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DEVELOPMENT OF FLOWERS AND BOLLS OF PIMA AND ACALA COTTON IN RELATION TO BRANCHING

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INTRODUCTION

A study of Pima Egyptian cotton in comparison with Acala, an upland variety now grown extensively in the Southwestern States, has been in progress at the United States Field Station, Sacaton, Ariz., for several years. The results of this comparison are not complete, but many notes taken during the seasons of 1924 and 1925 furnish data that are of interest in connection with general studies of the cotton plant. These data are presented in this bulletin and refer principally to the development of the fruiting parts of the plants—the floral buds, flowers, and bolls—in relation to their positions on the fruiting branches.[1] The developmental periods and the abscission of the buds, flowers, and bolls have been found to differ with different positions on the fruiting branches. Differences between the two varieties of cotton, as shown by the data, indicate the possibility of determining many points relating to cultural practices and to the comparative value of varieties under these practices.

[1] This bulletin forms a continuation of the study of fruiting parts of cotton made by Martin, Ballard, and Simpson (*17*). Other important phases of flower and boll development not dealt with or specifically mentioned in this bulletin have been described by Allard (*1*), Balls (*2* and *3*), Barre (*4*), Ewing (*10*), Harland (*11*), King (*12*, *13*), King, Loomis, and Varmette (*14*), Lloyd (*15*, *16*), Martin, Ballard, and Simpson (*17*), Martin and Loomis (*18*), Mason (*19*), and Zaitzev (*21*). Italic numbers in parentheses refer to "Literature cited," p. 27.

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PROCEDURE IN TAKING FIELD NOTES

Comparisons, with the two varieties grown side by side in alternate blocks, were made in 1924 and 1925, and although different plots were used in the two years the general uniformity of the soil in this field permits two sets of plots to be used without noticeably affecting results.

In both seasons the notes were obtained on 20 plants of each variety, selected in early June in different parts of the experimental plots in order that they might be as nearly representative of the field average of plants as was possible. The date of appearance of floral buds or "squares" and their position on the fruiting branches, the day on which any of these squares shed, the day on which a flower opened, and the day on which a boll opened were recorded throughout the fruiting season. From these records it is possible to trace the history of a square on any node of a fruiting branch from its appearance through the flowering stage to the opening of the boll or until it was shed, either in the square stage or as a young boll.

The date of appearance of a square was determined by following the method described by Martin, Ballard, and Simpson (*17*) as the day on which the three bracts of a floral bud became visible as a small triangular "form" approximately one thirty-second of an inch in diameter. A boll was recorded as open or mature on the first day that the contents could be picked with ease. Shedding of squares, opening of flowers, and shedding of young bolls are definite features and were recorded on the day of occurrence.

PRODUCTION OF SQUARES AND BOLLS ON PIMA AND ACALA PLANTS

The period in which the daily records were made of the appearance of squares on the 20 plants of Pima and the 20 plants of Acala extended from June 15 to August 14, 1924, and from June 8 to August 15, 1925. A few squares had already developed beyond the first stages on some of the plants when records were begun. These were recorded as "old" squares and are not included in discussions or tables relating to definite square periods, since the dates of appearance were unknown. The notes of square production were terminated in the middle of August, as the squares appearing after this time were considered as coming too late to develop into mature bolls before frost.

The number of squares produced, squares that shed, and bolls that matured, as recorded on the 20 plants of each variety during the period of the experiment, are shown in Table 1 for 1924 and in Table 2 for 1925.[2] The data relating to the main stalks and to the vegetative limbs were separated in the tables, but these data are also combined to show complete plants. In 1924 the Pima plants on which notes were taken developed no vegetative limbs, and the data given in Table 1 are for complete plants represented by only the main stalks.

[2] In these tables the difference between the number of squares produced and the number that shed equals the number of flowers produced. The difference between the number of flowers and the number of bolls matured equals the number of bolls that shed.

TABLE 1.—*Squares produced, shed, and developed into open bolls on 20 plants each of Pima and Acala cotton in 1924*

Plant No.	Pima, main stalk			Acala								
				Main stalk			Vegetative limbs			Complete plant		
	Squares produced	Squares shed	Bolls matured	Squares produced	Squares shed	Bolls matured	Squares produced	Squares shed	Bolls matured	Squares produced	Squares shed	Bolls matured
1	53	26	23	87	27	9	----	----	----	87	27	9
2	75	25	47	101	28	18	7	5	0	108	33	18
3	74	28	36	100	36	8	50	27	2	150	63	10
4	61	19	39	100	26	10	24	18	2	124	44	12
5	49	22	22	90	35	13	12	8	0	102	43	13
6	52	23	23	80	31	11	----	----	----	80	31	11
7	76	30	39	111	37	9	55	25	8	166	62	17
8	79	35	34	82	46	7	23	17	0	105	63	7
9	43	23	17	90	37	9	56	27	3	146	64	12
10	64	26	36	80	25	11	----	----	----	80	25	11
11	88	39	41	92	31	16	17	7	1	109	38	17
12	98	27	47	108	56	19	44	29	4	152	85	23
13	82	29	41	88	24	9	----	----	----	88	24	9
14	76	22	48	98	30	12	20	10	2	118	40	14
15	78	24	40	76	38	9	----	----	----	76	38	9
16	49	17	29	85	29	8	4	3	0	89	32	8
17	98	34	44	100	28	15	21	14	0	121	42	15
18	93	34	47	93	28	11	38	20	5	131	48	16
19	53	19	23	114	41	18	57	22	6	171	63	24
20	105	39	56	109	49	10	75	43	2	184	92	12
Total	1,446	541	732	1,884	682	232	503	275	35	2,387	957	267
Percentage	------	37.4	50.6	------	36.2	12.3	------	54.7	7.0	------	40.1	11.2

TABLE 2.—*Squares produced, shed, and developed into open bolls on 20 plants each of Pima and Acala cotton in 1925*

Plant No.	Pima									Acala								
	Main stalk			Vegetative limbs			Complete plant			Main stalk			Vegetative limbs			Complete plant		
	Squares		Bolls matured	Squares		Bolls matured	Squares		Bolls matured	Squares		Bolls matured	Squares		Bolls matured	Squares		Bolls matured
	Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed	
1	101	44	47	----	----	----	101	44	47	81	38	10	11	8	0	92	46	10
2	94	52	40	----	----	----	94	52	40	89	35	26	15	13	0	104	48	26
3	113	43	64	----	----	----	113	43	64	119	67	28	88	52	21	207	119	49
4	98	38	56	----	----	----	98	38	56	98	61	19	28	22	2	126	83	21
5	90	56	27	----	----	----	90	56	27	127	57	21	63	32	6	190	89	27
6	87	41	42	----	----	----	87	41	42	113	41	27	36	22	4	149	63	31
7	100	39	58	12	8	4	112	47	62	99	51	19	25	18	1	124	69	20
8	82	35	46	----	----	----	82	35	46	88	39	9	----	----	----	88	39	9
9	124	35	83	26	16	7	150	51	90	64	22	13	2	2	0	66	24	13
10	105	42	57	----	----	----	105	42	57	52	31	3	----	----	----	52	31	3
11	86	39	40	16	13	1	102	52	41	79	31	13	----	----	----	79	31	13
12	95	47	45	----	----	----	95	47	45	86	31	9	39	17	0	125	48	9
13	77	32	40	53	37	7	130	69	47	69	39	15	4	3	0	73	42	15
14	69	27	38	52	34	14	121	61	52	94	54	19	52	33	7	146	87	26
15	74	29	35	23	23	0	97	52	35	67	35	11	18	9	1	85	44	12
16	80	39	33	18	15	1	98	54	34	108	48	15	52	33	6	160	81	21
17	65	35	28	----	----	----	65	35	28	76	35	12	11	10	0	87	45	12
18	97	45	40	28	19	8	125	64	48	84	46	12	28	20	1	112	66	13
19	53	26	17	----	----	----	53	26	17	103	41	19	----	----	----	103	41	19
20	101	43	55	8	6	0	109	49	55	100	49	15	17	12	1	117	61	16
Total	1,791	787	891	236	171	42	2,027	958	933	1,796	851	315	489	306	50	2,285	1,157	365
Percentage	-----	43.9	49.7	----	72.5	17.8	-----	47.3	46.0	-----	47.4	17.5	----	62.6	10.2	-----	50.6	16.0

There was no material difference between the two years in the number of squares produced by the main stalks, by the vegetative limbs, or by the complete plants of the Acala. The 20 plants of Pima in 1924, which produced no vegetative limbs, had fewer squares than were borne by the main stalks alone in 1925 and only slightly over two-thirds as many as were borne by the entire plants the latter year. Square shedding of entire Acala plants was slightly higher than on the Pima plants each year, with the shedding in both varieties considerably higher in 1925.

A higher percentage of squares matured into open bolls on the main stalks and on the vegetative limbs of the Acala in 1925 than in 1924. The percentage of squares developed into mature bolls by the entire plants in this year was 5 more than in the preceding season. These plants had 39 per cent more open bolls than in 1924. Comparing the limbless Pima plants of 1924 with the main stalks of the following season, no difference is apparent in the proportion of squares maturing into open bolls; but combining the vegetative limbs with the main stalks of the 1925 plants lowers the proportion on these plants. However, with the increased number of squares borne on these plants, the number of bolls that matured was 27 per cent greater in 1925 than in 1924. In 1924 the Pima plants matured 732 bolls and the Acala 267, and the following season 933 bolls matured on the Pima and 365 on the Acala plants. The tendency for a greater proportion of bolls to mature on Pima than on upland cotton has been reported in previous publications (*5, 9, 10*).

Comparing vegetative limbs with the main stalks of each variety, the shedding of squares is seen to have been much greater and the percentage of squares developing into open bolls much lower on the vegetative limbs. In comparison with the main stalks, square shedding was relatively higher on the vegetative limbs of Pima than on those of Acala in 1925.

The shedding of young bolls, or "flower shedding" as it is sometimes miscalled, has been widely recognized as a factor materially affecting the yield of cotton. The shedding of the floral buds or squares is not so obvious as the shedding of bolls and generally has been disregarded as influencing yield, but indications of how serious square shedding often is may be found in Tables 1 and 2. If no square shedding had occurred, with the same rate of boll shedding, the number of bolls matured would have been increased at least 60 per cent in each variety in 1924 and from 90 to 100 per cent in 1925. That square shedding is not often noticed by the farmer was shown during the season of 1924 when many complaints were made by cotton growers of the Salt River Valley of Arizona regarding boll shedding, especially of the upland varieties, but nothing was heard regarding the loss of squares, although square shedding was prevalent throughout the valley. Again in 1925, with a still higher rate of square shedding at Sacaton and at least as much square shedding in the Salt River Valley as in the preceding year, no references were made to the loss sustained from this cause. Even boll shedding was not referred to by many growers in 1925, being less than in previous years and more evenly distributed throughout the season.

The shedding of squares on the two varieties, recorded in periods of days between the appearance and the shedding of the squares, and the mean age at which these fell are shown for the two seasons in Table 3.

TABLE 3.—*Number of squares shed at different ages from 20 plants each of Pima and Acala cotton in 1924 and 1925*

Age of square	Number of squares shed									
	Season of 1924				Season of 1925					
	Pima	Acala			Pima			Acala		
		Main stalk	Vegetative limbs	Complete plant	Main stalk	Vegetative limbs	Complete plant	Main stalk	Vegetative limbs	Complete plant
1 day	------	--------	1	1	0	0	0	2	1	3
2 days	------	4	1	5	1	0	1	4	0	4
3 days	------	5	--------	5	2	0	2	3	0	3
4 days	3	14	2	16	3	3	6	11	0	11
5 days	6	25	2	27	10	0	10	15	2	17
6 days	8	27	14	41	7	0	7	25	2	27
7 days	18	27	10	37	11	3	14	21	2	23
8 days	19	27	14	41	16	5	21	20	3	23
9 days	26	22	10	32	15	2	17	20	6	26
10 days	33	21	13	34	31	4	35	15	5	20
11 days	41	28	13	41	26	4	30	11	2	13
12 days	48	32	9	41	42	3	45	16	3	19
13 days	46	26	16	42	36	7	43	22	13	35
14 days	53	32	13	45	44	11	55	23	12	35
15 days	39	26	14	40	52	14	66	33	11	44
16 days	39	32	13	45	56	12	68	32	17	49
17 days	31	43	14	57	62	8	70	37	16	53
18 days	14	27	11	38	57	12	69	34	13	47
19 days	13	34	8	42	36	11	47	37	12	49
20 days	15	35	13	48	47	9	56	37	10	47
21 days	6	22	8	30	36	5	41	29	9	38
22 days	9	23	3	26	25	3	28	42	12	54
23 days	9	30	8	38	14	11	25	35	12	47
24 days	7	11	10	21	17	6	23	30	10	40
25 days	7	17	6	23	17	3	20	28	10	38
26 days	9	16	1	17	14	7	21	19	9	28
27 days	5	7	3	10	8	5	13	17	9	26
28 days	2	13	3	16	14	1	15	12	4	16
29 days	1	6	--------	6	14	5	19	13	13	26
30 days	1	3	1	4	5	4	9	10	4	14
31 days	1	5	1	6	6	2	8	0	1	1
32 days	1	0	--------	--------	0	0	0	4	0	4
33 days	1	0	--------	--------	1	2	3	--------	0	0
34 days	1	1	--------	1	1	--------	1	--------	1	1
Mean age at which squares were shed, days	14.2	15.4	14.7	15.3	16.9	18.4	17.2	17.3	19.2	17.8

As squares of Acala flower about 28 or 29 days after they appear and those of Pima flower about 33 days after appearance, the number that appear to have been shed a few days before they normally would have flowered, in Table 3, is seen to be much higher in the Acala than in the Pima. Shedding of normal squares within a few days of flowering is relatively infrequent, however, and in most cases may be attributed to external injuries, as of insects, wind, or cultivation.

During the recording of data on square shedding each season it was observed that the squares on the outermost node of fruiting branches of Acala sometimes became stunted or moribund after attaining a diameter of several millimeters. These squares were carefully watched and either did not increase in size or did so only slightly, in relatively long periods, and did not recover from this seemingly dormant state, but eventually withered and shed. As this peculiar behavior of the squares on the outer or last node of Acala fruiting branches was observed only a few times in 1924, no attempt was made to differentiate between these and normal squares, and all were included in Table 3. In this table many of the squares that appear to have shed near flowering time may be regarded as those that entered a dormant state before shedding, but some undoubtedly shed normally or were caused to fall by injuries. In 1925, however, so many of the squares on the last node of the fruiting branches exhibited a tendency to remain dormant before shedding that in compiling Table 3 no square was included which was borne on the last node of any fruiting branch of two or more nodes and which shed later than 30 days after it appeared. Eighty-seven such exceptions were found on the main stalks and 55 on the vegetative limbs of Acala. Their age at shedding varied from 31 to 69 days, which in the latter case is well over twice as long as an Acala square requires to reach the flower.

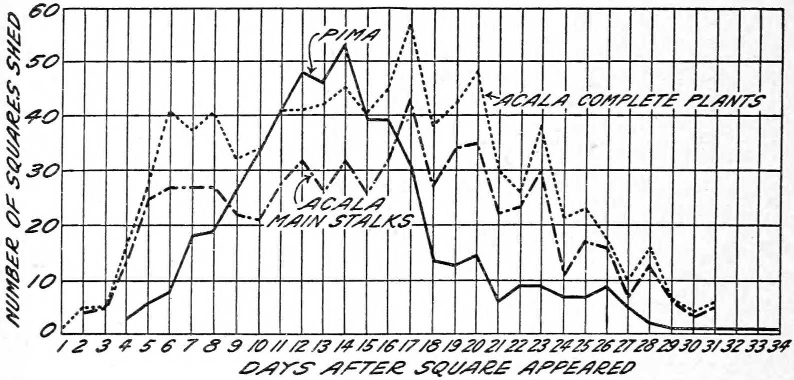

FIG. 1.—Number of squares shed at different ages from 20 Pima cotton plants and from 20 main stalks and complete plants of Acala cotton in 1924

Although some cases of dormant squares may occur in Pima, none was noted on the plants studied in either 1924 or 1925. The Pima squares that appear in Table 3 to have fallen just prior to flowering may have received injuries or may have been slightly affected by retarded growth or a short dormant period which escaped notice. That few if any squares on the outer node of the fruiting branches of either Pima or Acala lay dormant for more than a very short period and then flowered is apparent from Table 4, which shows the length of time for squares on specific nodes of the fruiting branches to reach flowering in 1924 and 1925. The number of days required for the squares to develop into flowers on the outer nodes does not show that the period of development of such squares had been greatly lengthened although some lengthening occurred, and it will be discussed in connection with the table.

In 1924 the age at which a square was likely to shed appears to have been more definite in the Pima variety than in the Acala, as may be observed from Figure 1, which shows graphically the data presented in Table 3. The majority of Pima squares which shed varied in age from 8 to 18 days, whereas the majority of those from Acala varied from about 5 to 25 days—a period double that of Pima. Very much less difference was found between the two varieties in 1925 in respect to the period in the age of squares in which shedding was most likely to take place, but a slightly longer period seems indicated in the Acala, as shown in Table 3. Shedding of younger squares is apparent in the Acala, while old squares shed at about the same rate in both varieties.

DETERMINING PERIODS OF SQUARE AND BOLL DEVELOPMENT

The earliness of a variety of cotton depends upon two factors—(1) the time at which the young plants begin to produce squares and (2) the length of time required for these squares to reach the flowering stage and for the flowers to develop into open bolls. The square and boll "periods," as the intervals between square and flower and between flower and open boll are called, have been determined for many varieties under different conditions, but generally by considering squares and bolls without regard to their location on the plants. (See under "Literature cited," *3*, *10*, *12*, *14*, and *17*.) But it appears that squares or bolls of the same date may differ in the length of their period of development, depending on whether they are borne on the basal nodes of the fruiting branches or farther out on the branches, as shown by the following data.

DEVELOPMENT OF SQUARES ON SPECIFIC NODES OF FRUITING BRANCHES

The period required for squares to develop into flowers on specific nodes of the fruiting branches of Pima and Acala cotton was determined in successive 10-day intervals in 1924 and 1925 from 20 plants in each variety in an effort to ascertain whether the squares on the outer nodes of the fruiting branches required a longer period than those that were developing at the same time on basal nodes, closer to the main axis of the plant. The periods for squares on specific nodes and the number of squares upon which these periods were based are shown in Table 4. Because of a fault in the method of recording notes in 1924, it was possible to compute the periods for only those squares that later developed into open bolls. In 1925, however, all squares that reached the flowering stage were used in computing the square periods.

Instances are seen in some 10-day intervals, particularly in 1924, where the square period of certain nodes has not been presented. This was because these nodes produced too few squares to allow the period to be determined.

In both years the square periods for the nodes in intervals in which all four nodes are represented show that squares classed as borne on the fourth-to-last nodes in most cases required a longer time to flower than squares produced at the same time on nodes 1 or 2, and usually longer than those on node 3. The general tendency is apparent from the table, and the probable errors for the square periods show significant differences toward a lengthening of the square periods on the outer nodes in many cases, as with Pima in 1924; for node 3 compared with node 2 in the interval from July 6 to 15; for node 4 compared with nodes 1 and 2 in the interval from July 16 to 25; for node 4 when compared with nodes 1, 2, and 3 in the interval from August 5 to 14.

TABLE 4.—*Periods of development of squares on specific nodes of fruiting branches of Pima and Acala cotton, averaged in groups of 10 days each in June, July, and August, 1924 and 1925*

Season and 10-day interval, based on appearance of squares	Fruiting branch node	Pima		Acala	
		Number of squares	Average square period (days)	Number of squares	Average square period (days)
Season of 1924:					
June 16 to 25	1	29	30.655±0.278	21	26.000±0.346
	2	14	29.286± .250	17	26.942± .329
	3	------	------	5	26.200± .352
June 26 to July 5	1	46	33.478± .107	9	28.444± .463
	2	14	32.500± .518	3	26.333± .662
	3	7	33.286± .220		
	4 to last	3	36.000±1.457	------	------
July 6 to 15	1	69	31.826± .068	9	27.556± .283
	2	49	31.633± .111	7	27.714± .590
	3	25	32.240± .122	12	29.000± .533
	4 to last	10	32.400± .141	3	29.000± .841
July 16 to 25	1	63	33.492± .110	24	27.833± .171
	2	41	32.585± .132	13	27.615± .227
	3	24	33.833± .227	12	28.500± .394
	4 to last	14	34.429± .289	11	28.000± .324
July 26 to August 4	1	41	34.976± .144	15	31.600± .776
	2	33	33.818± .117	8	29.875± .325
	3	24	35.000± .245	9	29.444± .302
	4 to last	25	34.840± .218	6	29.500± .742
August 5 to 14	1	40	33.675± .173	------	------
	2	34	33.147± .119	------	------
	3	24	33.625± .213	------	------
	4 to last	32	34.781± .238	------	------
Season of 1925:					
June 8 to 17	1	76	31.618± .087	65	26.923± .086
	2	55	31.273± .133	55	26.709± .109
	3	24	32.500± .224	45	27.200± .109
	4 to last	3	34.333± .767	8	27.625± .237
June 18 to 27	1	66	32.273± .093	68	27.956± .115
	2	55	32.382± .120	76	27.645± .089
	3	43	33.512± .188	70	28.057± .098
	4 to last	25	33.240± .139	45	28.244± .118
June 28 to July 7	1	60	32.100± .120	49	29.184± .161
	2	61	30.869± .112	45	28.467± .154
	3	41	31.902± .151	46	29.043± .168
	4 to last	40	32.550± .213	23	29.130± .167
July 8 to 17	1	42	34.048± .200	43	31.837± .373
	2	27	33.259± .305	37	30.973± .309
	3	24	35.417± .377	29	30.621± .243
	4 to last	28	38.679± .541	28	32.679± .407
July 18 to 27	1	47	35.191± .361	25	32.400± .232
	2	30	33.200± .169	20	32.700± .317
	3	22	35.455± .377	16	32.375± .342
	4 to last	24	36.583± .351	16	33.812± .401
July 28 to August 6	1	33	35.061± .220	12	32.083± .351
	2	19	33.526± .290	15	31.867± .304
	3	10	35.800± .186	8	33.500± .533
	4 to last	18	35.611± .564	12	33.083± .257
August 7 to 16	1	8	34.375± .290	------	------
	2	8	33.250± .409	------	------

In 1925 significantly longer periods on the outer nodes are shown in the Pima for node 4 compared with nodes 1 and 2 in the interval from June 8 to 17; for nodes 3 and 4, respectively, compared with nodes 1 and 2 in the interval from June 18 to 27; for nodes 3 and 4, respectively, compared with node 2 in the interval from June 28 to July 7; for node 3 compared with node 2 and for node 4 compared with nodes 1, 2, and 3 in the interval from July 8 to 17; for nodes 3 and 4, respectively, compared with node 2 in the interval from July 18 to 27; and for node 4 compared with node 2 in the interval from July 28 to August 6.

No significantly longer periods for squares on outer nodes appear in the Acala in 1924 in Table 4, as fewer squares with more widely varying periods than in the Pima were available for consideration, resulting in higher probable errors. In 1925, however, data were obtained on a larger number of squares, and significantly longer periods on the outer nodes are found for nodes 3 and 4, respectively, compared with node 2 in the interval from June 8 to 17; for node 4 compared with nodes 2 and 3 in the interval from July 8 to 17; for node 4 compared with node 1 in the following interval; and for node 4 compared with node 2 in the last interval. From these data it seems apparent that the squares on outer nodes of the fruiting branches of Acala generally require a longer time to reach the flowering stage than those on inner nodes, but this lengthening of the period on outer nodes is not so great nor so constant as in the Pima variety.

As shown in Table 4, squares on the second nodes of the fruiting branches of both Pima and Acala usually reached the flowering stage in a shorter time than did those on node 1, the same tendency being apparent in both seasons. That the square periods did not lengthen more consistently may be owing to other factors not yet recognized, though the general tendencies are apparent.

The average number of days required for squares of both varieties throughout the seasons of 1924 and 1925 to develop into flowers on specific nodes of the fruiting branches is given in Table 5, which also contains the average square period for both years. The table is a summary of the data presented in Table 4.

TABLE 5.—*Average number of days required for squares throughout the seasons of 1924 and 1925 to develop into flowers on specific nodes of fruiting branches*

Season and node of fruiting branch	Pima		Acala	
	Number of squares	Average square period (days)	Number of squares	Average square period (days)
Season of 1924:				
Node 1	288	33.076±0.071	78	28.103±0.241
Node 2	185	32.400± .089	48	27.687± .195
Node 3	104	33.635± .112	38	28.579± .251
Nodes 4 to last	84	34.500± .146	20	28.600± .328
All nodes	661	33.156± .050	184	28.147± .088
Season of 1925:				
Node 1	332	33.057± .076	262	29.179± .118
Node 2	255	32.082± .078	248	28.746± .111
Node 3	164	33.640± .129	214	28.963± .106
Nodes 4 to last	138	35.065± .210	132	30.417± .179
All nodes	889	33.197± .058	856	29.190± .063

Significantly longer periods are shown for the outer nodes of Pima in both years, though not for the Acala in 1924. In 1925 the fourth-to-last nodes represent the only case where the outer nodes have a significantly longer period than any of the three preceding nodes. In both varieties the squares produced on the first nodes each season required a longer period to develop than those on the second nodes, and after the first and second nodes the squares on the branches of both varieties required increasingly longer periods as they progressed outward.

The average period required for any square to develop, regardless of its position on a fruiting branch, was found to be slightly over 33 days for Pima in both seasons, whereas the Acala squares required but 28 days in 1924 and 29 days in 1925, or 5 days less for the Acala in the first year and 4 days less in the following year. These differences between the two varieties remained constant throughout the season in both years, as reference to Table 4 will show.

In respect to Pima cotton grown at Sacaton, Ariz., Martin, Ballard, and Simpson (*17*) reported that from their data there was "no significant evidence that the square period is longer because the square is produced at the outer nodes, toward the end of the branch." They state further that "this is evident when the periods for squares of first nodes are compared with periods for squares of fifth nodes that appeared on the same dates," but no data were presented to illustrate this point. The mean square periods given by them for Pima and Acala grown at Sacaton in 1921 were considerably shorter than were found in either 1924 or 1925, and squares of Pima were shown to require somewhat over 7 days longer to reach the flowering stage than did Acala, whereas the difference between these varieties in 1924 and 1925 amounted to only 5 and 4 days, respectively.

SQUARE AND BOLL RECORDS FOR SPECIFIC NODES OF FRUITING BRANCHES BORNE BY MAIN STALKS

The numbers of squares produced, the numbers that were shed, and the numbers that developed into mature bolls on specific nodes of the fruiting branches of the main stalks of 20 Pima plants in 1924 and 1925 are presented in Table 6. Squares or bolls borne beyond node 6 of the fruiting branches were too few in number for separate consideration and were included in the table under the heading of "nodes 6 to last." A class was included in the table presenting data for the last or outer node of all fruiting branches of two or more nodes, and another class was included giving the data for fruiting branches of one node only, such fruiting branches not being included in the figures given under node 1 in the table.

As shown by the totals in the table, the percentage of square shedding was very low on node 1 and was at least twice as great on the succeeding nodes. In 1924 nodes 4 and 5 had a lower percentage of square shedding than did node 3, but exceptionally heavy shedding took place on nodes 6 to last. No explanation for the decrease of shedding on nodes 4 and 5 was found. A consistent increase in shedding of squares occurred from node 1 to nodes 6 to last in 1925, indicating what appears to be normal behavior for Pima. Squares produced on the terminal node of fruiting branches of two or more nodes shed at the rate of 69 per cent in 1924 and 95 per cent in 1925; the increase was perhaps connected with the fact that the 1925 plants were producing a larger crop of bolls. Branches of one node only, which are normally produced only at the bottom and top of the plants, shed nearly half of their squares, in contrast with the first nodes of the longer fruiting branches, which shed less than one-fifth of their squares. The percentage of square shedding of these single-noded fruiting branches was intermediate between that for node 2 and node 3 of the longer branches.

The proportion of bolls matured on specific nodes is seen to have been highest on node 1 and to have decreased more or less rapidly to the outer nodes, where on the sixth node it was reduced to but 2 or 3 per cent of the squares produced there. Node 4 in 1924 presents the only instance where a greater proportion of squares were developed into mature bolls than on the preceding node. The terminal nodes of long fruiting branches matured one-fifth of their squares into bolls in 1924, but only about one-twentieth in 1925, when the shedding of the outer squares was greatly increased. The percentage of open bolls developed from squares produced on fruiting branches of only a single node was about intermediate between the percentages developed on nodes 2 and 3 each year. A larger proportion of the total number of squares which reached the flowering stage developed into mature bolls in 1925 than in 1924.

Data on the same features of fruiting as shown in Table 6 for Pima are given in Table 7 for the main stalks of 20 Acala plants in 1924 and 1925. In 1925 the percentage of square shedding was somewhat higher than for the preceding year. In both seasons the percentage of shedding increased gradually from node 1 to node 3, but increased rapidly thereafter, reaching 84 per cent on nodes 6 to last in 1924 and 96 per cent in 1925. The shedding of squares from the terminal node of all fruiting branches of two or more nodes was exceeded only by the shedding from nodes 6 to last in both years. Shedding from branches of only one node was approximately the same as from node 2 of the longer branches in 1924, but was greater than the shedding from node 4 in 1925.

The proportion of squares to make open bolls decreased uniformly from 20 per cent on node 1 to 3 per cent on the sixth-to-last nodes in 1924, and from 31 per cent to 2 per cent for the corresponding nodes in 1925. Proportionally fewer squares developed into open bolls on the last nodes of branches of two or more nodes in 1924 than on any specific node, and fewer of the last node squares developed into open bolls than on any nodes, except the sixth-to-last category in 1925. The same proportion of bolls matured from squares borne on branches of only one node in each year, and the proportion was about equal to that for node 2 in 1924 and for node 3 in 1925.

Comparing the data in Table 6 with those in Table 7, it seems evident that corresponding nodes of the fruiting branches of Pima and Acala did not show consistent differences in respect to square shedding. The total square shedding for entire Acala plants was shown in Tables 1 and 2 to be but very slightly higher than for Pima plants. As previously pointed out in the discussion of Tables 1 and 2, the percentage of squares developing into mature bolls was much higher on plants of Pima than on Acala, and this will be seen to hold true in comparing specific nodes of the two varieties, except, perhaps, on nodes toward the end of long Pima branches, as in comparing nodes 6 to last with the same node in the Acala tables.

TABLE 6.—*Number of squares produced, shed, and developed into open bolls on specific nodes of fruiting branches of the main stalks of 20 Pima cotton plants, 1924 and 1925*

Season and plant No.	Node 1			Node 2			Node 3			Node 4			Node 5			Nodes 6 to last			Last node only			Branches of one node only		
	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed
	Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed	
Season of 1924:																								
1	22	4	15	18	11	7	12	10	1	1	1	0	...	...	...	...	...	...	18	15	2	4	1	3
2	26	3	21	20	5	15	15	9	5	9	5	4	3	1	1	2	2	0	20	15	5	6	2	3
3	22	4	15	20	11	8	15	8	6	10	4	4	5	1	3	1	1	0	20	8	8	2	0	2
4	22	5	16	15	4	10	13	6	7	7	3	3	3	0	2	1	1	0	15	8	6	7	5	2
5	21	7	12	15	7	8	10	5	2	3	3	0	...	...	...				15	11	1	6	4	1
6	23	6	12	14	9	5	10	6	3	4	1	3	1	1	0	...	...	...	14	9	4	9	5	2
7	23	5	16	20	8	11	17	8	8	8	2	3	7	6	0	1	1	0	20	17	3	3	3	0
8	26	5	19	20	8	10	17	11	5	9	5	0	6	5	0	1	1	0	20	19	0	6	2	3
9	21	8	13	14	11	3	8	4	1	...	...	...	...	...	...	...	...	...	14	9	2	7	4	3
10	24	10	14	17	4	12	13	7	5	5	1	4	4	3	1	...	...	...	17	8	7	7	5	2
11	25	2	20	23	8	12	18	13	4	10	6	3	7	5	2	5	5	0	23	21	2	2	0	2
12	24	1	17	22	3	15	21	6	10	16	7	4	9	4	1	6	6	0	22	18	4	2	0	2
13	23	4	17	21	10	8	15	4	9	11	4	5	6	2	2	5	5	0	21	15	6	2	0	2
14	24	7	15	18	5	13	15	6	7	9	2	7	6	0	5	4	2	1	18	5	10	6	4	1
15	24	3	15	20	8	11	18	5	8	11	6	4	4	1	2	1	1	0	20	11	6	4	2	1
16	22	6	14	15	5	9	9	6	3	2	0	2	1	0	1	...	...	...	15	7	8	7	4	3
17	25	1	19	22	8	12	21	13	6	14	3	6	10	4	1	5	5	0	22	17	0	3	0	0
18	27	6	17	23	10	11	17	7	8	12	3	6	8	3	2	6	5	0	23	14	4	4	1	2
19	22	0	17	19	9	4	10	9	1	2	1	1	...	...	...	...	...	...	19	14	1	3	0	2
20	27	3	21	26	9	15	21	12	9	14	2	10	12	9	1	5	5	0	26	21	2	1	0	0
Total	473	90	325	382	153	199	295	155	108	157	59	69	92	45	24	43	40	1	382	262	81	91	42	36
Percentage	...	19.0	68.7	...	40.0	52.1	...	52.5	36.6	...	37.6	43.9	...	48.9	26.1	...	93.0	2.3	...	68.6	21.2	...	46.1	39.6
Season of 1925:																								
1	25	3	21	23	6	15	20	12	5	18	10	4	12	11	1	2	2	0	23	23	0	1	0	1
2	25	6	18	24	9	15	22	18	3	15	11	4	6	6	0	1	1	0	24	24	0	1	1	0
3	25	2	22	23	5	18	21	8	12	19	7	10	15	12	1	8	8	0	23	20	3	2	1	1
4	25	3	21	21	3	18	20	13	6	14	7	5	10	6	4	6	6	0	21	20	1	2	0	2
5	25	5	15	23	14	8	20	15	4	14	14	0	7	7	0	1	1	0	23	23	0	...	...	...
6	23	4	19	21	8	10	19	11	7	13	8	5	8	7	1	2	2	0	22	22	0	1	1	0
7	24	4	19	23	6	17	21	8	13	17	7	8	13	12	1	2	2	0	23	19	4	...	...	...

8	23	4	18	19	5	14	15	9	6	12	6	6	6	6	0	4	4	0	19	19	0	3	1	2
9	27	4	23	23	5	16	22	8	14	19	3	14	15	3	10	14	12	2	22	18	4	4	0	4
10	24	2	21	23	6	16	20	7	11	17	7	8	12	12	0	8	8	0	23	21	2	1	0	1
11	23	2	20	22	9	12	19	11	5	13	9	2	8	7	1	1	1	0	22	20	2			
12	26	4	22	24	9	14	22	15	7	13	11	1	6	5	0	2	2	0	24	23	0	2	1	1
13	21	6	15	18	6	12	15	5	10	12	6	2	6	5	0	2	2	0	18	18	0	3	2	1
14	20	2	17	17	5	12	15	7	6	9	6	2	5	5	0				17	17	0	3	2	1
15	20	2	17	18	7	9	14	4	6	11	8	1	7	5	1	2	2	0	18	18	0	2	1	1
16	23	6	16	19	8	10	16	9	5	10	6	2	8	6	0	2	2	0	19	19	0	2	2	0
17	20	4	16	18	11	7	16	11	3	6	5	1	4	4	0				19	19	0	1	0	1
18	25	6	18	22	9	9	20	9	7	14	8	3	10	9	1	2	2	0	21	18	3	4	2	2
19	20	3	12	15	8	3	12	11	0	2	2	0							15	15	0	4	2	2
20	24	3	21	21	5	16	19	9	9	16	8	8	12	10	0	6	6	0	21	20	1	3	2	1
Total	468	75	371	417	144	251	368	200	139	264	149	86	170	138	21	65	63	2	417	396	20	39	18	21
Percentage		16.0	79.3		34.5	60.2		54.3	37.8		56.4	32.6		81.2	12.4		96.9	3.1		95.0	4.8		46.2	53.8

TABLE 7.—*Number of squares produced, shed, and developed into open bolls on specific nodes of fruiting branches of the main stalks of 20 Acala cotton plants, 1924 and 1925*

Season and plant No.	Node 1			Node 2			Node 3			Node 4			Node 5			Nodes 6 to last			Last node only			Branches of one node only		
	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed
	Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed	
Season of 1924:																								
1	25	3	7	22	5	2	18	4	0	14	9	0	6	4	0	2	2	0	22	21	0	3	2	0
2	26	4	5	22	5	5	20	0	6	18	8	1	11	8	1	4	4	0	22	16	0	4	0	0
3	24	7	2	22	9	2	19	3	4	15	4	0	12	5	0	8	8	0	22	16	0	2	1	0
4	26	3	3	24	7	2	20	4	3	17	6	1	10	4	1	3	2	0	24	10	1	2	0	0
5	22	7	5	20	2	5	18	6	3	15	9	0	9	5	0	6	6	0	20	17	0	2	1	0
6	22	3	7	18	4	3	16	5	1	13	9	0	8	7	0	3	3	0	18	18	0	4	2	1
7	32	9	3	26	7	2	22	4	4	19	9	0	9	7	0	2	1	0	26	13	0	6	1	0
8	20	6	2	18	8	4	16	10	1	15	10	0	10	9	0	3	3	0	18	18	0	4	2	0
9	24	4	5	21	8	2	17	5	2	14	7	0	10	9	0	4	4	0	21	14	1	3	0	1
10	24	4	4	22	5	3	17	4	3	11	6	1	6	6	0	----	----	----	22	16	1	2	1	0
11	26	1	9	24	3	5	18	10	0	14	10	1	7	4	1	3	3	0	24	17	1	2	0	1
12	25	10	7	22	11	5	20	9	3	17	6	4	14	10	0	10	10	0	22	19	1	3	1	1
13	24	4	6	21	4	1	17	4	2	12	3	0	9	5	0	5	4	0	21	18	0	3	2	1
14	24	2	4	21	2	3	19	3	4	17	9	0	12	9	1	5	5	0	21	19	0	3	1	1
15	24	11	6	20	7	2	15	7	1	10	7	0	6	5	0	1	1	0	20	16	1	4	0	3
16	22	1	4	19	5	4	16	7	0	13	6	0	10	5	0	5	5	0	19	16	0	3	0	0
17	27	4	5	24	5	4	21	4	4	16	7	1	10	6	1	2	2	0	24	17	1	3	1	0
18	23	2	7	22	5	3	19	5	1	15	6	0	9	5	0	5	5	0	22	20	0	1	0	0
19	26	9	4	23	8	5	18	8	1	13	6	2	11	0	3	23	10	3	23	9	0	3	0	0
20	24	9	2	24	11	4	21	7	2	17	5	2	13	8	0	10	9	0	24	20	0	----	----	----
Total	490	103	97	435	121	66	367	109	45	295	142	13	192	121	8	104	87	3	435	330	7	57	15	9
Percentage	-----	21.0	19.8	-----	27.8	15.2	-----	29.7	12.3	-----	48.1	4.4	-----	63.0	4.2	-----	83.7	2.9	-----	75.9	1.6	-----	26.3	15.8
Season of 1925:																								
1	21	8	4	18	5	5	16	4	1	14	9	0	8	8	0	1	1	0	18	18	0	3	3	0
2	23	4	9	21	8	7	18	8	3	13	7	3	6	3	2	6	5	0	21	18	1	2	0	2
3	25	13	7	23	12	7	22	11	5	17	5	5	17	14	1	14	12	2	23	22	1	1	0	1
4	21	12	7	19	8	8	17	9	4	14	8	0	12	9	0	13	13	0	19	18	0	2	2	0
5	25	8	8	23	7	9	22	5	3	20	8	1	15	8	0	20	19	0	25	24	0	2	2	0
6	26	6	12	23	2	9	21	2	4	19	12	1	15	12	0	6	6	0	22	19	1	3	1	1
7	24	10	9	22	9	6	19	8	4	16	7	0	13	13	0	4	4	0	23	21	1	1	0	0

8	24	4	4	22	6	4	18	7	1	14	12	0	7	7	0	1	1	0	23	22	1	2	2	0
9	21	5	9	17	1	2	14	6	1	8	7	0	1	1	0	------	------	------	18	13	0	3	2	1
10	17	7	2	14	6	1	10	7	0	6	6	0	2	2	0	------	------	------	14	14	0	3	3	0
11	20	3	9	18	4	4	16	5	0	13	7	0	7	7	0	4	4	0	18	15	0	1	1	0
12	21	2	4	20	3	4	17	6	1	15	8	0	10	9	0	1	1	0	19	19	0	2	2	0
13	22	7	8	21	13	4	17	11	2	6	6	0	1	1	0	------	------	------	21	19	2	2	1	1
14	25	12	11	23	9	7	19	8	3	16	14	0	8	8	0	2	2	0	23	22	1	1	1	0
15	19	7	7	16	8	3	14	6	1	11	7	0	4	4	0	------	------	------	16	14	0	3	3	0
16	25	5	8	23	7	6	19	4	1	17	10	0	13	11	0	10	10	0	23	23	0	1	1	0
17	20	7	5	20	7	4	17	6	1	12	10	2	5	3	0	2	2	0	20	18	2	------	------	------
18	22	8	7	19	6	4	17	7	1	12	11	0	10	10	0	1	1	0	19	19	0	3	3	0
19	24	4	6	20	4	5	18	3	5	16	8	3	12	10	0	9	9	0	20	20	0	4	3	0
20	22	10	1	21	7	7	19	6	4	14	7	1	12	7	2	11	11	0	21	21	0	1	1	0
Total	447	142	137	403	132	106	350	129	45	273	169	16	178	147	5	105	101	2	406	379	10	40	31	6
Percentage	------	31.8	30.6	------	32.8	26.3	------	36.9	12.9	------	61.9	5.9	------	82.6	2.8	------	96.2	1.9	------	93.3	2.5	------	77.5	15.0

SQUARE AND BOLL RECORDS FOR SPECIFIC NODES OF FRUITING BRANCHES BORNE BY VEGETATIVE LIMBS

Data similar to those in the foregoing tables are presented in Table 8 for the vegetative limbs produced by the 20 Pima plants in 1925. The fruiting branches borne by vegetative limbs of cotton are normally shorter than those borne by the main stalks. It was accordingly found expedient to reduce the number of nodes considered in this table to three classes, the last of which includes the combined data for all nodes beyond the second. The percentage of squares shed from node 1 of the branches on the vegetative limbs was slightly higher than from node 1 of the branches on the main stalks, while the proportion that developed into mature bolls on this node of the fruiting branches of the vegetatives was 33 per cent less than on the corresponding node on the main-stalk fruiting branches. Square shedding from nodes 2 and 3 and from branches of but one node only was very much greater than from these nodes on the fruiting branches of the main stalks, and the proportion of squares to develop into mature bolls was necessarily very low. The last node of fruiting branches of two or more nodes on the vegetative limbs was only slightly different from the same class on the main stalks in 1925.

TABLE 8.—*Number of squares produced, shed, and developed into open bolls on specific nodes of fruiting branches on the vegetative limbs borne by the Pima main stalks shown in Table 6, season of 1925*

Plant No.	Node 1			Node 2			Nodes 3 to last			Last node only			Branches of 1 node only		
	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed
	Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed	
1 to 6															
7	2	0	2	2	2	0				2	2	0	10	8	2
8															
9	9	1	8	8	7	1	5	4	0	8	8	0	5	5	0
10															
11	6	3	1	5	5	0	1	1	0	5	5	0	4	4	0
12															
13	20	1	7	18	17	0	3	3	0	18	18	0	13	13	0
14	16	0	13	16	14	1	6	6	0	16	16	0	15	15	0
15													27	27	0
16	5	3	1	3	2	0	2	2	0	3	3	0	9	9	0
17															
18	9	3	5	9	7	2	6	5	1	9	8	1	4	4	0
19															
20	3	2	0	2	2	0				2	2	0	4	3	0
Total	70	13	37	63	56	4	23	21	1	63	62	1	91	88	2
Percentage	----	18.6	52.9	----	88.9	6.3	----	91.3	4.3	----	98.4	1.6	----	96.7	2.2

Data on the production of squares and bolls on the fruiting branches borne by the vegetative limbs of the 20 Acala plants in 1924 and 1925 are given in Tables 9 and 10. As more long-jointed fruiting branches were developed on the limbs in 1925, data are shown for an additional node that season.

The shedding of squares from the fruiting branches of the vegetative limbs of the Acala was similar to that on the vegetative limbs of Pima, in that shedding from the first node was but little different from that on the same node of branches on the main stalks, but showed a rapid increase on the next and succeeding nodes. The proportion of squares developing into mature bolls was slightly lower on the first node of the branches of the vegetative limbs than on those of the main stalks, but fell sharply on the following nodes; and on nodes 3 to last in 1924 and on nodes 4 to last in 1925 no bolls whatever were matured. In both years the proportion of squares shed or developed into bolls on the last node of the fruiting branches of the vegetative limbs did not differ materially from the proportions on the last node of long fruiting branches on the main stalks in the same season.

On fruiting branches of but a single node in 1924 the percentage of square shedding was greater than on nodes 1 or 2 of the longer branches, and the percentage of squares maturing as bolls was less. In 1925 the percentage of square shedding on the single-node branches was greater than on any of the specified nodes of longer branches, and the percentage of squares maturing into bolls was less than on nodes 1, 2, or 3 of the longer branches.

From the preceding tables and discussion it is obvious that in both Pima and Acala cotton the conditions for retention of squares and bolls are less favorable on the fruiting branches borne by the vegetative limbs than on the fruiting branches borne by the main stalks of the plants.

TABLE 9.—*Number of squares produced, shed, and developed into open bolls on specific nodes of fruiting branches on the vegetative limbs borne by the Acala main stalks shown in Table 7, season of 1924*

Plant No.	Node 1			Node 2			Nodes 3 to last			Last node only			Branches of one node only		
	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed
	Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed	
1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----	----	----	----	----	5	5	0
3	9	3	1	9	7	0	2	1	0	9	7	0	28	15	1
4	1	1	0	1	1	0	----	----	----	1	1	0	22	16	2
5	1	0	0	1	1	0	----	----	----	1	1	0	10	7	0
6	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
7	16	4	3	16	6	4	5	3	0	16	8	1	14	12	0
8	2	1	0	2	1	0	1	1	0	2	1	0	18	14	0
9	15	2	2	15	11	0	1	0	0	15	11	0	25	14	1
10	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
11	5	0	0	5	2	0	----	----	----	5	2	0	7	5	1
12	7	2	1	7	6	0	1	1	0	7	6	0	28	21	3
13	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
14	3	1	1	3	2	0	1	0	0	3	2	0	13	7	2
15	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
16	----	----	----	----	----	----	----	----	----	----	----	----	4	3	0
17	1	0	0	1	1	0	----	----	----	1	1	0	19	13	0
18	9	1	3	9	5	1	3	3	0	9	8	0	17	11	1
19	9	2	4	9	4	0	1	0	0	9	3	0	37	16	2
20	17	7	1	17	9	0	10	7	0	17	12	0	31	20	0
Total	95	24	16	95	56	5	25	16	0	95	63	1	278	179	13
Percentage	----	25.3	16.8	----	58.9	5.3	----	64.0	0	----	66.3	1.1	----	64.4	4.7

TABLE 10.—*Number of squares produced, shed, and developed into open bolls on specific nodes of fruiting branches on the vegetative limbs borne by the Acala main stalks shown in Table 7, season of 1925*

Plant No.	Node 1			Node 2			Node 3			Nodes 4 to last			Last node only			Branches of one node only		
	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed	Squares		Bolls developed
	Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed		Produced	Shed	
1	4	1	0	1	1	0	----	----	----	----	----	----	1	1	0	6	6	0
2	2	0	2	2	2	0	----	----	----	----	----	----	2	2	0	11	11	0
3	31	12	12	28	18	5	18	15	2	8	7	0	28	27	1	4	0	3
4	6	1	1	6	6	0	----	----	----	----	----	----	6	6	0	18	18	0
5	25	4	4	23	14	2	8	7	0	1	1	0	23	23	0	6	6	0
6	12	2	4	11	7	0	7	7	0	1	1	0	12	11	1	5	5	0
7	8	2	1	8	8	0	2	2	0	----	----	----	8	8	0	13	12	0
8	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
9	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	7	7	0
10	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
11	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
12	12	1	0	12	8	0	4	3	0	1	1	0	12	12	0	----	----	----
13	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	4	3	0
14	25	10	5	18	15	1	8	7	1	2	2	0	18	18	0	1	1	0
15	7	0	1	7	5	0	3	3	0	----	----	----	7	7	0	4	4	0
16	16	3	5	14	9	1	8	7	0	4	4	0	14	14	0	15	15	0
17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	16	15	0
18	9	2	1	7	6	0	3	3	0	----	----	----	7	7	0	11	11	0
19	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
20	10	5	1	5	5	0	2	2	0	----	----	----	5	5	0	4	4	0
Total	167	43	37	142	104	9	63	56	3	17	16	0	143	141	2	125	118	3
Percentage	----	25.7	22.2	----	73.2	6.3	----	88.9	4.8	----	94.1	0	----	98.6	1.4	----	94.4	2.4

SHEDDING OF SQUARES FROM SPECIFIC NODES OF FRUITING BRANCHES

Elsewhere in this bulletin the position of a node of a fruiting branch upon which a square was borne has been shown to influence the length of time required for that square to reach the flowering stage. Therefore it seemed of interest to ascertain whether the same influence was exerted on the length of time a square persisted on a node before it fell and was recorded as a "shed." The ages at the time of shedding, for squares that appeared in 10-day intervals throughout the seasons of 1924 and 1925, on specific nodes of the fruiting branches of the 20 plants of Pima and of Acala cotton, are shown in Tables 11 and 12. In collecting the data the ages of the squares from the fruiting branches of the main stalks and of the secondary stalks or vegetative limbs were recorded separately, and they are so presented. In view of the few squares produced beyond the third node of fruiting branches in 1924, it was not thought advisable to make a class for node 4 in Table 11 for presenting the ages of squares which shed from this node, as was done in Table 12 for 1925.

In each variety and in both years a general increase in the age at which the squares were shed may be noted by comparing the early 10-day intervals with those later in the season. From the varying ages indicated for the nodes in each interval on the Pima, the location on the fruiting branch occupied by a square did not seem consistently to hasten or to retard the shedding of the square. On the

Acala a tendency may be noted for the outer nodes to retain squares longer than nodes nearer the main stalk, among squares that appeared at the same time. Squares on specific nodes of the fruiting branches of the vegetative limbs of both varieties appear to have been retained somewhat longer than those on corresponding nodes of the branches on the main stalks.

TABLE 11.—*Mean age at time of shedding of the squares that appeared in 10-day intervals throughout the season of 1924 on specific nodes of the fruiting branches of 20 Pima plants and of the fruiting branches on the main stalks and vegetative limbs of 20 Acala plants*

10-day interval	Pima			Acala			
				Main stalk		Vegetative limbs	
	Fruiting branch node	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)
June 16 to 25	1	36	13.056±0.403	19	13.211±0.986	9	12.667±1.011
	2	24	11.917± .568	17	10.471± .496		
	3	13	11.769± .286	16	9.562± .845		
June 26 to July 5	1	25	13.400± .652	23	9.522± .549	50	13.360± .612
	2	27	12.444± .654	27	9.852± .879	8	13.125±1.458
	3	15	11.733± .549	27	8.000± .560		
	4 to last	4	8.000±1.012	52	13.981± .681		
July 6 to 15	1	8	14.000±1.066	14	11.286± .930	51	14.725± .730
	2	19	13.789± .638	17	10.235± .868	26	14.923± .603
	3	22	14.818± .586	11	12.182±1.683		
	4 to last	9	14.667± .861	99	17.192± .348		
July 16 to 25	1	6	14.333± .588	11	12.909±1.400	41	16.805± .615
	2	37	14.622± .608	19	14.579± .858	20	13.900± .597
	3	49	12.633± .458	23	13.435± .818		
	4 to last	36	12.472± .550	115	17.609± .348		
July 26 to Aug. 4	1	4	17.500±1.106	9	18.222±2.228	14	18.500±1.131
	2	18	14.667± .730	18	18.722± .849	11	12.909± .928
	3	18	15.778±1.097	15	19.400± .724		
	4 to last	16	13.500± .823	62	20.645± .443		
Aug. 5 to 14	1	4	15.500±1.609	4	17.500±2.964	3	17.333±3.137
	2	16	18.312± .904	10	19.500±1.399		
	3	33	15.212± .527	9	18.778± .935		
	4 to last	52	17.538± .532	16	19.625±1.038		

In recording the ages of the squares which shed in 1925 it was observed that many of the Acala squares which shed from the last node of the fruiting branches on the main stalks or on the vegetative limbs and many of those which shed from the fruiting branches of one node, at the top of the main stalks or of the vegetative limbs, were abnormally old when shed. These squares had been noted during the growing season, and it was observed that after they reached a size of several millimeters in diameter they grew very slowly or remained entirely dormant through long periods of observation. Such squares were never seen to resume normal growth and to flower, but in every case they eventually withered and shed. In preparing Table 12 all squares of both Pima and Acala at the ends of long fruiting branches and on branches of only one node, at the top of the main stalks and of the vegetative limbs, were omitted, but such data are shown separately in Tables 13 and 14. The ages of the squares are arranged in 10-day intervals, based on the date of appearance of the squares, throughout the season. So few of the squares which shed in 1924 from these positions were older than those which fell from the inner nodes of the fruiting branches that they were included in Table 11.

The only reason suggested for more squares having a dormant stage before shedding in 1925 was that the plants were carrying a much larger crop of bolls throughout the season than in the preceding year, so that stress conditions may have been more severe on the outer nodes of the fruiting branches and on the short branches at the top of the plants. At least there was some condition that caused the squares to cease growing, perhaps a lessened food supply. No greater lengthening of the period before shedding was observed for any of the squares borne on the single-noded fruiting branches at the base of the main stalks of the vegetative limbs than on node 1 of longer fruiting branches, and they were included in the data under node 1 in compiling Table 12.

TABLE 12.—*Mean age at time of shedding of the squares that appeared in 10-day intervals throughout the season of 1925 on specific nodes of the fruiting branches of 20 plants each of Pima and Acala cotton, data for main stalks and vegetative limbs being considered separately*

10-day interval	Fruiting branch node	Pima				Acala			
		Main stalk		Vegetative limbs		Main stalk		Vegetative limbs	
		Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)
June 8 to 17	1	13	11.538±0.625	10	11.000±1.251	21	8.619±0.542	20	13.050±0.902
	2	31	13.032± .278			20	9.300± .733		
	3	18	10.778± .354			13	8.923±1.224		
	4					9	10.889±1.168		
June 18 to 27	1	8	12.875±1.833	30	19.867± .961	17	10.176± .834	24	16.083± .760
	2	14	14.500±1.297			16	8.875± .791	15	16.600± .744
	3	15	16.933±1.350			13	12.923±1.503		
	4	12	22.667±1.470			26	14.654± .850		
	5					21	16.571±1.014		
June 28 to July 7	1	6	19.333±1.971	18	21.222± .984	11	14.818±1.025	12	18.667±1.110
	2	13	18.846± .907	4	20.500± .377	19	14.211± .815	6	19.500±1.769
	3	24	15.708± .366			16	14.687± .808	5	16.200± .400
	4	15	19.200± .446			31	17.452± .545		
	5	14	18.714± .588			26	16.923± .641		
July 8 to 17	1	4	24.500±1.204	12	18.835±1.315	4	19.250±1.398	6	28.167±1.324
	2	17	15.706± .791	5	20.400±1.510	8	19.750±1.811	7	24.429±1.535
	3	20	15.200± .446			14	19.786±1.516		
	4	21	18.952± .881			17	18.941± .914		
	5	10	19.600±1.137			10	22.100±1.313		
July 18 to 27	1	4	15.000±1.328	7	19.143±1.303	5	13.000± .895		
	2	16	16.125± .690	6	15.333± .519	8	16.875± .786		
	3	13	15.154± .381			16	14.937± .975	4	18.500±1.106
	4	15	21.933±1.260			10	20.000±1.421		
	5	4	20.000±1.328			21	22.048± .755		
July 28 to Aug. 6	1	3	26.667±1.863			6	20.000±1.582		
	2	12	15.833± .888			4	21.000±1.390		
	3	12	16.583± .747						
	4	3	17.667±1.324			4	21.000± .413		
	5	6	20.000± .967			5	18.200± .818		

In Tables 13 and 14 the squares that were shed from the last node of long fruiting branches of the Pima, either on the main stalks or on the vegetative limbs, were not appreciably different in age from those shown in Table 12, whereas those from the short one-node branches at the top of the main stalks or of the vegetative limbs were older, although the difference in age might not appear so great with a larger population in this class. In the Acala the squares on the last node of long fruiting branches and those on branches of one node only, at the top of the plants, were considerably older when shed than squares in the corresponding 10-day intervals shed from specific nodes, as shown in Table 12.

TABLE 13.—*Mean age at time of shedding of the squares that appeared in 10-day intervals throughout the season of 1925 on the last node of all fruiting branches of two or more nodes and upon fruiting branches of one node only at the top of the main stalks of 20 plants each of Pima and Acala cotton*

10-day interval	Pima				Acala			
	Last node only		Branches of one node only		Last node only		Branches of one node only	
	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)
June 8 to 17	27	10.222±0.804	----	----	----	----	----	----
June 18 to 27	14	16.643±1.450	----	----	28	19.643±1.237	----	----
June 28 to July 7	44	19.523± .507	----	----	71	28.394± .906	----	----
July 8 to 17	80	18.525± .537	----	----	56	27.036± .859	3	29.000±1.770
July 18 to 27	50	17.320± .590	3	24.000±2.861	68	24.250± .788	5	31.600±1.216
July 28 to August 6	62	17.597± .459	----	----	66	24.439± .535	7	25.143±1.274
August 7 to 16	99	17.899± .328	13	22.154± .786	36	18.583± .537	10	24.100± .877

TABLE 14.—*Mean age at time of shedding of the squares that appeared in 10-day intervals throughout the season of 1925 on the last node of all fruiting branches of two or more nodes and upon fruiting branches of one node only at the top of the vegetative limbs of 20 plants each of Pima and Acala cotton*

10-day interval	Pima				Acala			
	Last node only		Branches of one node only		Last node only		Branches of one node only	
	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)	Number of squares	Age at time of shedding (days)
June 18 to 27	----	----	----	----	22	19.636±1.167	6	15.833±0.403
June 28 to July 7	3	17.667±4.293	----	----	22	29.227±1.122	14	26.929±1.556
July 8 to 17	20	20.600± .739	----	----	33	30.212±1.189	14	40.429±2.716
July 18 to 27	17	17.294± .854	----	----	17	31.000±1.627	10	24.500±3.025
July 28 to August 6	9	13.333±1.002	4	25.750±2.436	16	24.427±1.433	4	30.750±2.561
August 7 to 16	11	17.273± .868	5	22.400± .845	8	21.000±1.862	5	31.200± .510

BOLL SHEDDING FROM SPECIFIC NODES OF FRUITING BRANCHES

In connection with the shedding of squares from specific nodes of the fruiting branches of the two varieties, it was thought to be of interest to determine whether the percentage of boll shedding was different on the inner and outer nodes of these branches. Table 15 gives the percentage of bolls shed from specific nodes of the fruiting branches on the main stalks and vegetative limbs of the 20 plants of Pima and of Acala for 1924 and 1925.

When only a few flowers were produced on certain nodes, no percentages for boll shedding from these nodes are given in this table. A progressive increase may be noted in the severity of boll shedding from the basal or inner nodes to those farther out on the fruiting branches, both on the main stalks and on the vegetative limbs of the two varieties and in both seasons. A higher degree of boll shedding occurred from branches of the vegetative limbs than from corresponding nodes on branches of the main stalks. From the variations exhibited by the percentages of shedding from the last node of long fruiting branches or of branches of only one node it is impossible to determine what the behavior of these nodes might be in regard to boll shedding.

In relation to the features of boll shedding dealt with here, it may be pointed out that Zaitzev (*21*), working in Turkestan, found that boll shedding on upper branches was greater than on lower branches and also that the shedding was increased toward the ends of the branches on any part of the main stalk.

TABLE 15.—*Percentage of bolls shed from specific nodes of the fruiting branches on the main stalks and vegetative limbs of 20 plants each of Pima and Acala cotton in 1924 and 1925*

Season, variety, and parts	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Last node only	Branches of one node only
Season of 1924:								
Pima—								
Main stalks	15.1	13.1	22.9	29.6	48.9		32.5	26.6
Acala—								
Main stalks	74.9	79.0	82.6	91.6	88.7	82.4	93.3	78.6
Vegetative branches	77.5	87.2	100				96.9	92.0
Season of 1925:								
Pima—								
Main stalks	5.6	8.1	17.3	25.2	34.4		47.6	0
Vegetative branches	35.1	44.9						
Acala—								
Main stalks	55.1	60.9	79.6	84.6	83.9		53.0	33.3
Vegetative branches	70.2	76.3						57.1

DEVELOPMENT OF BOLLS ON SPECIFIC NODES OF FRUITING BRANCHES

The length of time required for bolls to mature on specific nodes of the fruiting branches on the main stalks of both varieties was determined in 1924 and 1925 in order to compare the periods of bolls which began developing on the same date when these bolls were located on inner and outer nodes. These boll periods are given in Table 16. No periods are given in the last 10-day interval for Pima, as some of the bolls which developed from squares of this interval were injured by an early frost which affected their normal opening. The bolls of Acala developed from squares coming in this same interval escaped injury, as the shorter square and boll periods allowed the bolls to reach maturity earlier and to open before the frost came.

In comparing the records of the two years the boll periods in 1925 are seen to have been materially longer than in the previous season. Some lengthening of the boll periods possibly was caused by the plants having to develop a larger number of bolls than in 1924. Also several rains which fell while the cotton was opening and a flood on September 19 which held the field under a foot of water for a day and a half caused excessively high humidity in the field and undoubtedly contributed a great deal to the slower maturing of the crop.

Comparing the boll periods of inner nodes with those of outer nodes in each variety, numerous cases may be observed where the outer node had a significantly longer period than the inner node, and as was found in determining the square periods of specific nodes the boll period seems to be lengthened the farther out on the fruiting branch the boll is. What appears to be an exception to this is found in the last three intervals on the Pima in Table 16. In each of these intervals the bolls on inner nodes required longer to develop than did those farther out on the branches. As the bolls which developed from squares produced in these intervals were maturing at the time of high humidity and during the flood just mentioned, it is believed that these factors retarded the ripening of the bolls on the inner nodes, whereas the bolls on the outer nodes received more sunlight and better air circulation, and ripening proceeded without as much check. Although bolls on inner nodes of the fruiting branches of the Acala opened in less time than those on the outer nodes, the periods of all bolls, regardless of their position, appear to have been abnormally increased.

TABLE 16.—*Average length of time between flowering and maturing of bolls of 20 plants each of Pima and Acala cotton in 10-day intervals on specific nodes of the fruiting branches of the main stalks, 1924 and 1925*

10-day interval based on appearance of squares	Fruiting branch node	Pima		Acala	
		Number of bolls	Average maturing period (days)	Number of bolls	Average maturing period (days)
Season of 1924:					
June 16 to 25	1	29	52.034±0.293	21	47.239±0.293
	2	14	52.000± .477	17	49.294± .302
	3	---	---	5	50.800± .443
June 26 to July 5	1	46	55.261± .243	9	48.222± .348
	2	14	54.714± .382	3	47.333± .661
	3	7	59.714±1.440	---	---
	4 to last	3	63.333± .663	---	---
July 6 to 15	1	69	59.580± .361	9	49.000± .437
	2	49	61.367± .473	7	51.714± .922
	3	25	62.800± .857	12	55.000± .797
	4 to last	10	65.600±1.577	3	55.000±1.211
July 16 to 25	1	---	---	24	58.208± .737
	2	---	---	13	57.308±1.133
	3	---	---	12	57.417±1.359
	4 to last	---	---	11	58.818± .745
Season of 1925:					
June 8 to 17	1	108	54.231± .197	40	49.800± .500
	2	44	55.000± .279	15	49.467± .586
	3	13	56.923± .473	---	---
June 18 to 27	1	44	61.068± .232	23	52.000± .362
	2	27	61.778± .383	26	52.269± .335
	3	19	63.684± .399	4	50.750± .088
	4 to last	6	64.000± .450	3	52.667± .112
June 28 to July 7	1	49	65.429± .369	15	55.333± .527
	2	43	65.093± .436	13	56.923± .690
	3	21	64.810± .523	8	58.500±1.508
	4 to last	13	64.462± .561	---	---
July 8 to 17	1	34	71.412± .483	22	61.682± .836
	2	26	69.769± .535	12	65.250±1.082
	3	16	68.875± .587	7	70.286±1.201
	4 to last	10	66.800± .617	5	69.400± .690
July 18 to 27	1	20	68.950± .485	12	68.583± .342
	2	20	68.550± .662	5	68.800±1.069
	3	10	67.700± .695	---	---
	4 to last	8	65.250± .761	3	74.000±2.226

It is of interest in connection with these data to note that Zaitzev (*21*) found that flowers produced in an interval of approximately 10 to 15 days matured into open bolls in less time on the upper fruiting branches of the plants than on the lower ones. The upper bolls under these conditions would necessarily be on nodes closer to the main stalks than those of the same date on the lower fruiting branches. He suggested that "better nutrition of the higher bolls . . . and their stronger illumination" might account for the more rapid opening of the upper bolls. There is evidence, however, that the light factor has but slight direct effect on boll periods, as the inner bolls shown in Table 16, other than the exception just mentioned, matured more rapidly than those of the same date farther out on the fruiting branches, although the latter were exposed to much more light.

The average boll period for each node of the fruiting branches on the main stalks of the Pima and Acala plants in the 1924 and 1925 seasons and the average period of all the bolls produced by the main stalks in these seasons are given in Table 17. In comparing the boll periods of the specific nodes of the Pima branches with those on the same nodes of Acala branches in 1924, the Acala is seen to have developed mature bolls in 5 to 7 days less time than the Pima. In 1925 the Acala bolls on nodes 4 to last required as long to mature as those in the same position on the Pima, but the other nodes of Acala branches developed mature bolls in considerably less time than corresponding nodes of Pima branches. The difference each season between the periods of all bolls of the two varieties showed that bolls of Acala ripened in about 5 days less time than those of Pima. Nearly as great a difference in the average square period existed between the two varieties, and the average time from the appearance of a square until it reached maturity as an open boll was 9 or 10 days less for the Acala than for the Pima.

TABLE 17.—*Average boll period for each node on fruiting branches borne by the main stalks of 20 plants each of Pima and Acala cotton in 1924 and 1925 and the average period of all bolls produced by the main stalks in these seasons*

Season and fruiting branch node	Pima		Acala	
	Number of bolls	Average maturing period (days)	Number of bolls	Average maturing period (days)
Season of 1924:				
1	144	56. 681±0. 261	63	51. 810±0. 531
2	77	58. 455± . 441	40	52. 175± . 581
3	33	62. 061± . 734	31	54. 839± . 705
4 to last	13	65. 077±1. 235	14	58. 000±1. 078
1 to last	267	58. 266± . 239	148	53. 128± . 338
Season of 1925:				
1	256	61. 020± . 308	112	55. 339± . 483
2	161	62. 969± . 351	71	55. 887± . 586
3	79	64. 430± . 376	23	61. 130±1. 337
4 to last	38	65. 184± . 329	14	65. 071±1. 688
1 to last	534	62. 408± . 196	220	56. 741± . 378

BOLL PERIODS AFFECTED BY FRUIT ON PRECEDING NODES

An attempt was made to find whether the presence of bolls on the inner nodes of the fruiting branches caused a lengthening of the period required for bolls to reach maturity on the outer nodes. This was determined by comparing the maturing periods of bolls of the same date on a specific outer node of the fruiting branches when the preceding node bore a boll and when the preceding node was vacant. Only one case was found in which there were enough bolls in each of the necessary combinations for accurate information to be obtained. This case was found in the Pima variety in 1924 when the periods for bolls on node 2 produced from flowers of August 8 to 17 were compared in two groups—when a boll was present on node 1 and when node 1 was vacant. The mean period for bolls at the second node when the inner node was vacant was 61.778±0.782 days, but when a boll was present at the first node the period at node 2 was 65.454 ± 0.791 days, a difference of 3.676 ± 1.108 days, which shows the increased period as significant. On node 1, bolls of the same date as those on node 2 required a mean period of 62.076 ± 0.462 days to mature, giving evidence that bolls on the second nodes, when not preceded by a boll on node 1, developed in approximately the same length of time as for bolls at the first node.

PRACTICAL APPLICATION OF THE DATA TO COTTON GROWING

The facts shown by the preceding data have applications in cotton growing. The efficiency in the maturing of bolls is greatest on the inner or basal nodes of the fruiting branches and is greatly lessened on the outer nodes. The greater efficiency of the branches of the main stalks in this regard over those of the vegetative limbs is indicated. Plants without vegetative limbs and with short fruiting branches shed a smaller proportion of squares and develop a greater proportion of squares into mature bolls than do larger plants which have long fruiting branches and vegetative limbs.

A method of close spacing cotton plants, called the "single-stalk" method, by which the development of vegetative limbs is very greatly restricted and which places rather definite limits on the length of the fruiting branches, has been described in several publications (*5, 6, 7, 8, 20*). This method of growing cotton was evolved to take advantage of the facts above recognized and has usually resulted in earlier and larger yields than by following the old method of leaving the plants far apart in the rows, when long fruiting branches and many vegetative limbs are produced.

With relation to cotton growing under boll-weevil conditions, data such as shown in this bulletin may be of special value in answering questions pertaining to the rapidity of square and boll development and to when these features of growth begin and the length of the periods in which they are active. Also in testing or comparing varieties of cotton the accumulation of similar data will allow a more complete analysis to be made of the various phases of fruit development than has been practicable in the past.

SUMMARY

In making a comparison of Pima Egyptian with Acala cotton at the United States Field Station, Sacaton, Ariz., in 1924 and 1925, data were obtained on several features of plant behavior in relation to fruit production. Records of phases of square and boll development were made throughout both seasons on 20 plants of each variety by methods that made it possible to compare not only the two varieties but the different parts of the plants and different periods of the growing season.

More floral buds or "squares" were produced by the Acala plants in each season than by the Pima plants. The shedding of buds in 1924 amounted to 37 per cent on Pima and 36 per cent on the main stalks of Acala but was 55 per cent on the vegetative limbs of the latter, square shedding from complete Acala plants amounting to 40 per cent.

Squares shed from the main stalks of Pima and Acala in 1925 amounted to 44 and 47 per cent, respectively; those shed from vegetative limbs amounted to 72.5 and 63 per cent, respectively; and the

shedding of squares from the main stalks and vegetative limbs combined was 47 per cent for Pima and 51 per cent for Acala.

In 1924 the 20 Pima plants, none of which had vegetative limbs, developed 50 per cent of their squares into mature bolls; the Acala plants with the main stalks and vegetative limbs combined developed only 11 per cent. In 1925, combining the data from main stalks and vegetative limbs of the Pima and of the Acala, the percentage of squares developing into mature bolls was 46 and 16 for the respective varieties.

The mean age at which Pima squares shed was the fourteenth day after appearance in 1924 and the seventeenth day in 1925. The mean age at which Acala squares shed was the fifteenth day in 1924 and the eighteenth day in 1925. More Acala squares shed when well advanced in age than in the case of the Pima, and the period in the development of a square in which it was likely to shed was longer for the Acala in both seasons.

Among squares of the same date those on the outer nodes of the fruiting branches of both varieties required longer periods to develop into flowers than those on the inner nodes, closer to the main axis of the plant. Also there was a lengthening of the periods on all of the nodes as the season progressed, though squares on second nodes usually developed more rapidly than those on the first or third nodes. The mean square period for Pima was slightly over 33 days in both seasons, and for Acala the period was 28 days in 1924 and 29 days in 1925.

On specific nodes of fruiting branches of both varieties the percentage of square shedding increased and the percentage of squares developing into bolls decreased toward the ends of the branches. Branches of one node only, both on the main stalks and on the vegetative limbs of both varieties, had a higher percentage of squares shed and a lower percentage of squares developing to mature bolls than on node 1 of longer fruiting branches. The last or outer node of all fruiting branches of two or more nodes on the main stalks and vegetative limbs of each variety shed a larger proportion of squares and developed a smaller proportion to mature bolls. Boll shedding from specific nodes increased appreciably in both varieties on the outer nodes of the fruiting branches.

The Pima and Acala squares were shed in shorter periods in the early part of the season than in the later. The position of a square on a fruiting branch of Pima did not materially hasten or retard the shedding of that square, as squares on inner nodes were not consistently shed earlier than those on the outer nodes. Squares which shed from the outer nodes of Acala branches were usually somewhat older than those which fell from the inner nodes.

The maturation period of bolls of the same flowering date was longer on the outer than on the inner nodes of the fruiting branches of both varieties. Boll periods on all nodes lengthened as the season progressed. The mean boll period for the season was about 58 days on Pima and about 53 days on Acala in 1924 and about 62 days on Pima and 57 days on Acala in 1925.

The boll period on node 2 apparently was lengthened by the presence of a boll on node 1. When node 1 bore no boll, the boll on the second node developed in as short a time as a boll on the first node would have required.

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