	2	4	2.4	1400	38
16	Fulcaster	6	Nov. 30	April 30	May 15	June 2	2	3	1.6	280	40
17	Fulcaster	8	Nov. 30	April 30	May 15	June 2	2	3	3.6	1404	38
18	Fulcaster	4	Dec. 10	April 30	May 15	June 2	2	0	0.5	100	...

DRILL DISTANCES.

An attempt was made to compare results from having the drill rows six inches apart in one case and eight inches apart in the other. Two press drills were used and several plats

were so seeded. One plat was covered with a disc harrow, with discs eight inches apart. The table shows the conflicting results.

The work of preparing the ground and drilling the wheat in all the trials was under the supervision of Vice Director Glazier. The harvesting and threshing were supervised by the Assistant Agriculturist, J. H. Bone.

Drill Rows—Different Distances.

Plat	VARIETY	Distance in.	Sown 1895	Harvested 1896	Height ft. in.	Yield per acre bu. grain	Yield per acre lbs. straw	Pounds per bushel
1	Red Russian	6	Oct. 2	May 18	2 10	15.6	3316	53
2	Red Russian	8	Oct. 2	May 18	2 10	15.6	3693	53
3	Fulcaster	6	Oct. 2	May 21	2 10	19.3	4011	54
4	Fulcaster	8	Oct. 2	May 21	2 10	15.5	3800	54
5	Fultz	(disc 8)	Oct. 14	May 28	2 6	3.4	1156	50
6	Fultz	6	Oct. 14	May 28	2 0	3.2	1016	45
7	Fultz	8	Oct. 15	May 28	2 1	6.3	1203	48
9	Fultz	6	.....	May 28	2 1	6.8	1908	55
10	Fulcaster	6	.....	May 28	2 10	13.2	2473	55

FOOD VALUE OF CORN - (Maize,)

SCORCHED BY HOT WINDS.

BY GEO. L. HOLTER, Chemist.

One of the atmospheric conditions with which the Oklahoma farmer has to deal, occasionally, is the hot winds which catch the late corn before it is fully matured. Fortunately for us this does not take place every year and the farmers throughout the greater part of the Territory may plant their corn in the spring with fairly reasonable prospects of harvesting a good crop in the fall. I have never seen the hot winds do as much damage here as the former inhabitants of Western Kansas say they did there. The Oklahoma variety, however, is sufficiently active to satisfy us that such a thing is a possibility, and we know from experience that great injury has been done

the crops in former years, and the worst feature, apparently, is that there is no sure way of avoiding these hot blasts; they may come early and they may come late. The early corn may be a success, the late a failure, and again the reverse may be true.

A hot wind lasts from three to five days, moves from twenty-five to forty miles per hour and the thermometer registers from 98 to 102 degrees in the shade. During such a visitation one never feels warm, he is simply hot. It is not to be wondered at that vegetation becomes parched under these adverse conditions. To those who are not familiar with our peculiar climatic conditions it will seem incredible to them when I say that at this writing—five days after a four-inch rainfall—the roads are already quite dusty. This statement will give some conception of the rapidity with which evaporation takes place. Of course our sandy soil contributes greatly to rapid evaporation.

During the summer of 1894 a field of listed corn on the Station farm—the field having a southwest exposure—gave every indication of producing an excellent crop but, about the time the ears began to form we had a few days of hot winds, the blades "curled up" and the corn ceased to grow. A week or two later we had some good showers, but the crop never recovered from the scorching and in this condition it was harvested. At the suggestion of Maj. Henry E. Alvord, then President of the College, I took some samples of this corn for the purpose of determining what it was worth for feeding purposes.

Table No. 1 shows the percentage composition of the scorched fodder, and that of corn raised under normal conditions is shown in table No. 2. In each instance the calculations are based upon the water free material. No. 178 is composed of the whole plant minus the ears that had already formed

Table No. 1—Corn Scorched by Hot Winds in Summer of 1894.

	Ash. per cent.	Protein. per cent.	Fiber. per cent.	Nitrogen fr. extract. per cent.	Fat. per cent.
No. 178—Whole plant, without ears	9.62	12.50	36.29	39.36	2.23
No. 179—Blades and husks	7.57	10.23	28.75	50.29	3.16
No. 180—Whole ears	2.23	14.83	5.88	72.82	4.24
No. 181—Stalks only	7.22	8.94	36.02	45.36	2.46

(corn stover), making the sample correspond to No. *b* of table No. 2. In this sample I took one-half dozen stalks and made an effort to get what would be an average of the crop. The second, third and fourth samples, numbered 179, 180, 181 respectively, were made up by taking one dozen whole stalks and from the stalks thus selected using the blades and husks for one sample, the whole ears (such as they were) for the second and the ramaining stalks for the last sample.

Table No 2—Corn Raised Under Normal Conditions.

	Ash. per cent.	Protein. per cent.	Fiber. per cent.	Nitrogen free extract per cent.	Fat. per cent.
No. a—Corn stalks	6.50	11.90	28.80	50.90	1.90
No. b—Corn stover	6.50	6.80	34.20	50.30	2.20
No. c—Corn, whole ears	1.40	8.10	7.40	78.60	4.50

One of the most expensive food products is protein and an examination of tables 1 and 2, samples 180 and *c*, would indicate at first glance that the advantage is in favor of the scorched corn, the difference being in the ratio of 1.83:1. By comparing No. 178 with No. *b* the advantage is again in favor of the scorched corn in the ratio of 1.83:1, and carrying the comparison one step further and comparing No. 181 with No. *a* the advantage is against the scorched corn in the ratio of 1:1.33, only. If we were to stop here it would appear that it would pay to have hot winds stop the growth of the corn, but before discussing the question further it must be remembered that the crop of ears yielded by the scorched corn was about one-tenth of an average crop only, and the fodder produced by the scorched corn was not more than two-thirds of an average crop. There is another reason, which will appear later, for making a comparison of the two crops.

It goes without saying that a fully matured crop of corn is desired under all circumstances in preference to a crop that has been blighted by hot winds, but when we have a crop thus apparently destroyed let us see if some good may not be gotten out of it. It is not a question of the best crop but a question of making the best out of a poor crop: a crop that appears to be a total failure. The corn under consideration was not so badly scorched that it was made unpalatable. It had the appearance

of ripened corn ready to be cut. I think the fodder was fully as succulent as corn fodder is when it becomes fully matured, and certainly was an improvement, as far as appearances go, over fodder that has been badly frosted.

In all foods we should have a well balanced ratio—not too much carbohydrates for the protein present or the reverse—in other words a good nutritive ratio. By nutritive ratio is meant the proportion, by weight, of digestible carbohydrates (n. f. e.) and fat, to the protein, the protein being taken as unity.

No exact standard for nutritive ratio can be given and even the standards arrived at by various authorities do not agree. As a general rule the German standards call for a larger proportion of protein in the fodder than we use in American practice. Again, the nutritive ratio varies with the animal fed and the purpose for which the feeding is done. Wolff, the German author, gives feeding standards as follows: Steers at rest, 1:12; steers, heavily worked, 1:6; horses, lightly worked, 1:7; horses, heavily worked, 1:6; fattening steers, about 1:6; fattening sheep, about 1:5; fattening pigs, about 1:6; growing fat pigs (2–3 months old), 1:4; growing fat pigs (8–12 months old), 1:6.5; growing cattle (12–18 months old, 700 pounds), 1:7, and the same (3–6 months old, 300 pounds), 1:5.

To calculate a nutritive ratio, it is necessary to multiply the amount of fat by about 2.5 to give it a value corresponding to carbohydrates, because the fat furnishes approximately 2.5 times as much energy as do the carbohydrates.

Table No 3.

	Protein.	Nitrogen free extract.	Fat.	Nutritive ratio.
No. 178—Calculated to pounds of dry matter per ton	250.0	787.2	24.6	.....
No. b—Calculated to pounds of dry matter per ton	136.0	1006.0	38.0	.....
No. 178—Digestible matter per ton	162.5	590.4	18.5	1:3.9
No. b—Digestible matter per ton	88.4	754.5	28.5	1:9.4

Table 3 gives the number of pounds of protein, carbohydrates and fat in samples No. 178 and No. *b*, also the digestible matter per ton for each one of these food compounds and finally the nutritive ratio in each case. It will be seen by an examination of the tables referred to that No. 178 is rich in protein and No. *b* is poor in protein. In other words, to make a well

balanced ration from No. 178 some cheaper food product must be mixed with it, and on the other hand No. *b* must be mixed with a dear food product (protein) in order to make a well balanced food.

Table No 4.

	Protein.	Nitrogen free ex ract.	Fat.	Nutritive ratio.
No. 180—Calculated to pounds of dry matter per ton	296.6	1456.0	84.8	.....
No. c—Calculated to pounds of dry matter per ton	162.0	1572.0	90.0	.....
No. 180—Digestible matter per ton	192.6	1092.0	63.6	1:6.4
No c—Digestible matter per ton	105.3	1179.0	67.5	1:12.8

Table No. 4 presents the data the same as No. 3, and here we find the food value of No. 180 to be a little below the standard. At the same time a glance will show that No. *c* contains only half as much protein as does No. 180. In other words, we may double the carbohydrates in No. 180 and still it will have as well a balanced ratio as No. *c*.

Table No. 5.

	Protein.	Nitrogen free extract	Fat.	Nutritive ratio.
No. 181—Calculated to pounds of dry matter per ton	178.8	907.2	49 2	.....
No. a—Calculated to pounds of dry matter per ton	238.0	1018.0	38.0	.....
No. 181—Digestible matter per ton	116.2	680.4	36.9	1:6.6
No. a—Digestible matter per ton	157 4	763.5	28.5	1:5.3

Table No. 5 is similar to the preceding ones, but the general results indicate that the mature stalks form a well balanced ration, while those of the scorched corn are a little low in protein. While the results indicate that the corn stalks make a well balanced feed, they are not eaten with much relish when fed alone, and to be fed to any advantage—with any hope of their being consumed—they must be mixed with some more palatable food. The analyses have been made in this way for purposes of comparison only, and in practical feeding the stalks, leaves and husks are cut up together and frequently mixed with some ground feed. There are two objects in view in following this method: making a more palatable feed and at the same time presenting a more evenly balanced ration.

Table No. 6.

	Protein.	Nitrogen free extract.	Fat.	Nutritive ratio.
No. 179—Calculated to pounds of dry matter per ton	204.6	1005.8	63.2	
No. 179—Digestible matter per ton	133.0	755.4	47.4	1:6.5

Table No. 6 shows the protein, carbohydrates and fat in one ton of the leaves and husks. I have nothing at hand with which to make a comparison with these and similar products of the matured fodder, but the results presented would seem to indicate a fairly good feed. This compound has a slightly better ratio than the stalks, and on account of the general character of the material it makes a much more desirable feed.

In making these comparison I do not try to show that it is better to have scorched corn than a fully matured crop, neither do I wish to show that scorched corn makes a more desirable feed. It is better under all circumstances to have a full crop than to have only one-third or two-thirds, even, as the case may be. I think I have shown, however, that the tenth or two-thirds of a crop has value, and for this reason should be taken care of. Of course there may be a limit beyond which we would not be justified in going. What I have considered is the condition that presented itself, and it might have been much worse and still have paid to harvest the crop. I am told by reliable persons that they have seen, in this western country —not in Oklahoma—cornfields entirely stripped of the blades, leaving nothing but the bare stalks standing. Here we have never been so unfortunate, I hope we never shall be, but should such a disastrous condition confront us, I believe it would pay to take the stalks from the field, cut them up and work them through the stable and return to the land in the form of manure. A great many acres of Oklahoma soil are none too rich in organic matter, and for this reason the question of manuring is one that should never be lost sight of.

No attempt has been made to calculate yields per acre in either case. If a crop is destroyed, as far as growth is concerned, by the hot winds, the amount of fodder that will be produced depends upon the stage of advancement of the crop. It is possible that a crop caught in an earlier stage of develop-

ment by the hot winds would not produce as good results as the one under consideration. This would certainly be true with the corn ears, for had the hot winds come a week or two earlier no ears would been formed.

In the calculations made it is possible that some of the co-efficients of digestibility used are too high, but the same co-efficients were used in both the scorched and matured corn, in which case they are each increased alike and the true ratio between the two is not destroyed.

FRUIT GROWING IN OKLAHOMA.

HENRY E. GLAZIER, Vice Director and Horticulturist.

It is estimated that over 1,500,000 fruit trees have been planted in the Territory of Oklahoma in the last seven years. It is also estimated that one-quarter of this number have already died. When the practice of many farmers is considered, the only wonder is that more failures have not been made. It is estimated that two-thirds of the fruit trees planted were of pitted fruits, including peach, plum, apricot and cherry; and one-third of apple, pear, quince, etc. Many millions of small fruits, blackberry, raspberry and strawberry have been planted and many have also died. Can these failures be laid at the doors of the farmers, or shall they be charged to the soil and climatic influences? It will be liberal to divide the responsibility between the operator and the climatic influences.

SOME CAUSES OF FAILURE.

Trees and vines were purchased without stint, without waiting until proper preparation of the soil could be made. They were hurriedly stuck (not planted) in the ground, little regard being paid to the kind, much less to the character or personal quality of the trees, which soon became an easy prey to the burning sun; this followed by the round headed apple

tree borer, *saperda bivitata,* or the flat headed apple tree borer, *chrysobothris femorata,* both of which are natives of the great southwest.

The necessity of planting strong, healthy, low headed trees is emphasized. By low headed trees is meant those which throw out shoots at not more than 15 or 18 inches from the crown of the tree. The necessity of shading the trunk should be obvious to all, and there are many reasons which will present themselves to any inquiring mind why fruit trees should be low headed. To accomplish this end the knife must be freely used in cutting back, as well as in cutting the inside branches, in order to throw the top out. The necessity of pruning applies to the roots as well as to the branches.

The tree that is properly headed, with the trunk shaded, and kept in a thrifty, growing condition, will be exempt from the attacks of the borer.

If greater precautions are desired, it is recommended to use a solution by mixing one and one-half pounds of either hard or soft soap, to the gallon of water and adding one ounce of Paris green and four ounces of lime, thoroughly mixing. For pitted fruits, dilute by adding one-half gallon of water and four ounces of lime. The lime will prevent injury by the Paris green. This solution should be applied with a brush about the first of May in this latitude. If applied in the late fall it will be found an excellent preventive of attacks of mice and rabbits. Where trees have been neglected and the borer has found a home in the tree, the use of the knife and wire is the only remedy.

CULTIVATION OF ORCHARDS.

Only hoed crops should be cultivated in orchards, and these only for the first few years. Continued cultivation to secure what is known as dry mulching will be found more desirable, especially in dry seasons; the ground having been thoroughly plowed and subsoiled, thus creating a reservoir for the more complete storage of storm water. Dry mulch greatly reduces evaporation. Keeping the surface loose and dusty, if possible, during the summer, much lessens the capillary power of the soil. The evaporation of moisture from the soil is very great, but the annual precipitation is sufficient, if it is properly husbanded, to insure fair fruit yields. Mulching with straw or compost should not be practiced, as the tendency would be to induce shallow rooting by the trees, which is very detrimental in this latitude.

LATE FROSTS THE MOST SERIOUS DANGER.

We are often confronted with the facts that very many have been successful in growing thrifty trees, but have been unable to protect the bloom from late frosts. This problem settled and the success of fruit culture in Oklahoma is assured.

The concensus of opinion as to the cause of the difficulty is that the warm days usually occurring in late winter, in what some have been pleased to call our Italian climate, start the flow of the sap, causing the swelling of the buds, which open in March to be caught by the later frosts. This is especially true with the early, pitted fruits on unfavorable exposures. There are favorable exposures which are not liable to be affected by these climatic influences. Hardly any one will be so incredulous as to disbelieve that, if suitable walls were constructed on the south side of all bearing fruit trees in normal condition, their fruiting would be annual.

The most desirable exposure for an orchard, especially of pitted fruits, is a northern exposure with cold air drainage—that is, where the land breaks off abruptly to a water course on the north, having timber shelter on the south and west. The water and the depression create a drainage for the cold air. That altitude has much to do with the effects of climatic changes cannot be doubted. In one case, in Northern Michigan, the thermometer showed a difference of 11 degrees with a variation of only 14 feet in altitude. The variation is not always so great. A week or more of travel in the counties of Logan, Oklahoma and Cleveland, with a trip into the Chickasaw country near Paul's Valley, have strongly impressed the belief that the foregoing position is correct and indicates the only safe course to follow.

ROOT PRUNING.

Many expedients have been tried with unfavorable results, to retard the flow of the sap. Straw mulching has proved detrimental in many cases by inducing shallow rooting, which gives the sun undue advantage. The process of laying down the trees has usually given no direct beneficial results. The buds on the trees laid down, when uncovered, usually show a more advanced stage of development than those on trees in natural position.

The writer has tested a system with encouraging results. The process is that of cutting a ditch around the tree—with a

plow if the orchards are large; otherwise with a spade. The ditch should be about ten inches deep, cutting off the terminals of the lateral roots, which have a two-fold office; one to stay the tree, the other to furnish a conduit for sap water. The dirt from the ditch should be thrown from the tree on the south, east and west sides of the trees; on the north side it may be thrown to the tree, the better to construct an embankment to prevent the sun's rays reaching the bottom of the ditch. Thus we have a reservoir for the storage of the winter's storm waters, and gathering snow, sleet and ice. Should the weather become sufficiently severe to freeze the earth, a little straw mulching placed over the ditch would retain the frost longer. Should there not be sufficient freezing weather, the storm waters will have far checked the flow of water to the extent of roots pruned. The ditch should be left open until late spring. This system benefits the tree, by causing the growth of more fibrous roots and inducing a deeper penetration into the subsoil. If continued a few years, simply cutting the terminals of the lateral roots, the roots will be beyond the reach of the early warmth that often operates so disastrously to many fruit growers. It is also claimed that the longevity of the trees will be increased by root pruning.

Four apricot trees in the Station orchard were treated by this system. The trees apparently most exposed to climatic influences were selected. Two were ditched with a plow on the four sides. In this case the dirt was thrown from the trees. At the four corners or angles the roots were not cut. A portion of the branches on the ditched trees bloomed with others on trees not treated, while some of the branches bloomed later, showing nearly two weeks difference between the extreme early and extreme late. The two trees treated saved some fruit; trees not treated lost all by the frost. Two other apricot trees with equal exposure were laid down the year before, with tops pointing to the north. The only difference reported the following spring was the more advanced condition of the buds. The south and central portions of the roots being quite thoroughly root pruned entered deeper into the subsoil. The conduct of these trees was quite similar to that of the two ditched trees, the fruit showing on the south and central portion of the trees. A little scattering fruit was found on the north side of one tree. High horticultural authority admits that, with trees in normal condition, the water furnished by given roots more or less definitely passes up the side of the tree on which it started.

This was borne out by the fact that trees with part of the roots pruned showed the earliest bloom on the side on which were no pruned roots.

The trees which were laid down have apparently made a more thrifty growth than trees not treated. A treatment which will save apricots should protect early peaches as well. Fruit growers who have heretofore been having only failures, may well give the system a thorough trial. Do not hesitate to cut the roots.

DESIRABLE LOCATIONS.

Many farmers in the Territory have failed because they failed to take advantage of the more favorable locations on their premises. They located their buildings in a "draw" close to a surface spring, and there they staked out an orchard, because to plant on the most desirable location would make it inconvenient. They did not remember that He who made the hills made them to grow delicious fruit. Successful orchardists in Oklahoma have secured, in all cases, locations that are desirable because of their altitude and cold air drainage. A Mr. White, located about two and a half or three miles east of north from Oklahoma City, showed the writer a peach orchard of about 500 trees, situated about a quarter of a mile from his house, with trees of early varieties, such as Amsdens, Alexanders and Arkansaw Travelers (which might have been Alexanders), which was estimated to have yielded not less than 1,500 bushels of peaches this season. He did not miss the few peaches the mischievous boy purloined. He would not have had peaches had he planted on the bottom land near his house. Fruit yields bountifully on lands where corn would fail. He realized $1.25 per bushel for his peaches. For his corn he may receive 8⅓ cents per bushel.

Many orchards visited in Oklahoma county, where due regard had been paid to location, altitude and cold air drainage, were in evidence. The trees were loaded with excellent fruit. The far-famed orchard at or near Paul's Valley, set out about 33 years ago by the late Governor Paul, a Chickasaw Indian, is a living witness to the fruitfulness of the country. Samples of apples were selected which will favorably compare with any grown by our eastern neighbors. A gentleman met at Oklahoma City had in charge three wagon loads of as fine Red Astrachan apples as we have ever seen. He claimed they were grown on trees planted 23 years

ago. Samples of the apples from each of these old orchards can be seen at this Station.

This reference to orchards in different sections of the country will answer many questions and, it is hoped, settle many doubtful minds concerning the future of this country as a fruit growing region. The old as well as the new, under proper treatment, commend themselves to our better judgment and proves that failures in fruit growing are largely attributable to the want of information by growers, coupled with a degree of indifference on the subject of horticulture.

SUMMARY.

Plant only thrifty, low headed trees.

Two-year-old trees are preferable.

Plant in the fall. Usually more time can then be given to the setting out of the trees and they are ready to make early summer growth.

Prune tops; prune roots; prune down and out.

Wash trees in May and November.

Dry mulching is the best for young growing trees. Never use straw or compost mulching.

Select locations having high altitude and cold air drainage, even at the expense of traveling one-half mile from your house.

If unfortunate in not being supplied with suitable locations for an orchard, it is believed the difficulties from extreme climatic influences can be overcome in large degree by a proper system of root pruning.

PEACH ROSETTE.

E. E. BOGUE, Botanist.

The disease known as Peach Rosette has appeared on some peach trees in and about Stillwater.

The disease is described at length in "Journal of Mycology," vol. VI.

The presence of the disease is readily distinguished by tufts of deformed leaves produced from winter or obscure buds. The leaves, that normally would have been scattered along the twig are clustered together and are more or less narrowed and curled, and the foliage has a general yellowish appearance.

The disease is readily communicated from one tree to another and is surely fatal.

The only remedy is to cut *and burn* the tree as soon as the presence of the disease is detected. The burning should not be neglected, as that is the essential part. If the tree is simply cut down the disease will spread from that to other trees as readily as mature seed will spread from a mature weed that has been cut and not burned.

Considering the somewhat extensive cultivation of the peach in Oklahoma, it is very unfortunate that such a fatal disease as the Peach Rosette should appear. It is hoped that these words of warning will induce any one who sees its appearance to cause its immediate destruction.

MELON LOUSE,

(Aphis cucumeris Forbes.)

E. E. BOGUE, Entomologist.

A great many and perhaps all of the fields of melons in the Territory are suffering from the attacks of the melon louse. The insect works on the under side of the leaves, sucking out the juices and causing the leaves to curl under from the edges. Old and young leaves suffer alike. The insect is very small but by a little careful examination can readily be seen with the naked eye. The different individuals vary in color and size according to age. The young are yellowish, but as they grow older become darker in color. The mature males have dusky wings. The insect secretes a sweet substance usually called honey. The presence of the lice may frequently be detected from this habit alone as, particularly in the morning, flies and ants will be numerous about the vines gathering this sweet secretion. The insects increase in numbers very rapidly. It is viviparous, that is, the young are produced from the parent alive instead of eggs being laid and allowed to hatch, as is the case in most insects. One female often produces four or five young in a single day, and may repeat this for several days in succession. When the young are perhaps less than a week old they in turn begin producing young, and so on. Thus it will be seen that any remedy must be speedily and thoroughly applied. If taken in the very first stages something may be accomplished with a first class spraying apparatus.

This can be secured at a cost of about eight dollars. The same apparatus would answer for two or three farmers, so that the cost to each would not be great. An apparatus that emulsifies the kerosene directly with the water is preferable, otherwise the kerosene must be emulsified with soap in the following manner: Dissolve six ounces of hard soap in three quarts of

water, heating the solution to make the soap more soluble. While hot add three pints kerosene slowly to the soap solution, stirring it at the same time vigorously by forcing it through the spray pump, when a creamy emulsion should be formed. Dilute this solution enough to make three gallons. The same proportion can be used in making larger quantities. If the leaves of the vines are very much curled it will be difficult to reach all the lice with the emulsion, hence the need of speedy application as soon as the lice are discovered before the leaves have curled much.

Another very effective remedy is described by John B. Smith in "Insect Life," Vol. VII, No. 2. This treatment consists in drawing the vines together, if they are very long, and covering them with anything air-tight, such as an air-tight wooden, tin, paper, iron or stone vessel. In a small open dish under this air-tight vessel place one teaspoonful of bisulphide of carbon. Allow the cover to remain over the hill one hour while the liquid is evaporating. At the end of this time all the lice on that hill should be dead and the plants in condition to start a new growth. If one had enough boxes to keep a man busy for an hour changing them from hill to hill, the work could be performed speedily and economically. Too much bisulphide will injure and perhaps kill the plants.

The lice are sucking insects, so that any poison placed on their food does them no injury. They must be destroyed by something that kills by contact.