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COOPERATIVE MUSKMELON BREEDING PROGRAM IN TEXAS, 1955-67. NEW RATING.
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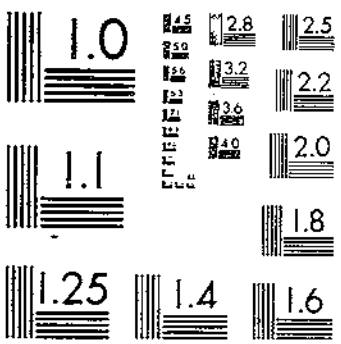

MICROCOPY RESOLUTION TEST CHART
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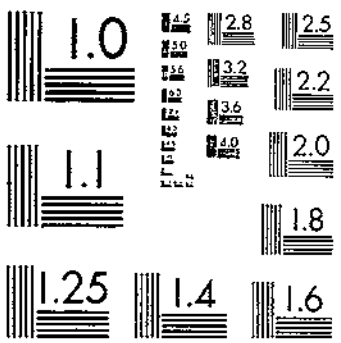

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Cooperative Muskmelon Breeding Program in Texas, 1955–67: New Rating Scales and Index Selection Facilitate Development of Disease-Resistant Cultivars Adapted to Different Geographical Areas

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Cooperative Muskmelon Breeding Program in Texas, 1955–67: New Rating Scales and Index Selection Facilitate Development of Disease-Resistant Cultivars Adapted to Different Geographical Areas

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INTRODUCTION

Muskmelon Crop Potential in South Texas

South Texas has great volume potential for early spring muskmelon production. The warm, humid climate and moderately alkaline soils can produce fast growth of luxuriant plants with good yields of high-quality fruits. Unfortunately, the climate also favors the dispersal and growth of injurious fungi, viruses, insects, mites, and nematodes. These pests increase growers' costs and risks, and reduce fruit yield and quality. The cooperative breeding program between the United State Department of Agriculture and the Texas Agricultural Experiment Station described here was directed toward the production of disease-resistant varieties to improve yield and quality of melons in the Lower Rio Grande Valley. The improvement trend, derived from index selection of breeding lines (*2*), is indicated by production figures of 1954 and 1967 (*25, 26*).[1] The 1954 plantings of 17,000 acres, mostly of powdery and downy mildew-susceptible cultivars of cantaloup, produced an average yield of 7,000 pounds per acre with a total value of $7,000,000; 1967 plantings of 12,500 acres, mostly of the downy and powdery mildew-resistant Perlita cultivar, produced an average yield of 10,500 pounds per acre with a total value of $11,000,000.

Early Cantaloup Breeding Efforts in Texas

Cantaloup breeding in Texas was initiated in the late 1930's by S. S. Ivanoff (*18, 19, 24*) with the crossing of an inbred strain of a

[1] Italic numbers in parentheses refer to Literature Cited, p. 24.

West Indian melon (Rocky Dew Green Flesh) with a strain of the Hale's Best variety (New Seed Breeder).

In 1945, Texas Resistant Cantaloup No. 1 (*20*) was released. It possessed acceptable resistance to melon aphids and downy mildew. The new variety improved yields but did not meet with shippers' and consumers' acceptance because of internal flesh breakdown at full-slip maturity.

In 1941, cantaloup breeding was initiated at the Lower Rio Grande Valley Research and Extension Center, Weslaco, Tex., by G. H. Godfrey (*10, 11, 12, 13*) with the crossing of a "wild" melon, *Cucumis melo* var. *Chito* Naud., and Hale's Best. The F_1 hybrid was outcrossed to a selected strain of Smith's Perfect. Several generations of inbreeding and selection led to release of the Rio Sweet variety. Rio Sweet was resistant to downy mildew but not to powdery mildew (*14*). Rio Sweet did not meet with consumer and shipper acceptance due to dull, green to yellow-green exterior, internal flesh breakdown, and watery seed cavity at the full-slip stage.

In 1953, the Center released the Rio Gold variety (*16, 17*), selected for rind color from the same three-way cross. Rio Gold possessed excellent resistance to downy mildew, but it was susceptible to powdery mildew. The internal quality of Rio Gold fruit was very good, but both flesh and rind were soft at full-slip maturity so that fruits were damaged excessively in long-distance shipments. Rio Gold also was subject to dry rind rot and to stem end decay of the ripe fruits. The variety was well adapted, however, for local market production.

Origin and Achievements of the Cooperative Program

The muskmelon breeding program begun in the late 1930's was expanded in 1955 to include Federal-State cooperative breeding experiments and, in the spring of 1956, to include evaluation trials at several locations in the Lower Rio Grande Valley. The cooperative trials were conducted with financial support of the Missouri Pacific Railroad, American Refrigerated Transit Company, Texas Citrus and Vegetable Growers and Shippers Association, and local growers and shippers.[2]

The cooperative Federal Grant Project, titled "Development of Shipping Type Cantaloupes for Different Regions in Texas and in Other Production Areas of the Nation," has resulted in (1) the development and release of three varieties of cantaloup suitable for production in the Lower Rio Grande Valley and three adapted for production elsewhere; (2) the origin of several cantaloup and honeydew

[2] We sincerely appreciate the generous support of W. C. Cook, W. R. Cowley, G. H. Godfrey, D. M. McLean, H. M. Meyer, B. A. Perry, R. O. Standridge, J. R. Wall, E. V. Wann, and T. W. Whitaker who assisted the authors at various times with the evaluation of plant materials in the field, and, during extended discussions, offered numerous helpful suggestions on testing procedures and on plant materials selected for further work.

breeding lines of potential merit; (3) significant observations on variation in breeding lines grown in different environments; and (4) the development of new breeding and evaluation techniques. The pedigrees of released cultivars and of breeding lines of noted merit, together with observations on breeding and evaluation techniques, are included in this report.

MATERIALS

The initial experimental plantings, begun in 1956 in the Federal-State Cooperative program, included a wide assortment of horticultural types so that the full range of adaptation would be sampled and the full potential for disease resistance existing in the species *Cucumis melo* L. would be exposed. Materials planted in later years conformed more and more closely to accepted commercial standards in plant and fruit characteristics, and consisted largely of line selections made at one of the three primary breeding centers of California, Texas, and South Carolina. A comparison of the area of selection in relation to breeding progress became one of the principal experimental objectives.

Breeding lines developed at the U.S. Vegetable Breeding Laboratory, Charleston, S.C.; the U.S. Horticultural Field Station, La Jolla, Calif.; the Lower Rio Grande Valley Research and Extension Center, Weslaco, Tex.; and at other places were compared with cultivar standards in single block plantings in commercial production fields at three to five locations[3] in the Lower Valley each year from 1956 to 1967. Entries were usually F_4 and later generation inbreds. The later trials included entries bred and selected in Texas from crosses between earlier entries developed by the different cooperators. Trial locations included Weslaco, Raymondville, Rio Grande City, Laredo, Crystal City, and occasionally other production centers in south Texas. The 12 annual, cooperative trials were planted and grown under the supervision of R. T. Correa in cooperation with muskmelon growers at the various locations.

CULTURAL METHODS

A small (25-hill=50-plant) plot of each of more than 100 entries was included in the block at each location during the early years. Larger plots were used in the more recent trials and the number of entries was reduced. Entries in most years were divided into a standard 25-hill group and an advanced 300-hill group. The small advanced group was selected on merit in previous trials. The large plots were more suitable than the 25-hill plots for evaluation of early- and late-maturing entries during a limited timespan of observation.

The plots were hand planted in the cooperating grower's field and grown like the field variety. Thus cultural methods as well as climate and soil varied among locations and years. The plants were grown on

[3] One or two of the plantings made at five locations were often destroyed before reaching maturity by inclement weather or insect and plant diseases.

low beds of alkaline soils with furrow irrigation until harvest, then left dry. Spacing ranged from 4×6⅔ feet to 2×6⅓ feet. Weeds were usually well controlled early in the season but were sometimes troublesome at harvest. All fields were treated with insecticides, but not all were treated with fungicides.

The climate was warm and humid with occasional showers or heavy rain during the growing season. The environments were often favorable for downy mildew (*Pseudoperonospora cubensis* (B. & C.) Clint) (*11*, *12*, *13*, *15*) and powdery mildew (*Sphaerotheca fuliginea* (Schlecht) Poll (=*Erysiphe cichoracearum* DC)) (*3*, *15*, *21*, *32*). Downy mildew was prevalent at Weslaco and Rio Grande City, while powdery mildew was prevalent at Laredo and Crystal City. Other diseases prevalent in occasional fields in some seasons included *Alternaria* leaf blight or target spot (*Alternaria cucumerina* (Ellis & Everhart) Elliot) (*15*), gummy stem blight or black rot (*Mycosphaerella melonis* Passerini) (*6*), tobacco ringspot virus, and watermelon mosaic virus (*22*, *23*, *30*, *31*). The degree of disease control by fungicidal dusts and sprays varied widely according to season, location, and treatment. Treatments often failed to prevent injury to powdery mildew- and downy mildew-susceptible varieties and breeding lines in one or more of the experimental plantings.

Aphids, leaf miners, and leafhoppers usually caused moderate injury; occasionally, they caused severe injury during late crop maturity. Fields were treated with insecticides, usually with good results.

In 1957, the first full-scale cooperative trial was begun. It included 15 cultivars and 126 breeding lines from various sources planted at five locations in Texas: Raymondville, Weslaco, Rio Grande City, Crystal City, and Laredo. Single, 25-hill (50-plant) plots of numerous entries were planted at each location to survey the relative merits of available plant materials, especially those untested in the area. Accordingly, 60 entries from Charleston, 40 from La Jolla, and 26 from Weslaco were compared with 15 cultivars.

At that time, it was believed that different varieties might be needed for the different districts. Environmental conditions differed substantially in the different locations scattered along a 180-mile strip of the Lower Rio Grande Valley. In addition to differences in weather, soils, irrigation water, and cultural methods, planting and harvesting were 5 to 15 days later in the northwestern districts. The growing seasons at Crystal City and Laredo were generally warmer, drier, and less cloudy than those at Rio Grande City, Weslaco, and Raymondville. Furrow irrigation was provided at all locations except Raymondville.

EVALUATION METHODS

Origin and Use of the 1 to 5 Rating Scale

The availability of rapid and relatively simple standard evaluation procedures, which ordinarily would be regarded as an essential prior condition to a cooperative breeding program, instead became one of

the experimental objectives. The evaluation systems in use at the three primary breeding stations (Charleston, La Jolla, and Weslaco) before 1957 were consolidated and tested during a trial and error period covering most of the early years of cooperation.

The major features of the rating system were adapted from those in use at the La Jolla station in which 18 prominent plant and fruit characters were scored on a 1 to 5 scale, with the higher value denoting greater acceptability. Some special merits of the 1 to 5 scale for rating disease resistance were described in 1953 (*1*). In using this scale, class 3 generally described specimens or breeding lines that were doubtful or intermediate in value, and could be considered either acceptable or unacceptable according to existing circumstances. This flexibility was very useful where selections were made under severe environmental stress.

Characters Evaluated

The field record sheets adopted in 1960 contained columns for 17 plant and fruit characters. Three of the characters (fruit size, shape, and net type) were first recorded in symbols, and two other characters (percent net cover and percent soluble solids) were recorded by measure; these five characters were later converted to 1 to 5 scale ratings as described in table 1. All other characters were scored on the 1 to 5 scale directly in the field. Such characters included plant vigor, general resistance (foliage condition), two specific diseases, earliness, appearance, stem size, crack resistance, flesh color, thickness, firmness, and dry cavity.

The symbols for fruit size refer to the number of fruits that can be packed in a standard jumbo crate, 13⅛ × 13½ × 22 inches, widely used for shipping cantaloups from Western States. Scoring of fruit size must have flexibility; for example, a size 18 melon would be unacceptably large for a netted cantaloup on Western wholesale markets, but would be acceptable (class 4) in a honeydew or casaba type. Similarly, the net scoring scales shown for netted cantaloups would not be applicable to net-free honeydew and casaba types.

Origin and Use of the Godfrey Net Class Code

The net classification system used in this report (see table 1, footnote 3, p. 6) is based on one prepared by G. H. Godfrey,[4] which was substantially modified by the authors during several years of use. It is now widely used by melon breeders in the South and West. Standardization of the net code is one of the principal achievements of the cooperative program.

[4] G. H. Godfrey, written commun., June 28, 1956.

TABLE 1.—*Conversion scores for rating five characters of cantaloup fruits*

Class	Fruit size score		Fruit shape score	Net type score	Net cover score	Soluble solids score	Other characters
	Melons per crate [1]						
	large	*small*	*Symbol* [2]	*Symbol* [3]	*Percent*	*Percent*	*Meaning*
1	10	------	I, Ob, L	B1−, C1−, N [6]	5–39	0–5	Extremely poor.
2	18	72	Ob, L	B2−, B3−, AS1−, C2−	40–59	5–8	Poor, unacceptable.
3	21	54	Off R, off O	A1+, A2−, B2+, C2+	60–69	9–11	Intermediate or doubtful.
4	27	45	R, O	A2+, AS2+, B3+	70–89	12–14	Good, acceptable.
5	36	36	R–O	A2++, A3+	90−	15–18	Excellent.

[1] A standard jumbo crate, 13⅜×13½×22 inches.

[2] I, irregular; Ob, oblate; L, long; off R, off round; off O, off oval; R, round; O, oval; R–O, round oval.

[3] Godfrey net class code: A1, round net, shallow; A2, round net, deep (like PMR 45); A3, round net, extra wide and deep (ropy); B1, flat net, shallow (like Persian); B2, flat net, deep (like Rio Gold); B3, flat net, extra wide and deep (like Honey Rock); C1, slender net, shallow (like Honey Ball); C2, slender net, deep; N, no net (like Honey Dew); S, prominent stripe "suture," or vein tract mostly free of net; +, net closely spaced (like PMR 45); −, scattered or scant net (like Smith's Perfect).

Disease Resistance Ratings

Many of the ratings on resistance to specific diseases proved to be without value because the prevailing level of infection was too low. Conversely, we found it very difficult to make reliable disease ratings where more than one disease was prominent. Consequently, the category "General Resistance" appeared to be the most useful characterization of plant performance in the field.

Selection Procedure

The modal class score (mode) for the three to five plantings was used as the final score for most characters in the selection index. However, only plantings in which a specific disease was prevalent were used for the specific disease ratings. Entries were selected on the basis of total performance at the several locations plus selected specific disease resistance ratings and grouped as follows: (1) Advanced to larger plots; (2) repeated as small plots; (3) improved before reentry; (4) used as parents in crosses; or (5) discarded.

RESULTS

1956–60

The experience of the 1957 cooperative program were typical of the early phase of the program. The diseases downy mildew, powdery mildew, and *Alternaria* blight were present at all locations. Those diseases were more abundant and severe at the more humid and overcast southern sites, and more critical leaf disease ratings were secured there. Gummy stem blight infections were sporadic and resistance could not be rated satisfactorily. Virus infections also were sporadic and resistance could not be confirmed.

There were no conspicuous examples of strong local adaptations among the 141 entries at the five locations. A variety with low vigor at one location also gave a weak vegetative response at all other locations. A variety resistant to a particular disease at one location gave a correspondingly resistant response at the other locations. Most entries were alike in size, shape, and quality characteristics at the different locations.

The findings established two important concepts for the prosecution of future trials and associated breeding work: (1) A single variety of cantaloup, or other muskmelon type, could be developed to serve the entire Lower Rio Grande Valley area; and (2) trials at the several locations could be treated as replications and summarized with a single average score for overall performance in any character.

The single-plot plantings at several locations served certain functions better than several replications at one location. First, the plantings at several locations exposed the material to a range of environments sampling the whole production area, and in 1 year yielded a more reliable estimate of general adaptation than would several rep-

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lications at one location. Second, the widely separated locations served as insurance from loss by inclement weather or other catastrophes. Indeed, the Crystal City planting was inundated and severely damaged by a late-season rainstorm in 1957; a planting at one or another location was often lost by inclement weather or severely damaged by drought, nematodes, virus, or other sporadic injury in other years. At least three of the five plantings were available for study each year.

None of the commercial varieties commonly grown in the Lower Rio Grande Valley in 1957 was judged to be adapted to culture in the area; all were susceptible to downy mildew, and several were also susceptible to powdery mildew and *Alternaria* blight (target spot). In the presence of these diseases, total yields included large proportions of cull fruits, and ratings on selected, firm fruit samples were below levels required for market quality in certain characters (table 2, group 1).

Even in the absence of severe disease, observations in some experimental and several commercial plantings indicated that popular standard varieties were variable in fruit size and related characters. These observations agreed with results reported later in California (*7*, *8*). Fruits of PMR 45, PMR 450, PMR 5, PMR 6, and Big River 6 (a grower's selection from PMR 6) were inclined to be excessively large, odd shaped, and with broad, bare sutures or vein tracts (*9*) in some fields, and too small but otherwise with good quality characters in others. Observations in subsequent years indicated marked seasonal variation as well as location-induced variation in fruit size and related characters in varieties and breeding lines adapted to culture in Arizona and California. In addition, fruit flesh was paler and duller in color and hue and less firm than it was in fruits produced by the same varieties in Arizona and California. The placental tissues were often broken down, producing wet-cavity (shaker) melons.

The winter melons, with one exception, were very susceptible to all three leaf diseases (table 2, group 3). The honeyball-type cultivar PMR 88 was highly resistant to powdery mildew and moderately resistant to downy mildew and *Alternaria*, but the soluble solids content of its fruit was low in the Lower Rio Grande Valley.

In contrast with commercial varieties, most of the breeding lines were resistant to one or more of the three leaf diseases that regularly reduce muskmelon yields and quality in the Lower Rio Grande Valley (table 2, groups 4 to 6). In 1957 and subsequent years the experimental plot could be recognized at a distance by the green, vigorous vines that contrasted with the yellow and brown discolored, nonthrifty vines of the adjacent commercial variety. Some of the breeding lines were resistant to all three leaf diseases.

Despite their resistance and resulting excellent plant condition, most of the breeding lines produced fruits with genetic defects that prevented their release for commercial production. Net size, net distribution, skin color, and fruit conformation or symmetry (the latter two characters not shown in the table) were the most common fruit defects. Outstanding breeding lines included C105, LJ 36607, W 57–123, and W 14. C105 had a brown rind, low soluble solids, and an insipid flavor (not shown); it produced an excess of long, oversize fruits in some plantings. Several useful and attractive selections were later obtained from C105. LJ 36607 also had low soluble solids con-

TABLE 2.—*Average performance of selected entries among 141 grown at five locations in the Lower Rio Grande Valley, 1957* [1]

[Class 1, extremely poor; class 2, poor, unacceptable; class 3, intermediate or doubtful; class 4, good, acceptable; class 5, excellent]

Entry	Source	Plot	Vigor	Condition	Downy mildew	Powdery mildew	*Alternaria* (target spot)	Rindspot	Earliness	Appearance	Size	Net size [2]	Net cover [2]	Sutureless	Crack resistance	Flesh color	Thickness	Firmness	Dryness	Soluble solids		Acceptability index	Total score
		No.	*Class*																	*Percent*	*Class*	*No.*	*Sum*
Group 1 (western cantaloup):																							
Sierra Gold	Commercial	114	3	2	2	2	3	5	3	4	5	4	4	3	3	3	4	3	3	8.0	2	6	58
PMR 45	do	111	4	2	1	2	3	5	3	4	5	4	4	3	3	4	4	4	4	10.8	3	10	62
PMR 450	do	113	4	2	2	2	----	---	3	4	5	4	4	3	3	3	4	3	2	6.8	2	(3)	(3)
SR 91	do	115	3	1	1	2	----	5	4	4	4	4	4	3	4	4	4	4	3	9.9	3	(3)	(3)
PMR 5	do	109	4	3	3	4	----	4	3	3	5	2	4	4	4	3	4	3	3	8.7	2	(3)	(3)
PMR 6	do	110	3	3	3	4	----	5	3	3	5	4	4	3	4	3	4	4	4	8.0	2	(3)	(3)
Big River 6	do	100	4	3	3	4	3	5	3	3	4	4	4	3	4	3	4	4	4	6.8	2	10	64
Group 2 (eastern cantaloup):																							
Edisto	Commercial	103	3	2	3	3	4	5	3	2	---	---	---	---	---	---	---	---	---	---	---	(3)	(3)
Purdue 44	do	108	3	2	2	2	----	5	4	4	4	2	4	4	4	3	4	4	3	6.0	2	(3)	(3)
Iroquois	do	106	3	1	1	1	2	5	4	3	4	2	2	3	4	2	4	3	3	7.6	2	5	49
CBR–1	Mesa, Ariz	102	3	2	2	2	2	3	3	3	5	2	4	4	4	4	4	4	3	6.9	2	7	56
Cu6–2 (Home-garden)	Charleston, S.C.	2	5	4	4	4	5	5	3	2	5	2	2	5	3	3	3	4	4	13.9	4	11	67

See footnotes at end of table.

TABLE 2.—*Average performance of selected entries among 141 grown at five locations in the Lower Rio Grande Valley, 1957*[1]*—Continued.*

Entry	Source	Plot	Vigor	Condition	Downy mildew	Powdery mildew	*Alternaria* (target spot)	Rindspot	Earliness	Appearance	Size	Net size [2]	Net cover [2]	Sutureless	Crack resistance	Flesh color	Thickness	Firmness	Dryness	Soluble solids	Acceptability index	Total score
		No.	*Class*																	*Percent*	*Class*	*No.*	*Sum*
Group 3 (winter melons):																							
Golden Beauty Casaba.	Commercial	104	3	1	1	2	4	---	2	---	---	---	---	---	---	---	---	---	---	5.5	1	(3)	(3)
Crenshaw, Casaba.	do	101	2	1	1	2	3	5	2	3	3	5	5	5	4	2	4	4	4	9.2	3	8	58
Honey Dew	do	105	3	2	1	2	---	---	3	3	4	5	5	5	5	2	3	5	5	12.4	4	(3)	(3)
PMR 88 (honeyball type).	La Jolla, Calif.	112	4	3	3	4	---	---	2	4	5	2	2	5	5	4	5	4	3	7.2	2	(3)	(3)
Group 4 (cantaloup):	Charleston, S.C.																						
C105	PMR 45 × LJ 32793.	7	5	4	4	4	4	5	4	4	5	4	4	3	4	3	4	4	4	9.2	3	15	72
C315	Ethiopian	19	4	4	5	5	5	---	2	2	5	2	2	4	3	4	3	4	4	13.4	4	(3)	(3)
C152	Rio Gold × Invanoff 482.	54	4	4	4	3	4	3	4	3	5	3	3	3	3	4	4	4	4	12.0	4	11	66
C154	Rio Gold × male sterile.	56	4	3	3	3	5	5	3	4	5	3	3	3	4	3	4	3	4	9.5	3	8	65
Fla 27–13	B. F. Whitner-Florida.	21	3	4	4	3	---	3	3	3	4	2	2	4	3	3	4	3	3	13.7	4	(3)	(3)

Group 5 (cantaloup):	La Jolla, Calif.																						
LJ 36607	F_{16} (45 × RC × 45).	64	4	3	3	4	4	5	4	4	5	4	4	4	4	4	4	4	4	9.7	3	15	71
LJ 36762	F_{11} (45 × RC × 124111).	66	4	4	4	4	4	3	3	3	4	4	4	3	4	3	4	4	4	9.1	3	12	66
LJ 36811	F_8 (45 × RC × 124111 × HD).	67	4	4	5	4	4	5	3	4	2	2	4	4	3	3	4	4	3	12.7	4	12	66
LJ 37261	F_9 (45 × RC × 124111 × HD).	73	3	4	5	4	5	5	3	3	2	2	4	4	3	4	4	3	4	12.0	4	11	66
LJ 37296	F_{18} (124111 × 45).	74	4	4	4	4	4	5	2	2	4	2	2	4	4	2	5	4	4	5.3	1	12	61
Group 6 (cantaloup):	Weslaco, Tex.																						
W 57–123	(RG × W13 × PMR 6).	123	5	4	4	2	3	2	4	4	5	4	4	4	4	4	4	4	4	10.8	3	14	68
W 14	(PMR 6 × RG 65).	127	5	4	5	4	2	4	3	4	5	4	4	4	3	4	4	4	4	12.7	4	15	71
W 17	(PMR 6 × RG 65).	131	5	4	5	3	3	3	3	3	5	2	4	4	4	4	4	4	4	12.4	4	12	68
W 44	Rio Gold	132	4	4	5	2	2	2	4	4	4	2	4	4	4	4	4	4	4	12.3	4	14	65
W 7	(PMR 6 × W 27).	139	3	4	4	5	2	3	4	4	4	2	4	4	4	3	3	3	4	11.9	3	10	63

[1] Data are from 1957 report to cooperators by C. F. Andrus and G. W. Bohn.

[2] Net size class 5 and net cover class 5 indicate freedom from net in Casaba and Honey Dew, but abundant high net in cantaloup and honeyball types.

[3] Information incomplete.

tent in the Lower Rio Grande Valley. It produced an excess of too small and too odd-shaped fruits for direct use. Plants of LJ 36607, like those of PMR 6, deteriorated from effects of a physiological crown blight in the absence of apparent parasitic disease in some fields. LJ 36607 served as one parent of breeding lines that produced Perlita. W 57–123 was susceptible to powdery mildew and *Alternaria* and produced fruits with a genetic rindspot causing rind decay in storage. Wescan was selected from W 57–123, which also served as the other parent of Perlita. W 14 was very susceptible to *Alternaria*.

Effort was expended in subsequent years, through direct selection and by crossbreeding and selection, to secure entries with combined resistance, good earliness and high yield, and excellence in all quality characters.

1961–65

The 5-year period 1961–65 resulted in much breeding progress. During this period, new breeding lines were selected from crosses among stocks previously found to have partial adaptation in the Lower Rio Grande Valley environment. Crossbreeding of entries (secured from the different cooperators) having complementary resistance and quality characteristics, coupled with alternating spring and fall selection in the Lower Rio Grande Valley and supplemented by seedling screening for resistance in greenhouses, ultimately yielded breeding lines of superior merit for the Lower Rio Grande Valley.[5] The yield included, among others, the cultivars Wescan, Perlita, and Dulce (*27*, *28*, *29*).

Trials to date have indicated that cultivars and breeding lines selected and adapted in the Lower Rio Grande Valley are not adapted to culture in the far western or in southeastern United States. In California, the plants grow satisfactorily but they produce fruits that are too small and odd shaped or with defective net and thin flesh. In South Carolina, the plants are unproductive and the fruits are undersized.

The cultivars Campo and Jacumba, developed by G. W. Bohn and T. W. Whitaker, were selected for early spring culture in California (*4*, *5*). They performed poorly in the cooperative trials in south Texas. The plants were vigorous, but Campo developed a nonparasitic crown blight in some fields, and both varieties produced oversized, odd-shaped fruits with sparse, coarse net, and pale-colored, soft, insipid flesh. The tendencies were noted in other California selections including some from crosses that responded favorably to selection in the Lower Rio Grande Valley.

The cultivar Gulfstream [6] began as a selection from entry 8 in the 1958 cooperative trials in the Lower Rio Grande Valley, but all sub-

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[5] BOHN, G. W., ANDRUS, C. F., and CORREA, R. T. MUSKMELON BREEDING—COOPERATIVE TRIALS IN THE LOWER RIO GRANDE VALLEY, 1963. U.S. Dept. Agr., Agr. Res. Serv., Crops Res. Div., 10 pp. 1963. [Mimeographed.] Available from authors.

[6] AGRICULTURAL RESEARCH SERVICE. NOTICE TO SEEDSMEN OF THE RELEASE OF CANTALOUP, GULFSTREAM. U.S. Dept. Agr., Agr. Res. Serv., Crops Res. Div., 1 p. 1967. [Mimeographed.] Available from C. F. Andrus.

sequent selections leading to its development were made at Charleston, S.C. Gulfstream has good adaptation in the southeastern and Gulf States but not in the Lower Rio Grande Valley. It also fails to perform favorably in California, just as the California selections fail in southeastern United States and Perlita fails outside Texas.

Evidently, there are environments peculiar to each of the three primary breeding areas that are not easily matched in the other two. Accordingly, a variety selected for adaptation in only one of the three areas lacks adaptation to the other two. However, a broader based adaptability in cantaloup varieties may eventually be achieved. Promising results were secured by Andrus and Bohn (*2*) from selection in a cyclic sequence of four environments.

In summary, the results of the cooperative work and related observations at this stage indicated that a single variety of cantaloup could be produced with adaptation to culture in the whole Lower Rio Grande Valley producing area, but there was little to encourage the idea that a variety with adaptation in one area could be selected exclusively at another, far-removed location.

1966–67

The 1966 cooperative trials in the Lower Rio Grande Valley included 56 cantaloup and 11 honeydew entries planted at five locations. The cantaloup entries included three older commercial varieties, one new variety developed in the project, 13 breeding lines from Charleston, four from La Jolla, and 24 from Texas. The honeydew type entries included commercial Honey Dew, five breeding lines from La Jolla, and five from Weslaco selected from a cross of downy mildew-resistant Charleston entry 64–28 with powdery mildew-resistant La Jolla entries 64–56 and 64–57.

Flooding rains destroyed two of the five trials so that only three plantings survived maturity in 1966. The wet, warm, and cloudy weather produced an epiphytotic of downy mildew. The disease was so severe that many commercial fields of susceptible cultivars were destroyed despite intensive spray programs. The continuous, severe attack by downy mildew caused moderate injury to commercial plantings of the resistant cultivar Perlita in very wet, humid locations that could not be treated regularly with fungicides. It caused injury, also, to several breeding lines that had shown no injury in earlier and drier years.

The warm, wet weather favored, also, severe infections by the target spot fungus, *Alternaria*. This provided a comparatively rare opportunity to evaluate the breeding lines for target spot resistance.

In contrast with the devastating attack by downy mildew and the severe attack by *Alternaria*, infections by powdery mildew were sporadic and mild, so that resistance to that disease could not be evaluated. Similarly, infections by tobacco ringspot virus and watermelon mosaic viruses were sporadic and mild.

The ratings for several plant and fruit characters, averaged over all plantings, registered marked superiority of the breeding lines in comparison with the cultivars (table 3). A rating of 4 or 5 (good

TABLE 3.—*Average performance of cantaloup and honeydew cultivars and selected breeding lines grown at three locations in the Lower Rio Grande Valley, 1966*

[Class 1, extremely poor; class 2, poor, unacceptable; class 3, intermediate or doubtful; class 4, good, acceptable; class 5, excellent]

Entry	Source[1]	Plot	Vigor	Condition	*Alternaria* (target spot)	Downy mildew	Yield	Earliness	Appearance	Stem scar	Size	Net type	Percent net cover	Cracks	Color	Depth	Firmness	Dryness	Soluble solids		Acceptability index	Total score
		No.	*Class*																*Percent*	*Class*	*No.*	*Sum*
PMR 45	Commercial	25	3	2	4	2	2	4	4	4	4	2	4	4	3	3	2	2	7.8	2	7	51
PMR 6	do	24	3	3	3	3	2	4	3	3	5	2	4	3	3	4	2	2	10.4	3	4	52
SR 91	do	26	2	2	2	2	1	4	4	4	4	2	3	2	3	3	2	2	8.7	2	4	44
63-5-8	Charleston, S.C	4	4	4	4	3	3	3	3	4	4	4	3	4	4	3	4	4	9.8	3	10	61
63-30-12	do	6	4	4	3	3	3	4	2	4	4	4	3	4	4	4	4	3	9.3	3	10	60
64-18	do	8	4	4	2	4	3	3	3	3	4	2	3	3	4	4	4	4	10.7	3	8	57
64-40-M1	do	12	4	4	2	4	3	4	3	3	4	2	3	3	4	2	3	3	11.4	3	6	54
WMR Jacumba	La Jolla, Calif	15	4	4	4	4	1	4	3	3	4	2	3	4	3	3	3	3	8.8	2	7	54
WMR ms[1]	do	16	5	4	2	3	1	4	2	2	4	2	2	3	3	4	3	3	9.7	3	5	50
PMR 13280	do	17	4	4	3	3	2	4	3	2	4	4	3	2	3	3	3	3	9.6	3	5	53
Perlita	57-123×57-64	36	4	3	3	3	5	4	4	3	4	4	4	4	4	3	4	4	10.9	3	11	63
W 5678	57-123×57-64	32	4	4	4	3	4	3	4	3	4	5	4	4	5	3	4	4	12.1	4	13	66
W 5 & 6-B	57-123×57-64	38	4	4	3	3	5	4	4	4	4	3	4	4	4	4	4	4	11.8	3	13	65
W 7 & 8-B	57-123×57-64	39	4	4	3	3	5	4	4	4	4	5	4	4	4	3	4	4	10.7	3	13	66
W 125	W 61.92×W 122	66	4	4	4	4	3	4	4	3	5	4	3	4	4	4	4	4	11.7	3	13	65
W 126	W 61.92×W 122	67	4	4	4	3	3	4	4	3	5	4	3	4	4	4	4	4	12.9	4	13	65

W 26	W 59.17×57–123	43	4	4	3	3	4	2	4	4	4	4	4	4	4	3	4	4	11.7	3	12	62
W 55	W 59.17×59–25	55	4	4	5	4	3	4	4	4	3	5	4	5	5	3	4	4	11.4	3	13	68
W 84–6	W 59.17×59–31	61	4	4	3	4	5	4	4	4	3	4	4	4	4	3	4	4	11.7	3	13	65
W 84–9	W 59.17×59–31	64	4	4	3	4	5	4	4	4	3	3	4	4	4	3	4	4	12.8	4	13	65
Honey Dew	Commercial	23	3	3	4	2	2	3	4	4	4	5	5	5	4	3	4	3	11.9	3	9	61
61051M (HD)	La Jolla, Calif	18	4	3	4	3	1	3	4	4	5	5	5	5	3	4	4	4	10.7	3	11	64
61087M (HD)	do	19	4	4	5	3	1	3	3	4	3	5	5	5	4	3	4	4	11.6	3	10	63
61090M (HD)	do	22	4	4	4	3	2	3	4	4	5	5	5	5	3	3	4	4	10.6	3	11	65
HD 3–S–B	64–28×64–56	27	4	4	4	4	2	4	3	4	5	5	5	5	4	4	4	5	13.3	4	15	70
HD 4–S–B	64–28×64–57	30	5	4	4	4	3	3	3	4	4	5	5	5	4	3	4	4	13.1	4	13	68
HD 5–B–B	64–56×64–28	31	4	4	4	4	2	4	4	4	4	5	5	5	3	3	4	4	13.8	4	14	67

[1] Charleston entries were developed from complex crosses of breeding lines from various sources selected at Charleston. La Jolla entries were developed from complex crosses of breeding lines from various sources selected at Brawley, Calif. Weslaco, Tex., entries were developed from the indicated crosses and selected in the Lower Rio Grande Valley. Numbers with prefix W are Weslaco breeding line numbers; those without prefix are Weslaco cooperative trial entry numbers.

or excellent) was considered satisfactory for any character and accorded one point in the acceptability index. The numerical grades on the 5-class scale were added to secure the total score index.

Although most cultivars could attain superior ratings for most characters in suitable environments, they were prevented from attaining them by disease injury and lack of adaptation to south Texas soils and climate.

Disease injury was not responsible for inferior ratings for fruit characters in the breeding lines (table 3), which were still in excellent vegetative condition at maturity. Inferior ratings in the breeding lines resulted from deficiencies of genes for acceptable quality in the Lower Rio Grande Valley environment. Such lack of adaptation was typical of breeding lines selected in other environments. The breeding lines selected at Charleston, S.C., were deficient in yield, appearance, and abundance of net in the Lower Rio Grande Valley. Lines selected at Brawley, Calif., were deficient in those characters, and, also, in most internal fruit characters, and they tended to be oversized.

The breeding lines generally were acceptable or superior in most characters at the locations where they were selected. This variation in fruit characters of a single breeding line in the widely separated locations was noted in other years. Observations of cooperators' lines strongly indicated that breeding lines selected at any one of the three headquarters stations (Charleston, La Jolla, or Weslaco) were not adapted to culture at either of the other locations. These observations were largely responsible for the progressive decrease, during the course of the cooperative project, in numbers of entries developed elsewhere, and increase in those selected in the Lower Rio Grande Valley.

The superior ratings for the Weslaco entries developed in the Lower Rio Grande Valley, from crosses between cooperators' lines that had complementary ratings and performed well in earlier trials, indicate that selection in the commercial production area is superior to selection elsewhere for the production of new adapted cantaloup varieties. This concept agrees with research data on other crop plants.

The data and related observations from the cooperative trials, strongly indicate the necessity for selection and maintenance of muskmelon foundation stock seed in the commercial production area or a similar environment. They refute the currently widespread practice of producing seed in areas isolated from market production areas, and differing greatly from them in soils and climate.

The data on both cantaloups and honeydews in table 3 demonstrate that the objectives of the cooperative project have been substantially achieved. Potent resistance to three leaf diseases, adaptation to the Lower Rio Grande Valley, and high quality in all essential fruit characters have been located in various breeding stocks. The desired characters have been progressively combined, at each cooperating headquarters, into breeding lines satisfactory for commercial production in each area.

The 1967 cooperative trials included one casaba, 31 cantaloup, and 13 honeydew entries. Included were 19 entries from Charleston, five from La Jolla, and 18 from Weslaco. Four plantings that matured at widely different dates were rated. Twenty fruits of each entry, five from each planting, were rated for internal fruit characters including

soluble solids. The entire plot was rated at each location for other characters, and the average performance of each selected entry at the four locations is given in table 4.

In contrast with the 1966 season, the spring of 1967 was dry with few rains. The warm, dry weather favored powdery mildew infections, which were abundant and persisted throughout the spring. Downy mildew infections were fairly abundant but did not persist and, therefore, caused only slight damage. *Alternaria* infections were sporadic and nonpersistent and caused little damage. Virus infections were also sporadic, late, and mild. In this environment, disease-induced losses were light in commercial fields of Perlita but severe in the powdery mildew race 2-susceptible cultivars: SR–59, SR–91, and PMR 45.

The abundant, persistent powdery mildew infections caused severe injury to susceptible entries such as the Honey Dew cultivar in the trials (table 4). They caused moderate to no injury in resistant entries. Downy mildew caused only moderate injury in susceptible entries and little or no injury in partly resistant ones. Most of the entries, including the cultivars, produced fruits with adequate soluble solids, despite powdery mildew injury, in the warm, dry weather.

The entries from Charleston and La Jolla varied in ratings at the different locations in the Lower Rio Grande Valley. In performance averaged over all four locations, the entries selected in the humid environment at Charleston were poor (table 4). With a single exception the 19 cantaloup entries were deficient in net development and distribution, and many of them were low in soluble solids content. Similarly, the two La Jolla cantaloup entries, selected for adaptation to cold weather during early growth and warm, dry weather during fruit maturation, were variable in net development and of moderate quality in other characters.

In contrast, most of the entries selected at Weslaco performed well at all four locations and yielded higher average ratings. Several exhibited quality in most characters sufficient to warrant their release as cultivars.

The honeydew entries from La Jolla and Weslaco, both developed from alternate spring and fall selection programs, exhibited excellent ratings in most characters combined with resistance to powdery mildew. Two entries from Weslaco, HD–2 and HD–6, were highly resistant, also, to downy mildew.

The data confirmed and extended the following conclusions derived from 1966 and earlier trials:

1. Resistance to a disease in an environment in which that disease is mild does not guarantee good performance by a cultivar when and where epiphytotics occur; therefore, high-level resistance effective in all environments is worth the extra effort required for its transfer to cultigens.

2. Good quality characters in a breeding line at one location give little indication of the potential quality in that breeding line in other environments; therefore, selection for adaptation to any environment should be performed in that environment.

TABLE 4.—*Average performance of cantaloup and honeydew varieties and selected breeding lines grown at four locations in the Lower Rio Grande Valley, 1967*

[Class 1, extremely poor; class 2, poor, unacceptable; class 3, intermediate or doubtful; class 4, good, acceptable; class 5, excellent]

Entry	Source [1]	Plot	Vigor	Condition	Powdery mildew	Downy mildew	Earliness	Appearance	Shape	Size [2]	Net type [3]	Percent net cover [3]	Stem scar	Cracks	Flesh color	Depth	Firmness	Dryness	Soluble solids		Acceptability index	Total score
		No.	*Class*																*Percent*	*Class*	*No.*	*Sum*
PMR 45	Commercial	35	3	3	2	2	2	3	4	3	4	2	4	3	3	3	2	2	11.7	3	3	48
PMR 6	do	36	4	3	4	3	3	3	4	3	2	2	2	2	3	3	3	3	10.7	3	3	50
60–2M	Charleston, S.C	1	4	3	3	4	3	3	4	3	2	2	3	4	3	4	3	3	9.9	3	5	54
63–4M	do	7	4	4	4	3	3	3	4	4	2	2	3	4	3	3	3	3	10.6	3	6	55
64–4M	do	11	3	4	3	3	3	3	4	3	2	2	4	4	3	3	3	3	9.5	3	5	54
64–23M	do	16	2	3	3	3	3	3	3	3	5	5	3	3	4	3	3	3	11.0	3	3	55
WMR 29	La Jolla, Calif	20	3	3	3	3	3	3	4	3	4	3	3	3	3	3	3	3	10.8	3	2	53
WMR ms [1]	do	21	4	4	4	3	3	3	3	3	2	2	2	2	3	3	3	3	11.1	3	3	50
57–123	Wescan [5]	42	4	4	3	4	3	4	4	3	4	3	3	4	3	3	4	4	13.6	4	10	61
61–92	Perlita (57–123×57–64) [5]	37	3	4	4	4	4	4	4	5	3	3	3	4	3	3	4	4	12.1	4	11	63
62–66	W 59.17×57–123 [5]	38	4	4	4	4	3	4	4	5	5	5	2	4	4	4	4	4	13.9	4	15	68
W–25	W 59.17×57–123 [5]	39	4	4	4	4	3	4	4	5	4	5	3	4	4	3	4	4	12.5	4	14	67
W–83	W 59.17×59–25 [5]	43	2	4	4	4	4	4	4	2	5	5	4	4	4	3	4	3	12.1	4	13	64

Honey Dew	Commercial	27	4	2	2	2	3	4	4	4	5	5	4	5	4	3	4	3	13.7	4	11	62
61090M4d (HD)	La Jolla, Calif	22	4	4	4	3	3	4	4	4	5	5	5	5	4	3	4	4	14.7	4	14	69
61090M4e	do	23	4	4	4	3	3	4	4	4	5	5	4	5	4	3	4	4	13.9	4	14	68
61090M4b (HD)	Weslaco, Tex	26	4	4	4	3	3	4	4	5	5	5	5	5	4	3	4	4	15.1	5	14	71
W–HD–2	64–57×64–28	29	4	4	4	4	4	4	4	4	5	5	4	5	4	3	4	4	14.1	4	16	70
W–HD–6	64–57×64–28	33	4	4	4	4	4	4	4	3	5	5	4	5	4	3	4	4	13.2	4	15	69
W–HD–7	64–57×64–28	34	4	4	4	3	4	4	4	5	5	5	5	5	3	4	4	4	15.4	5	15	72
W–HD–5	64–56×64–28	32	4	4	4	3	4	4	4	4	5	5	5	5	4	3	4	4	15.2	5	15	71
W–HD–3	64–28×64–57	30	4	4	4	3	4	4	4	5	5	5	5	5	4	3	4	4	14.3	4	15	71

[1] Charleston entries were developed from complex crosses of breeding lines from various sources. La Jolla entries WMR 29 and WMR ms [1] (male sterile 1) were developed from complex crosses of watermelon mosaic-resistant P.I. 180280 with powdery mildew-resistant breeding lines.

[2] All entries were acceptable in size in one or more plantings: uniformity of size in different plantings, rather than size itself, is reported here.

[3] Net scores 5 and 5 indicate well-developed, high, round net covering 70 percent or more of the fruit surface in cantaloups; they indicate complete freedom from net in honeydews.

[4] PMR 6 suffered injury from crown blight unassociated with any known pathogen.

[5] Weslaco entry sources: partly from earlier cooperative trials; W59.17 indicates a Weslaco breeding line, but 59–25 indicates a cooperative trial entry.

3. However, the consistently better performances of Weslaco and La Jolla honeydew entries, which were produced from alternating spring and fall selection programs, suggest that overall uniformity and reliability is enhanced by such alternation.

4. Therefore, the application of similar breeding techniques (alternating seasons or locations) may result in cultivars adaptable to an increasingly wide range of environments.

SUMMARY

The 12-year program of cooperation among cantaloup breeders in Texas, the far western, and southeastern United States has led to the development of six new varieties: Wescan, Campo, Jacumba, Perlita, Gulfstream, and Dulce. Of these, Perlita and Dulce seem to meet all the requirements for successful mass production in the Lower Rio Grande Valley, where the cooperative effort was concentrated. Wescan is a useful local market melon in Texas; Campo and Jacumba have local adaptation in Imperial Valley in California, and Gulfstream is adapted in southeastern States.

The program also has promoted the development of new testing, evaluation, and selection techniques; helped to define the limitations of regional adaptation; created a widely useful rating system for muskmelons; and described a net classification code that has received wide acceptance.

DESCRIPTION OF NEW VARIETIES

Wescan

Wescan (*27*) originated from a cross made, at Weslaco, Tex., during 1953, between Rio Gold and W–13, a Weslaco breeding strain. A second generation hybrid was crossed during 1954 with pollen from a variant with honeyball-type fruit found in a commercial field of the PMR 6 variety. A selected strain, self-pollinated for four generations, was entered in the 1957 trials as W 57–123. Four additional generations of inbreeding with selection yielded Wescan.

Wescan is highly resistant to downy mildew. It is susceptible to powdery mildew race 2 and *Alternaria* but tolerant to sulfur, which can be used to prevent infection. It is well adapted to south Texas soils and climate. Wescan produces a vigorous vine and coarsely netted, hard-rinded, medium-sized (36), oblong-oval fruits. The flesh is of medium thickness, salmon colored, and very firm, with good flavor and high soluble solids content, ranging from 14 to 17 percent.

Even though Wescan possesses good downy mildew resistance and excellent shipping quality, the rough, coarse net is not acceptable to shippers because it is unattractive. Wescan can be grown for local markets wherever cantaloups are grown in Texas.

Perlita

Perlita (*28*) originated from a cross made at Weslaco, during 1957, between downy mildew-resistant Wescan and Co-op entry 57–64, a powdery mildew-resistant USDA breeding line with smooth, round

net. Selections were made at Weslaco during spring and fall in eight successive self-pollinated generations. Three additional generations were bulk seeded and evaluated in commercial trials. The 11th generation was released as Perlita.

Perlita is resistant to both downy mildew and powdery mildew, and adapted to soils and climate in the Lower Rio Grande Valley. It is susceptible to *Alternaria* and gummy stem blight.

Perlita produces medium-sized vines and very early yields of hard-rinded, medium-sized, round-oval fruits with small, dry stem scars. The skin is yellow-orange at full slip. The melons are well netted and free from bare sutures (vein tracts) and stem-end cracks. They are, also, resistant to fruit rind-rot favored by wet soil conditions during the net formation and fruit maturity period. The fruit possesses good shipping quality and an attractive external appearance that meets the requirements of cantaloup shipper, buyer, and consumer. The flesh is salmon-orange, medium in thickness, and fairly firm. It has a good cantaloup flavor and averages 12.5 percent soluble solids.

Perlita differs from other varieties in that it produces perfect blossoms at the third or fourth node from the root crown. This accounts in part for its early fruit set and maturity. The early fruits make good sizes (36 and 27) from February plantings in the Lower Rio Grande Valley.

In 1965, 1,200 acres of Perlita were grown and harvested commercially in the Lower Rio Grande Valley area. In 1966, 3,500 acres (50 percent of the cantaloup acreage in the Lower Rio Grande Valley) were planted with Perlita. During both years, Perlita survived very well the mildew epiphytotics that destroyed most plantings of other cultivars. During 1967, an estimated 95 to 98 percent of the early spring cantaloup acreage (8,500 acres) in the Lower Rio Grande Valley was planted with the Perlita cultivar. Perlita performed well and remained free from injury during that season in which powdery mildew was very damaging to susceptible varieties.

Campo

Campo (*5*) originated from a cross made at Brawley, Calif., in 1953. LJ 36486 (=P_3), a breeding line very resistant to powdery mildew race 2 but with poor fruit characteristics, was crossed with PMR 45, a shipping variety resistant to powdery mildew race 1. The F_1 hybrid was outcrossed to PMR 450, and the resulting trihybrid was inbred, with selection at Brawley and La Jolla, for four generations. A fourth generation selection was twice backcrossed to PMR 450, and inbreeding with selection was continued for eight generations. The ninth generation was released as Campo.

Campo is resistant to powdery mildew and adapted to soils and climate in Imperial Valley. Selected to set fruits during March and April from December plantings, Campo produces pistillate (perfect) flowers on fruiting spurs some distance from the crown. It produces vigorous vines that retain green foliage through harvest from December and January plantings. The plants produce early yields of hard-rinded, medium-sized, round-oval fruits that are well netted and nearly free from bare sutures (vein tracts) and with small, dry stem

scars. The flesh is salmon-orange, thick, and firm. It has good cantaloup flavor and averages 11.4 percent soluble solids.

Campo has a narrow range of adaptation. Plants at other locations may suffer crown blight injury and produce fruits that are too large, irregular in shape, and have poorly colored flesh.

Jacumba

Jacumba (*4*), with the same pedigree as Campo but selected from a different final backcross, is also resistant to powdery mildew and adapted to soils and climate in Imperial Valley. It produces vigorous vines that retain green foliage through harvest in May and June from December and January plantings there. The plants produce early yields of hard-rinded, medium-sized, oval fruits, well netted but with bare sutures (vein tracts) and with small, dry stem scars. The flesh is salmon-orange, thick, and very firm. It has good cantaloup flavor and averages 11.1 percent soluble solids. The firm-fleshed fruits are very well suited for long-distance shipping, but they must be held several days at room temperature to allow the flesh to become soft enough for eating.

Jacumba has a wider range of adaptation than Campo; the plants retain green color at most locations in southwestern States.

Gulfstream

Gulfstream [7] originated from a series of crosses begun in California and completed in South Carolina. The last cross, between the cultivar PMR 45 and a resistant breeding line, 32793, was made at the Edisto Experiment Station, Blackville, S.C., in 1954. The hybrid populations were inbred with selection at Charleston for eight generations followed by mass selection. The fifth mass-generation was released as Gulfstream.

Gulfstream is resistant to downy mildew and powdery mildew, and adapted to soils and climates in the warm, humid southeastern United States. The vigorous plants retain green foliage through harvest in Alabama, Florida, Louisiana, and South Carolina. They produce a concentrated set of early maturing attractive melons that resemble those of Hale's Best in appearance. The spherical fruits are of a medium size suitable for crating and average 2.6 pounds in weight. They are yellowish-green at maturity, well netted, and have distinct vein tracts. The fruits have small, dry stem scars and are comparatively free from stem-end cracks.

The salmon-orange flesh is thicker and firmer than that of Hale's Best, with moderate sugar content and a mild, very pleasing flavor. Gulfstream lacks the strong, musky odor possessed by some other varieties, and hence it should be preferred by housewives.

Dulce

Dulce (*29*) originated from a cross made at Weslaco, Tex., during 1960, between W 59.17, a Weslaco breeding line, and Wescan. Selec-

[7] See footnote 6.

tions were made at Weslaco during spring and fall in eight successive inbred populations followed by mass selection. The 11th generation was released as Dulce.

Dulce is very resistant to both downy mildew and powdery mildew race 2, and adapted to soils and climate in south Texas. It produces vigorous vines that stay green through harvest and produce early, medium-sized, round-oval fruits with medium-large, dry stem scars. The skin is yellow-orange at full slip. The melons are well netted and nearly free from visible sutures (vein tracts). They are tolerant to conditions that cause stem end and other surface cracks. The salmon-orange flesh is very thick and firm. It has good cantaloup flavor and averages 13.9 percent soluble solids (table 4, entry 62–66).

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