

The irradiator involved consists in principle of three 15 watt germicidal tubes mounted four inches above a cardboard plate. Pollen is exposed as an agitated cloud atop this vibrating plate. Inch high sides allow the cloud to be shifted back and forth to avoid pooling. A one minute exposure, as used in these studies, gives approximately a 50% mortality. Complete mortality has resulted from four minutes of exposure. Plate capacity is such that an individual exposure in the recurrent irradiation study involves the bulked pollen of ten plants. A 110-160 volt AC car generator enables a closed laboratory (station wagon) to be placed right beside the rows to be worked.

E. E. Gerrish

COLORADO STATE UNIVERSITY
Fort Collins, Colorado
Department of Agronomy

1. The Colorado corn collection.

Colorado is still a fertile source of open-pollinated corn varieties, even though hybrids are rapidly becoming predominant. The percentage of corn acreage planted to hybrid seed in Colorado may be compared with that for the United States as follows (Colorado Agricultural Statistics, 1956 Final, 1957 Preliminary: 41; 1958 Final, 1959 Preliminary: 51):

<u>Year</u>	<u>Colorado</u>	<u>United States</u>
1940	1.9%	30.5%
1950	52.0%	78.0%
1959	81.5%	94.8%

In order to preserve sources of genetic diversity, a number of open-pollinated varieties were collected during the autumn season of 1960.

Although the climate of Colorado is generally cool and dry there is a great diversity of environments. Corn is grown at elevations of 3500 feet in the northeast and southeast to 8000 feet in the San Luis Valley of south central Colorado. The growing season for corn varies from 100 days in the San Luis Valley to 190 days at Grand Junction on the Western Slope. Dryland corn is grown on the sandy soils of the eastern plains under an average annual precipitation of 15 to 18 inches. In 1958 irrigated corn accounted for 68 percent of the total acreage and 87 percent of the total production in the state.

The open-pollinated varieties tend to be grown in "clusters" within certain regions. This is particularly true in the drylands. In such cases some of the samples are undoubtedly quite similar genetically; but through knowledge obtained concerning the morphology of each variety, its original source and the direction of any artificial selection that had been applied, obvious duplicates were avoided.

Each collection consisted, whenever possible, of approximately 50 ears or one-half bushel of shelled grain. An attempt was made to include 10 representative ears with each shelled sample. Many of the collections were made by county agents or the farmers themselves. The farmers were asked to select the sample in the same way that they would select their own seed. Thus, only a few of the collections are random samples.

The collections in table I are classified according to (1) endosperm type and (2) kernel color. The influence of two distinct sources can be noted. Most of the collections are derived from varieties which were brought across the plains by emigrants from the central states, beginning in 1858. Along the southern border of Colorado are vestiges of the Mexican strains (variegated colors, flinty and/or floury endosperm) which came in with the early penetration of Mexican settlers into the Rio Grande and Arkansas basins. While not commercially important, these types are particularly well-adapted to short, cool seasons, semi-arid conditions and high altitudes. In most cases 10 representative ears were chosen from each collection for measurement of ear length, ear diameter, and row number, and for determination of surface texture. The surface texture of an ear refers to the surface of the kernel tops and represents an average. A sample of ears, all medium rough to the touch, would be scored the same as one in which half the ears were rough and half smooth. The numbers or descriptions underlined in the case of kernel color and row number are modal classes.

In table II the length of culture does not necessarily represent the actual number of generations that have been grown, since farmers often use seed from a good year for planting in several successive years; there is, however, a general relationship. Relative maturity applies to the number of days from planting to the time at which a particular variety is well dented and safe from frost damage. This is difficult to determine accurately. In addition, a variety which matures in 85 days at 6500 feet may react differently at 8000 feet. Many of the maturity estimates are simply a combination of, e. g., knowledge that a variety has medium maturity for a certain area plus information on the planting dates and average growing season for the region. Because of the "premium" placed on maturity in Colorado there is a tendency to grow varieties which do not utilize the full growing season.

In table III the description "good" isolation refers to those varieties which have been grown for certification, in isolated areas or under careful supervision with respect to isolation. The length of time that selection was practiced for a certain character may range over the entire number of generations grown (most cases were of this type) or may represent a lesser number of generations. Under original source, both the parental strain and locality were listed, if known. The amount collected refers to the actual seed supply on store under refrigeration in the Department of Agronomy. Many varieties had germination percentages in excess of 95%, and only a few showed less than 80% germination. Some varieties had been stored on farms for several years prior to 1960.

Three pound samples of most of the collections have been placed in the National Seed Storage Laboratory at Fort Collins for permanent maintenance. Collection numbers with an asterisk in table I are those not stored in the National Laboratory.

This collection is not complete. An effort will be made to add more varieties, as well as more information on some of those already collected. Reference can be made to the March-April, 1961, issue of Colorado Farm and Home Research (in press) for additional, general information concerning the varieties and their contributors. It is hoped that some of these materials can be used in a corn breeding program for Colorado. They may also be of value in genetic studies and for breeding programs in other localities. One of the first steps in their utilization will be to obtain comparative data on production and other agronomic characteristics in several environments. The Department of Agronomy will be glad to furnish seed samples upon request.

David W. Crumpacker

Table I. Morphology of kernel and ear.

Collection Number	Endosperm Type	Kernel Color	100 Kernel Weight (gm.)	Cob Color	Ear Length (in.)	Ear Diameter (in.)	Row Number	Surface Texture of Ear
1	dent	yellow	33	red	7.5	2.0	12, <u>14</u> , 16, 18	rough
2	dent	yellow	33	red	7.5	2.0	<u>14</u> , <u>16</u> , 18, 20	rough
3	dent	yellow	28	red	7.5	2.0	<u>14</u> , <u>16</u> , 18	rough
4	dent	yellow	33	red	8.5	2.0	<u>14</u> , <u>16</u> , 18	rough
5	dent	yellow	29					
6	dent	yellow	32					
7	dent	yellow	35					
8	dent	yellow	28	red	8.0	2.0	<u>14</u> , 16, 18	rough
9	dent	yellow	29					
10	dent	yellow	30	red	7.5	2.0	<u>14</u> , <u>16</u> , 18	medium
11*	dent	yellow	30	red	7.0	2.0	<u>14</u> , <u>16</u> , 18	medium
12	dent	yellow	29	red	6.5	2.0	<u>14</u> , <u>16</u> , 18, 20	rough
13	dent	yellow	24					
14	dent	yellow	30	red	7.5	2.0	12, <u>14</u> , 16, 18	medium
15	dent	yellow, some white caps	29	red, some white	7.5	2.0	12, <u>14</u> , 16, 18	medium
16	dent	yellow	32	red	7.5	2.0	12, <u>14</u> , 16	medium
17	dent	yellow	32	red	7.5	2.0	10, <u>12</u> , <u>14</u> , 16	medium
18	dent	yellow	28	red	7.0	2.0	12, 16, <u>18</u> , 20	medium

Table I. (continued)

Collection Number	Endosperm Type	Kernel Color	100 Kernel Weight (gm.)	Cob Color	Ear Length (in.)	Ear Diameter (in.)	Row Number	Surface Texture of Ear
19	dent	yellow	30	red	7.0	2.0	12, <u>14</u> , 16, 18	medium
20	dent	yellow	35	red	9.5	1.5	<u>12</u>	smooth
21	dent	yellow	34	red	9.0	2.0	<u>14</u>	smooth
22	dent	yellow, some burnt orange, a few white caps	36	red	8.0	2.0	<u>12</u> , <u>14</u> , <u>16</u>	medium
23	dent	yellow	25					
			graded small					
24	dent	yellow	31	red	8.5	2.0	16, <u>18</u>	medium
25	dent	yellow	31	red	7.0	2.0	<u>12</u> , <u>14</u> , 16, <u>18</u> , 20	medium
26	dent	yellow	33	red	10.0	2.0	<u>14</u> , <u>16</u>	smooth
27*	dent	yellow	32	red	9.0	2.0	<u>14</u> , <u>16</u>	smooth
28	dent	yellow	31	red	8.0	2.0	12, <u>14</u> , <u>16</u> , 18	medium
29	dent	yellow	39	red	9.5	2.0	12, <u>14</u> , <u>16</u>	rough
30	dent	yellow	28	red	9.0	2.0	16, <u>18</u> , <u>20</u> , 22, 24	smooth
31	dent	yellow	33	red	8.0	2.0	<u>14</u> , <u>16</u> , <u>18</u> , 20	medium
32	dent	yellow	29	red, occasionally white	9.5	2.0	16, <u>18</u> , <u>20</u> , <u>22</u> , 24	rough
33	dent, occasionally light dent or flint	red, yellow, yellow with red stripes or sections, occasionally white caps	30	red, white	7.5	2.0	10, <u>12</u> , <u>14</u> , 16, 18	medium

Table I. (continued)

Collection Number	Endosperm Type	Kernel Color	100 Kernel Weight (gm.)	Cob Color	Ear Length (in.)	Ear Diameter (in.)	Row Number	Surface Texture of Ear
34	dent, occasionally flinty	red, yellow, <u>yellow with red stripes or sections</u>	20	red, white	6.0	1.5	12, <u>14</u> , 18	smooth
35	dent, some floury	red	35	red	9.0	2.0	<u>12</u> , <u>14</u> , 16	medium
36	dent	white	29	white	7.0	2.0	12, <u>14</u> , <u>16</u>	medium
37	dent	white	31					
38	dent	white	29	white	8.0	2.0	12, <u>14</u> , <u>16</u> , 18	medium
39	dent	white	35	white	8.5	2.0	12, <u>14</u> , <u>16</u> , 18	medium
40	dent	white	33	white	7.5	2.0	<u>12</u> , <u>14</u> , <u>16</u>	smooth
41	dent	white	30	white	8.5	2.0	<u>12</u> , <u>14</u> , 16	medium
42	dent, occasionally flinty	white	23	white	6.5	1.5	<u>10</u> , <u>12</u> , <u>14</u> , 16	smooth
43	dent, some flour and flint	white, some purple, a few yellow	28	red, white	7.5	2.0	12, <u>14</u> , <u>16</u>	medium
44	dent, flint	blue, purple, white, a few yellow	24	white, occasionally red	8.0	1.5	10, 12, <u>14</u>	smooth
45	flint, occasionally light dent	white	31	white	9.5	1.5	10, <u>12</u> , 14	smooth
46*	flint	white, yellow, olive, blue, red, pink, purple, occasionally red striped	23	white	6.5	1.5	8, <u>10</u> , 12	smooth

Table I. (continued)

Collection Number	Endosperm Type	Kernel Color	100 Kernel Weight (gm.)	Cob Color	Ear Length (in.)	Ear Diameter (in.)	Row Number	Surface Texture of Ear
47	flour, some flint	gray, blue, purple, occasionally white	19	white	6.5	1.5	<u>12</u> , 14, 16	smooth
48	flour, occasionally flinty	gray, blue, purple reddish-purple, some burnt orange and white	24	white	6.5	1.5	8, 10, <u>12</u> , 14, 16	smooth
49	flour, occasionally light dent or flint	gray, blue, purple occasionally white	28	white, occasionally red	7.5	1.5	<u>10</u> , 12, 16	smooth
50	flour, some flint	white, occasionally yellow or purple	23	white	7.0	1.5	10, 12, <u>14</u>	smooth

Table II. Information on environment and relative maturity.

Collection Number	Place of Culture	Length of Culture (yr.)	Approximate Annual Precipitation (in.)	Approximate Elevation (ft.)	Relative Maturity of Variety (days)
1	N. W. of Haxtun, Logan Co.	13	17	4000	
2	N. W. of Dailey, Logan Co.	10	17	4000	105-110
3	N. of Haxtun, Phillips Co.	14	17	4000	
4	N. of Haxtun, Phillips Co.	37	17	4000	110-115
5	N. W. of Haxtun, Phillips Co.	36	17	4000	105-110
6	N. of Haxtun, Phillips Co.	20	17	4000	
7	N. W. of Haxtun, Phillips Co.	15	17	4000	
8	N. W. of Holyoke, Phillips Co.	10	18	3800	90
9	S. W. of Holyoke, Phillips Co.	9	18	3800	105-110
10	S. E. of Brush, Washington Co.	20-30	17	4600	
11	S. of Akron, Washington Co.		17	4600	
12	N. W. of Yuma, Yuma Co.	1	17	4100	
13	N. E. of Yuma, Yuma Co.	10-15	17	4100	
14	W. of Wray, Yuma Co.	25	17	3800	
15	N. of Wray, Yuma Co.	10	18	3800	
16	N. W. of Wray, Yuma Co.	2	18	3800	
17	S. of Eckley, Yuma Co.	15	17	4000	
18	N. E. of Flagler, Kit Carson Co.	27	16	4700	

Table II. (continued)

Collection Number	Place of Culture	Length of Culture (yr.)	Approximate Annual Precipitation (in.)	Approximate Elevation (ft.)	Relative Maturity of Variety (days)
19	N. E. of Burlington, Kit Carson Co.	4	17	3800	
20	N. W. of Eads, Kiowa Co.	more than 20	15	4300	115-120
21	N. W. of Eads, Kiowa Co.	more than 20	15	4300	120-125
22	E. of Drennan, El Paso Co.	39	15	6100	90
23	S. E. of Ft. Collins, Larimer Co.	34	I 1/	5100	105-110
24	E. of Pueblo, Pueblo Co.	35	I	4600	
25	E. of Pueblo, Pueblo Co.	82	I	4600	110
26	Calif. Mesa near Delta, Delta Co.	42	I	5300	
27	Western Slope, probably Mesa or Delta Co.		I		
		15	I	4500	95-100
28	Fruita, Mesa Co.		I	6100	
	Eckert, Delta Co.	20 or more	I	4700	
29	N. E. of Grand Junction, Mesa Co.	more than 15	I	4700	160-170
30	N. E. of Grand Junction, Mesa Co.	38	I	4500	120-130
31	W. of Fruita, Mesa Co.	3	I	4800	130-140
32	S. W. of Cortez, Montezuma Co.	about 30	I	6100	80-85
33	E. of Drennan, El Paso Co.	12	15	6500	
34	S. E. of Calhan, El Paso Co.		15	5000	
35	Purdy Mesa on Kannah Creek, Mesa Co.		I		

1/ Irrigated.

Table II. (continued)

Collection Number	Place of Culture	Length of culture (yr.)	Approximate Annual Precipitation (in.)	Approximate Elevation (ft.)	Relative Maturity of Variety (days)
36	S. of Dailey, Logan Co.	36	17	4000	100-105
	Iliff, Logan Co.	(total)	15	3800	
37	N. W. of Wray, Yuma Co.	25	18	3800	
38	N. of Wray, Yuma Co.	15	18	3800	
39	N. of Burlington, Kit Carson Co.	30	17	3800	
40	Arapahoe, Cheyenne Co.	over 20	16	4000	90
41	N. W. of Eads, Kiowa Co.	over 30	15	4300	
42	Calhan, El Paso Co.	about 50	15	6500	
43	W. of Walsenburg, Huerfano Co.	4	15	6300	
44	N. E. of Platner, Washington Co.		17	4400	
45	N. W. of Eads, Kiowa Co.	54	15	4300	95-105
46	Dolores Co.	1	16	6500	90-100
47	Chama, Costilla Co.		1	8200	80
48	San Pablo, Costilla Co.	39	1	8200	
49	W. of Walsenburg, Huerfano Co.	43	15	6300	
50	W. of Walsenburg, Huerfano Co.	90	15	6300	

Table III. Isolation, selection, source, and amount collected.

Collection Number	Isolation	Selection Practiced	Original Source of Variety	Amount Collected (lb.)
1		lodging resistance, 1-2 ft. ear ht., small cob, short shank, 16 rows; deep, well dented kernel, square base	Haxtun area, 1947	11.6
2	poor	earliness, 16 rows or more, deep kernel	Yuma area	22.8
3	fair	lodging resistance, heavy tassel, 3 ft. ear ht., short shank, 16 rows; deep, dark colored kernel	Haxtun area, 1946	12.6
4	good	short plant, 3 ft. ear ht., moderately rough ear, 16 rows, medium maturity	mixture of Minn. 13 and Reid Yellow Dent; Haxtun area, 1915	22.2
5	fair	16-18 rows; deep oily kernel, shallow yellow cap, some reddish color	Akron area, 1923	24.2
6	fair	moderately rough ear, 16 rows; oily kernel, deep color, square base	Haxtun area, 1938	23.8
7	fair	medium-large ear and kernel	Haxtun area	19.2
8	fair	earliness, rough ear; small, red cob; some reddish kernels	Haxtun area, 1949	13.6
9	fair	earliness	Yuma area, 1950	18.2
10	fair	kernels firmly packed on ear	Yuma area	17.8
11				0.9
12	fair		Yuma area	16.2
13	poor			46.4
14	fair	lodging resistance, 3 ft. or more ear ht., large ear, deep kernel	Yuma area, 1935	15.2

Table III. (continued)

Collection Number	Isolation	Selection Practiced	Original Source of Variety	Amount Collected (lb.)
15	poor			11.6
16	good		Eckley area	37.0
17	poor			12.6
18	good	ear size and shape	Minn. 13; Potter, Nebraska, 1930	51.6
19	poor	large ear	Wray area, 1956	5.4
20		12 rows; long, smooth ear; earliness	Lancaster Surecrop, Pennsylvania	15.0
21		14 rows, smooth ear, medium maturity	Lancaster Surecrop, Pennsylvania	3.8
22	fair	tall plant, thick stalk, 20 in. or more ear ht., medium rough ear, earliness	Drennan area, 1921	32.7
23	good	Colorado 13 type, earliness	Minn. 13; Longmont-Platteville area about 1915-1917	73.2
24	fair	Colorado 13 type	Minn. 13; Colorado Springs area, 1920	7.0
25	fair	Reid Yellow Dent type	Reid Yellow Dent Pueblo area, 1875	18.6
26	good	well filled ear, uniform row no.	Minn. 13; Fort Collins-Longmont area, 1918	6.4
27			Golden Glow	0.9
28	fair	ear of uniform diameter	Cedaredge area	16.6
29			Iowa Goldmine, Iowa	13.4

Table III. (continued)

Collection Number	Isolation	Selection Practiced	Original Source of Variety	Amount Collected (lb.)
30	fair		Uintah Basin, Utah, 1922; originally from Iowa	14.4
31	fair		Minn. 13; Utah, 1957	17.8
32	good	large, rough, ear, tightly packed kernels; red cob, deep kernel	Reid Yellow Dent x White Elephant; S. W. of Cortez, 1930	21.8
33	fair	yellow kernel with red stripes	Fountain area, 1948	39.5
34	good		Bloody Butcher	15.2
35			mixture of local white variety and an early white variety from Minnesota; Iliff, 1922-1924	12.4
36	good	cylindrical ear, 16 rows, white dent kernel		21.9
37	good	ear size, kernel depth	probably Iowa	40.4
38	good		Silvermine	11.6
39		large, uniform ear, white kernel		5.8
40	good	ear length, white cob		15.2
41		white dent kernel	native white dent	12.0
42	good		Iowa Silvermine; Calhan area, about 1910	13.4

Table III. (continued)

Collection Number	Isolation	Selection Practiced	Original Source of Variety	Amount Collected (lb.)
43	poor	white dent kernel	Mexico City, 1955	7.2
44				7.4
45		white flint kernel	Australian White Flint; Fort Scott, Kansas, 1906	10.2
46	poor		Maxwell, N. M., 1960	1.3
47	good	purple kernel	Chama area, grown for many years	3.0
48	good	dark red kernel and blue kernel		3.4
49	poor	purple kernel	Mexico, 1917	5.8
50	poor	white flour kernel	Taos, N. M., 1870	4.0