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MENDELISM IN MELONS



By DAVID LUMSDEN

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM, N. H.

NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION.

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MENDELISM IN MELONS.

DAVID LUMSDEN.

INTRODUCTION.

During the season 1908, Prof. H. F. Hall, horticulturist at the New Hampshire Experiment Station, and the writer had various discussions with reference to plant breeding, together with the advisability of growing choice muskmelons in the greenhouses during the summer months when the houses were not occupied by carnation plants—between the months of June 1st to September 20th. Before the work had been outlined Professor Hall resigned as horticulturist and the project was commenced by the writer. No funds were available at that time by which the project could be carried out, so it was at first conducted privately.

A test was first made of several varieties of muskmelons and cantaloupes, some of which are mentioned in the following paragraph.

Sutton's Superlative, an English muskmelon bearing fruits of medium size, almost round and beautifully netted,—no ribbing being discernible on the fruits,—color of the skin green, flesh a deep salmon pink and very thick, cavity medium sized and roundish, seeds many and of a large size, rind or skin hard and thick. *Delices de la table*, a French cantaloupe with a yellow or straw colored skin, fruits large in size and deeply ribbed, scarcely any signs of netting were noticeable on the fruits, shape of the fruit obtuse-elliptical, flesh a light salmon pink and of medium thickness, cavity large and elliptical in shape, seeds small in size and not numerous, rind or skin of melon thin and soft. Other varieties of choice muskmelons grown were Rockyford, Burrill's Gem, Ford Hook, Hackensack, Honeydrop, and Jenny Lind.

Very interesting data were obtained from this variety test regarding strength and vigor of varieties, freeness regarding the setting of fruits, earliness or lateness of varieties in ripening, firmness of fruits, together with their dessert qualities.

This project was carried on in the college greenhouses and the flavor of the fruits of all varieties was much superior to the

melons which we had been previously growing outside on prepared land. This may easily be accounted for owing to the shortness of the growing season in our northern climate, as melons do not mature and develop quality as they do further south in the melon regions.

In England the melon is very highly prized as a dessert fruit; its cultivation is, however, limited to glass houses and frames, and on many private estates greenhouses are erected for the sole purpose of raising choice melons for the table; the melons being supported under the roof of the house by means of a wire trellis. These melon ranges are usually of a low and narrow form of construction.

We find that comparatively few melons are raised in the state of New Hampshire, perhaps due to the fact that they do not mature early enough and are picked from the vines long before the ripening period and when served as a dessert fruit are lacking in quality. The writer has had an opportunity to visit many fairs and horticultural exhibitions in the state, and to observe the quality of melons on display, and it is noticeable that the average exhibitor errs oftentimes in sacrificing quality for size of fruit. However, when size of fruits can be obtained without sacrificing quality, it creates interest in the exhibition hall and finds a ready sale on the market. A few years ago smaller varieties were in demand, today however we find well grown specimens of the Montreal and other large types of melons increasing in popularity.

Taking into consideration this present market condition a large melon *Delices de la table* was selected as one of the parents, and *Sutton's Superlative*, a medium sized melon as the other. Also recognizing that these two varieties were practically pure this cross furnished excellent material for our Mendelian studies.

HISTORICAL.

The melon (*Cucumis Melo*) is perhaps the richest and most highly valued plant in the family *Curcubitaceae*. Its native habitat is the hotter parts of Asia and it is supposed to have been introduced from there to Europe at the commencement of the Christian era. In the Far East where melons grow plentifully the fruit forms one of the chief articles of food for the inhabitants.

In the more northern sections of this country success is rarely attainable without the aid of frames or greenhouses and artificial heat. Several years ago before melons were raised in quantity in Colorado and others of the more southern states, the fruit was considered a luxury.

The melon is classed as a trailing plant, and if trained to cover a trellis is partially self-supporting, attaching itself by its numerous tendrils. The flowers are monoecious, *i. e.*, the male and female flowers are borne separately on the same plant, the flowers being produced in the axles of the leaf stalks. The male flowers are far the more numerous of the two sexes. The variety Rockyford is an exception, it being hermaphroditic, the stamens and pistil being produced in the same flower; it also has purely staminate flowers which are produced in great profusion.

CLASSIFICATION.

In the Cyclopedia of American Horticulture, Bailey gives the following classification of melons.

“There are two general types of commercial muskmelons in North America,—the furrowed and hard-rind types, known as nutmeg or netted melons. . . . The various strains of netted melons are the ones mostly grown in the North for the home garden and for early market. The cantaloupes are mostly longer season varieties.”

In Bulletin No. 2 of the New Hampshire College Experiment Station, F. William Rane states that muskmelons readily group themselves into eight distinct classes, or what he has chosen to call types. These types are arranged primarily according to size, and secondarily according to the shape of the fruit. After first distinguishing the types the sub-classification of each type was made as follows: Whether ribbed, shallow or deep, or not ribbed; secondly, whether netted or not netted; and third, whether the color of flesh was green or salmon.

Beginning with the smaller melons the types designated by Rane were as follows: (1) Jenny Lind, (2) Rockyford, (3) Hackensack, (4) Montreal, (5) Cosmopolitan, (6) Acme-Osage, (7) Long Yellow, (8) Bay View.

Sutton's Superlative muskmelon, the female parent of the hybrid, would come under the No. 5 group or Cosmopolitan as classified

by Rane. In the first place as this melon does not show any ribbing, and secondly by its size, it being a medium sized melon, averaging four to five pounds. *Sutton's Superlative*, as all other varieties of the Cosmopolitan type, shows netting to a marked degree. *Delices de la table*, the male parent of the hybrid, would be classified as a cantaloupe, although differing somewhat from the description of the cantaloupe as given by Bailey in that it retains the furrowed or ribbed character, but has a soft rind. All the other characters of a cantaloupe are manifest in this variety.



Fig. 1. Cross section of melons showing comparative sizes of cavities and thickness of flesh. Seeds not removed.

COMMERCIAL VALUE OF HYBRIDS.

It is an undisputed fact that a melon to attain the highest state of perfection should be allowed to ripen on the plant, as the quality of a melon thus produced will be greatly enhanced, in fact the acme of quality in a melon can in no other way be obtained. If a fruit is picked from the vine several days previous to the ripening period the flavor and quality will be greatly impaired. On account of having to ship muskmelons a long distance to the market, and they having to pass through various hands before reaching the consumer, it is highly desirable to produce a fruit that would manifest to a high degree the following characteristics:

First,—Its quality should be the highest.

Second,—Depth of flesh or solidity of flesh should be marked, a small cavity being desirable.

Third,—It should be of attractive appearance and uniform in size.

Fourth,—Its outer skin should be firm and hard-rinded with a depth of flesh manifest at the blossom end of the fruit. Netting is usually considered desirable.

These points are important. Many of our market melons today have a decidedly large cavity, and in many there is a con-



Fig. 2. Cross section of melons showing sizes of cavities and thickness of flesh. Seeds removed.

siderable reduction of flesh near the blossom end of the fruit. This character is detrimental, first, because the flesh at the blossom end ripens and decays earlier than other portions of the fruit; second, because that portion is more easily bruised in handling and in transportation. Figures Nos. 1 and 2 show in detail the structure of the hybrid melon in this respect and hence its superiority as a commercial melon.

FLAVOR AND QUALITY IN FRUIT.

Sutton's Superlative, the female parent of the hybrid, is acknowledged by connoisseurs to be a melon of very good quality; it has a musk flavor and is moderately sweet, while *Delices de la table*,

the male parent, is a melon of large size and its flavor is remarkably refreshing without being too sweet and sickly as are some of the types of English muskmelons.

As a general rule the French cantaloupes do not take on the English markets; the same is true of the English muskmelons when offered for sale in Paris, the flavor of each type of melon being peculiarly characteristic of itself. English people prefer to serve the muskmelon with sugar and grated ginger, while the French invariably serve the cantaloupe with salt.

The hybrid melon inherits traits from each parent, the flavor being a decided blend of the English musk and the French cantaloupe; the close netting inherited from the female parent together with its almost round form gives it a pleasing and very attractive appearance.

Sutton's Superlative, the female parent, may be classed among the hard-rind melons; this characteristic also is transmitted in a marked degree to the offspring. The quality inherited from the blend of the muskmelon and cantaloupe, with evenness of ripening, renders the melon a very desirable market variety.

Several specimens of this melon were exhibited before the Massachusetts Horticultural Society at the fall exhibition, September, 1911, and were awarded a first-class certificate. The hybrid melons were also exhibited before the same society at the fall exhibition, 1913, and were awarded the Massachusetts Horticultural Society's Silver Medal.

CULTURAL TREATMENT.

Greenhouse No. 1 of the college range was used for the work (see Fig. 3) during the first season; the following seasons for F_2 and F_3 generations of hybrids, Houses No. 5 and No. 6 were used in order that a larger number of plants could be grown.

The melons were raised from seeds, sown singly in $2\frac{1}{2}$ inch pots during the month of April, and were repotted soon after the first character leaf appeared. Good heavy loam, friable rather than of an adhesive nature, was placed on the benches to a depth of 6 inches; well decomposed manure was added at the rate of 1 part manure to 4 parts of soil, care being exercised that the soil

was not made too rich, so as to induce an over luxuriant growth of vine. After fruits were set on vines food was added by applying bone meal as a top dressing to the bed, three applications being given covering a period of six weeks, one-half ounce being applied to each square foot of space at each application.

Plenty of light and a moderate amount of air was given the plants in order to make them strong and sturdy. The tempera-



Fig. 3. Melons in Greenhouses. The two shown on either side of the house are the parent forms of the cross on which the studies in inheritance of characters have been made. Sutton's Superlative on the right; Delices de la table on the left.

ture of the houses were kept as constant as possible and all through the growing period the atmosphere of the houses were kept charged with moisture by syringing the walks and under the benches twice a day with water. After the plants developed five or six shoots beyond the cotyledons the stem was pinched off; three shoots were allowed to develop from the main stem. Side shoots were developed in due course and when the laterals were about 18 inches long they were pinched back one inch above the fifth or sixth leaf, other shoots developing afterward were treated in the same way.

The first female blossoms to appear were suppressed for two reasons: first, that the plants might gain more strength before fruiting; second, in order that three or four flowers may open on each vine simultaneously, and when pollinated would develop fruits more even in size than if the flowers are pollinated with a few days' difference between. Oftentimes if one fruit gets too much of a lead it is somewhat difficult to get other melons to set on the vine owing to the fact that the nutriment is being rapidly acquired in development of the first fruit set.

Throughout the entire period of growth watering and ventilation were carefully attended to, water being applied to the beds early in the morning. As the melons arrived at maturity, which is first noticeable by the change of color in the skin of some varieties and by the aroma, also by the stem of the melon commencing to crack and lift from the fruit,—this latter is a sure sign the melon is approaching maturity,—the fruits were cut and placed in a refrigerator before sampling them for quality, etc.

In House No. 1 the vines on the center benches were trained on a wooden A-shaped trellis, having wires stretched lengthwise of the house at a distance of 12 inches apart, and planted at a distance of 3 feet apart. Plants grown on the side benches were planted at the same distance apart and allowed to trail over the benches as in outdoor culture, with the exception that stopping or pinching was attended to in the same manner as when grown on the trellis.

In Houses No. 5 and No. 6 the plants were treated in a similar manner, uniform growth being noticeable throughout.

PARENT STOCK.

Seeds of *Sutton's Superlative* melon were imported direct from the originators, Sutton & Sons, Reading, England, this melon¹ being the results of a cross between the varieties, "Royal Favorite" (white flesh), and "Westley Hall" (scarlet flesh). The former variety bore fruits quite smooth, round and well netted, while the latter was somewhat oval in shape and netted. Seeds of *Delices de la table* were imported from Messrs. Vilmorin & Sons, Paris, France. Two varieties of cantaloupe melons are grown in France, namely, the Prescott *hatif a' chassis*, and the Prescott

¹Letter from Sutton & Sons dated February 7, 1914.

fond blanc. A silvery variety (argente) is also grown. *Delices de la table* belongs to the latter or silvery class. All these melons have roundish irregular, somewhat ribbed fruits, the skin being mottled with shades of green and white, and toward the ripening period assume shades of yellowish brown.

OBJECT OF THE EXPERIMENT.

Recognizing the fundamental importance of heredity, and its great value when applied to the practice of breeding, this work presented an opportunity to ascertain, if possible, how melons Mendelize. Gregor Mendel pointed out that, in a breeding experiment, plants must be selected that possess differentiating characters, and that the hybrid plants must be protected from the influence of foreign pollen during the flowering period. The former requirement was adequately fulfilled in the selection of a muskmelon and a cantaloupe as each of these possessed differentiating characters. The latter requirement was easily and readily accomplished in utilizing a greenhouse for this purpose, the ventilators and openings to the house being kept carefully screened by the use of mosquito netting.

CHARACTERS CONSIDERED.

In breeding work there are many characters which may be considered in any given kind of plants but only the outstanding ones, which the student believes would be carried as unit-characters and can be easily determined, are selected. The following characters are readily studied in melons and hence are here considered:

1. As regards Form of Fruit.
2. As regards Color of Skin.
3. As regards Size of Seeds.
4. As regards Size of Fruits.
5. As regards Ribbing.
6. As regards Netting.

Also whether in melon-breeding work the recognition of the following forms of heredity are manifest:

(a) Blended Inheritance. Whether in crossing parents which differ regarding certain pairs of allelomorphs the hybrid is found to be a blend.

(b) Mosaic Inheritance. Whether a form of variegation of pie-bald color manifests itself in any of the hybrids.

(c) Alternative Inheritance. Where one character of a complementary pair is inherited to the apparent exclusion of the other.

F₁ GENERATION.

During the season 1909, 80 seeds of the cross SS x 149* were sown, and in the offspring several of the melons resembled the

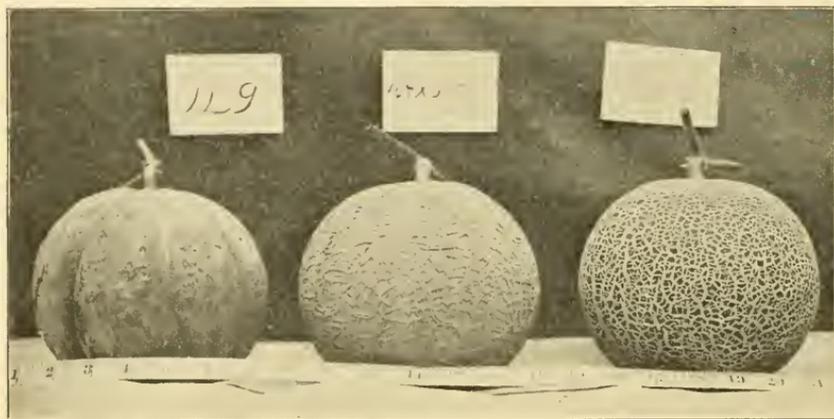


Fig. 4. Parents and offspring in melon cross. 149, *Delices de la table*, a French cantaloupe with yellow or straw colored skin, deep ribbing, and no netting; and Sutton's Superlative, an English muskmelon with a dark green skin, very close netting, no ribbing and perfectly round in shape. The melon in the center is a perfect combination of the characters of the parent. It possesses the color of 149, the netting of Sutton's Superlative, and is intermediate in ribbing, size and shape.

female, while others resembled the male parent, the majority, however, being hybrid in character. One melon possessed the combined characteristics of both parents, namely, in netting it resembled the female, while the color of skin resembled the male. Modified ribbing was manifest and in form of fruit it resembled the female; the seeds were decidedly intermediate and in flavor the melon was a decided blend; the cavity, how-

*For convenience the male parent, *Delices de la table*, is referred to in this bulletin as No. 149, the serial number in the stock book, while the female parent, *Sutton's Superlative*, is referred to as SS.

ever, was much smaller than in either of the parents (see Fig. 2). Seeds from this melon were used to carry on the breeding work.

During the season 1911 three of the college greenhouses were devoted to muskmelons in order to carry on the breeding work commenced during the season 1908— F_3 generation. Nine distinct types of the hybrids were selected and fifteen plants from each were used in the experiment.

Seeds from the following melons were selected as differing materially in various attributes from each other: Nos. 23; 13; 70; 68; 27; 26; 17; 24; 34.

One hundred and thirty-five plants were grown on the benches; careful treatment regarding cultivation and fertilization was afforded them as in previous years.

Season 1912. Seeds of hybrid melons No. 27 and No. 34 were selected for the purpose of ascertaining whether a pure hybrid type has been fixed in these hybrids, melon No. 27 having a green skin and melon No. 34 a yellow skin. Both these hybrid melons were close pollinated.

Season 1913. Seeds of melons No. 27 and No. 34 which were close pollinated season 1912 were tested out to confirm work in fixation of type, and resulted in a duplication of F_4 generation, thereby proving fixation of type in these hybrids.

The work indicates that when such pairs of characters as are here considered have been crossed, they show a blend in the F_1 generation rather than dominance of either character. In the F_2 generation the segregation of dominant and recessive characters occurs.

Six pairs of characters have been studied in the melon, and show dominance and recessiveness as follows:

DOMINANT	RECESSIVE
Yellow Color of Skin	Green Color of Skin
Round Form of Fruit	Obtuse-elliptical form of fruit
Large Size of Seeds	Small Size of Seeds
Ribbing	Non ribbing
Netting	Smoothness
Large Size of Fruits	Small Size of Fruits

TABLE I. SS X 149. SERIES A.
Results—Color of Skin.

Crosses.	F ₁ Generation.		F ₂ Generation.		Percentages.		Ratio.	
	No. plants.	Character.	No. plants.	No. green.	No. yellow.	Green.		Yellow.
SS x 149... ♀ ♂	1	Yellow	79	21	59	26	74	1:2.76

TABLE II. SS X 149. SERIES B.
Results—Form of Fruit.

Crosses.	F ₁ Generation.		F ₂ Generation.		Percentages.		Ratio.	
	No. plants.	Character.	No. plants.	Obtuse elliptical.	Round.	Obtuse elliptical.		Round.
SS x 149... ♀ ♂	1	Round	79	58	21	73	26	2.76:1

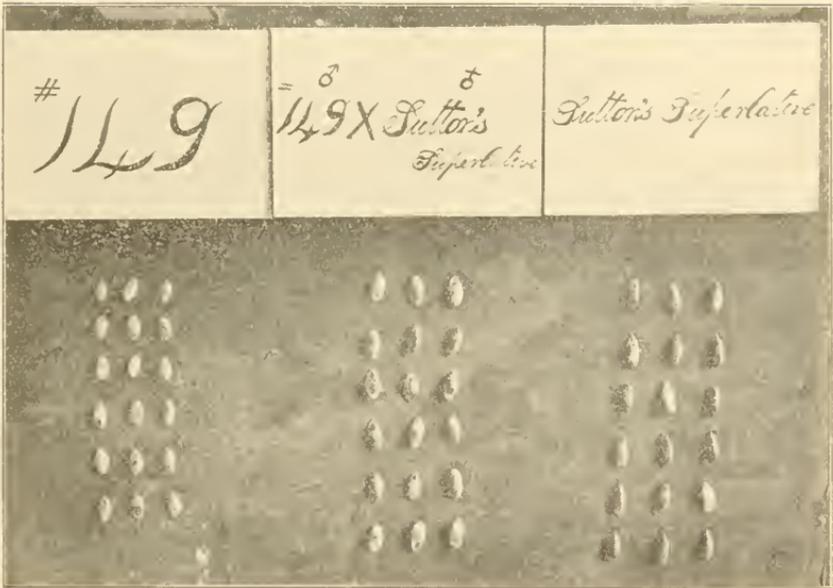


Fig. 5. Illustrating seeds of parents and hybrid in melon cross.
Note evident combination and blending of various characters.

TABLE III. SS x 149. SERIES C.
Results—Size of Seeds.

Crosses.	F ₁ Generation.		F ₂ Generation.		Percentages.		Ratio.	
	No. plants.	Character.	No. plants.	Large seeds.	Small seeds.	Large seeds.		Small seeds.
SS x 149 . . . ♀ ♂	1	Large	79	59	20	74	25	2.95:1

TABLE IV. SS x 149. SERIES D.
Results—Size of Fruits.

Crosses.	F ₁ Generation.		F ₂ Generation.		Percentages.		Ratio.	
	No. plants.	Character.	No. plants.	Large.	Small.	Large.		Small.
SS x 149 . . . ♀ ♂	1	Small	79	57	22	72	27	2.59:1

NOTE.—For convenience we have classed Sutton's Superlative as a small fruit in order that the term small will be more definite than if either intermediate or medium size were used.

TABLE V. SS X 149. SERIES E.
Results—Netting.

Crosses.	F ₁ Generation.		F ₂ Generation.			Percentages.		Ratio.
	No. plants.	Character.	No. plants.	5% to 45% netting.	46% to 100% netting.	5% to 45% netting.	46% to 100% netting.	
SS 169... ♀	1	Netted	79	30	49	37	62	1:1.6

NOTE:—*It will be observed that although the male parent manifested no signs of true netting on the fruits, yet the F₂ generation had forms of netting varying from 5 per cent to 100 per cent. "This may be owing to the fact that the rind is really a part of the maternal tissue and, since the maternal tissue has both the potentialities of ribbing and netting, these potentialities may be realized on the rind."

* Extract from a letter from Dr. Davenport, dated January 8, 1914.

TABLE VI. SS x 149. SERIES F.
Results—Ribbing.

Crosses.	F ₁ Generation.		F ₂ Generation.		Percentages.		Ratio.	
	No. plants.	Character.	No. plants.	5% to 45% ribbing.	46% to 100% ribbing.	5% to 45% ribbing.		46% to 100% ribbing.
SS x 149 . . . ♀ ♂	1	Ribbed	79	51	28	64	35	1.8:1

NOTE:—What has been stated in reference to netting may be equally true regarding the variation in ribbing, no perceptible ribbing being noticeable on the female parent. It is, however, a common experience that when there are two heterozygous factors somewhat antagonistic that now one and now the other shall show a dominance in the soma. It is not uncommon in the F₁ generation to see variation in dominance.—C. B. Davenport.

TABLE TO ILLUSTRATE MENDEL'S EXPLANATION OF SEGREGATION IN THE 1:2:1 RATIO.

Types of fertilized ovules.	Percentage of frequency.	Nature of fruit color which they develop.	Percentage of frequency.
Yellow-yellow	25	Pure yellow	25
Yellow-green	25	Hybrid yellow	50
Green-yellow	25		
Green-green	25	Pure green	25

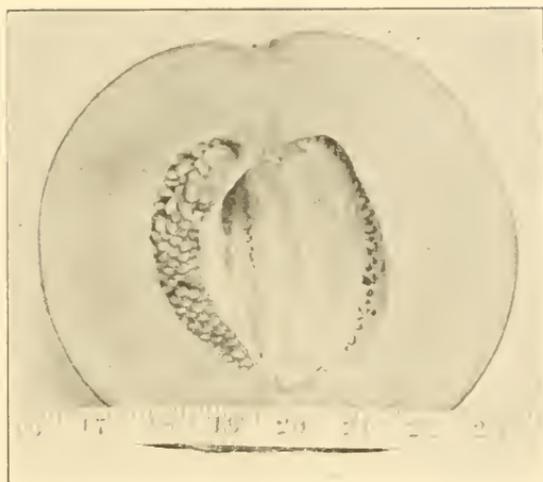
PLANT BREEDING PROJECT.

Summary of Data Obtained in Percentages of Ribbing in Fruits.

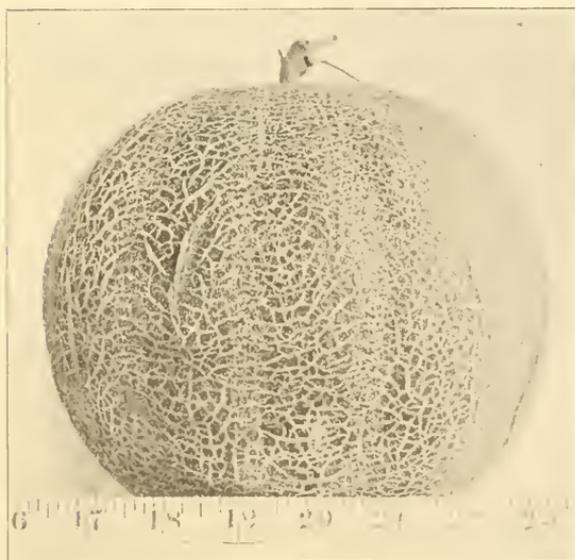
Percentages.....	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Fruits.....	9	11	6	11	9	1	1	3	0	13	0	3	0	0	2	3	0	3	0	4

Summary of Data Obtained in Percentages of Netting on Fruits.

Percentages.....	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Fruits.....	12	8	3	3	3	0	0	1	0	4	0	3	0	3	1	5	4	0	5	27



HYBRID, No. 23.



HYBRID, No. 23.

TABLE VII. CROSSES AND RESULTS. SERIES I.

Color of Skin.

F ₃ Generation.		No. plants.	Character.	Green.	Intermediate.	Yellow.	Percentages.		
Hybrid selfed.	No. 23						Green.	Intermediate.	Yellow.
		15	Green	15	0	0	100	0	0

TABLE VIII. CROSSES AND RESULTS. SERIES II.

Netting.

F ₃ Generation.		No. plants.	Character.	Not netted.	Intermediate.	Netted.	Percentages.		
Hybrid selfed.	No. 23						Not netted.	Intermediate.	Netted.
		15	Netted	0	10	5	0	66	33

TABLE IX. CROSSES AND RESULTS. SERIES III.

*Form of Fruit.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Form of Fruit.			Percentages.		
			Obtuse elliptical.	Intermediate.	Round.	Obtuse elliptical.	Intermediate.	Round.
No. 23	15	Intermediate	0	15	0	0	100	0

TABLE X. CROSSES AND RESULTS. SERIES IV.

*Ribbing.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Ribbing.			Percentages.		
			Ribbed.	Intermediate.	Not ribbed.	Ribbed.	Intermediate.	Not ribbed.
No. 23	15	Intermediate	0	15	0	0	100	0

TABLE XI. CROSSES AND RESULTS. SERIES V.

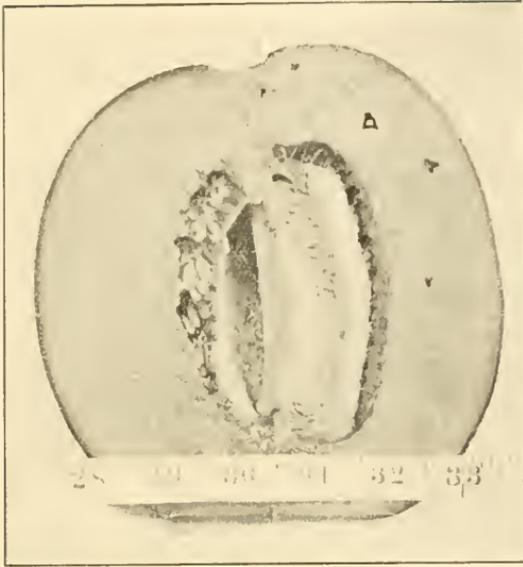
Size of Seeds.

F ₃ Generation.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
Hybrid selfed.								
No. 23	15	Intermediate	0	15	0	100	0	0

TABLE XII. CROSSES AND RESULTS. SERIES IV.

Size of Fruit.

F ₃ Generation.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
Hybrid selfed.								
No. 23	15	Intermediate	0	15	0	100	0	0



HYBRID, No. 24.



HYBRID, No. 24.

TABLE XIII. CROSSES AND RESULTS. SERIES I.

*Color of Skin.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Green.	Intermediate.	Yellow.	Percentages.		
						Green.	Intermediate	Yellow.
No. 24	15	Yellow	3	0	12	20	0	80

TABLE XIV. CROSSES AND RESULTS. SERIES II.

Netting.

Hybrid selfed.	No. plants.	Character.	Not netted.	Intermediate.	Netted.	Percentages		
						Not netted.	Intermediate.	Netted.
No. 24	15	Netted	0	15	0	0	100	0

TABLE XVII. CROSSES AND RESULTS. SERIES V.

Size of Seeds

F ₃ Generation.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
Hybrid selfed.								
No. 24	15	Intermediate	0	15	0	0	100	0

TABLE XVIII. CROSSES AND RESULTS. SERIES VI.

Size of Fruit.

F ₃ Generation.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
Hybrid selfed.								
No. 24	15	Intermediate	0	15	0	0	100	0



HYBRID, No. 27.

TABLE XIX. CROSSES AND RESULTS. SERIES I.

Color of Skin.

F ₃ Generation.		Percentages.						
Hybrid selfed.	No. plants.	Character.	Green.	Intermediate.	Yellow.	Green.	Intermediate.	Yellow.
No. 27	15	Green	15	0	0	15	0	0

TABLE XX. CROSSES AND RESULTS. SERIES II.

Netting.

F ₃ Generation.		Percentages.						
Hybrid selfed.	No. plants.	Character.	Not netted.	Intermediate.	Netted.	Not netted.	Intermediate.	Netted.
No. 27	15	Netted	0	15	0	0	100	0

TABLE XXI. CROSSES AND RESULTS. SERIES III.

Form of Fruit.

F ₃ Generation.		Percentages.						
Hybrid selfed.	No. plants.	Character.	Obtuse elliptical.	Intermediate.	Round.	Obtuse elliptical.	Intermediate.	Round.
No. 27	15	Intermediate	0	15	0	0	100	0

TABLE XXII. CROSSES AND RESULTS. SERIES. IV.

Ribbing.

F ₃ Generation.		Percentages.						
Hybrid selfed.	No. plants.	Character.	Ribbed.	Intermediate.	Not ribbed.	Ribbed.	Intermediate.	Not ribbed.
No. 27	15	Intermediate	0	15	0	0	100	0

TABLE XXIII. CROSSES AND RESULTS. SERIES V.

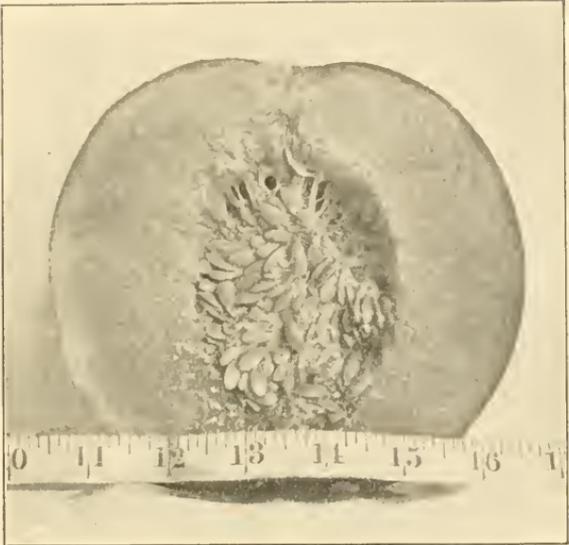
Size of Seeds.

F ₃ Generation.	Hybrid selfed.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
							Large.	Intermediate.	Small.
	No. 27	15	Intermediate	0	15	0	0	100	0

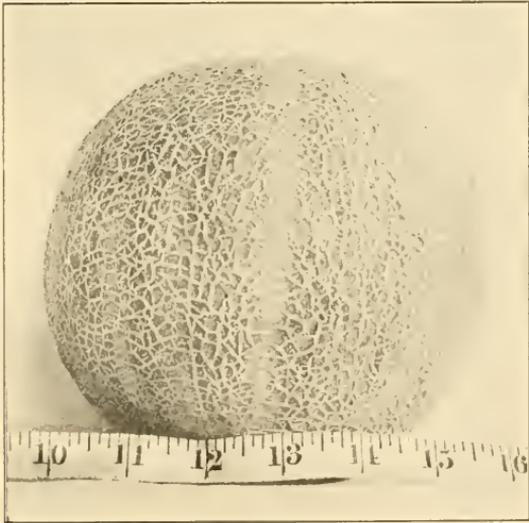
TABLE XXIV. CROSSES AND RESULTS. SERIES IV.

Size of Fruit.

F ₃ Generation.	Hybrid selfed.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
							Large.	Intermediate.	Small.
	No. 27	15	Intermediate	15	0	0	100	0	0



HYBRID, No. 34.



HYBRID, No. 34.

TABLE XXV. CROSSES AND RESULTS. SERIES I.

*Color of Skin.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Green.	Intermediate.	Yellow.	Percentages.		
						Green.	Intermediate.	Yellow.
No. 34	15	Yellow	0	0	15	0	0	100

TABLE XXVI. CROSSES AND RESULTS. SERIES II.

*Netting.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Not netted.	Intermediate.	Netted.	Percentages.		
						Not netted.	Intermediate.	Netted.
No. 34	15	Netted	0	0	15	0	0	100

TABLE XXVII. CROSSES AND RESULTS. SERIES III.
Form of Fruits.

F ₃ Generation.		No. plants.	Character.	Form of Fruits.			Percentages.		
Hybrid selfed.	Obtuse elliptical.			Intermediate.	Round.	Obtuse elliptical.	Intermediate.	Round.	
No. 34 . . .	15	Intermediate	0	15	0	0	100	0	

TABLE XXVIII. CROSSES AND RESULTS. SERIES IV.

Ribbing.

F ₃ Generation.		No. plants.	Character.	Ribbing.			Percentages.		
Hybrid selfed.	Ribbed.			Intermediate.	Not ribbed.	Ribbed.	Intermediate.	Not ribbed.	
No. 34	15	Intermediate	0	15	0	0	100	0	

TABLE XXIX. CROSSES AND RESULTS. SERIES V.

*Size of Seeds.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
No. 34	15	Intermediate	0	15	0	0	100	0

TABLE XXX. CROSSES AND RESULTS. SERIES VI.

*Size of Fruits.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
No. 34	15	Intermediate	5	10	0	33	66	0



HYBRID, No. 70.

TABLE XXXI. CROSSES AND RESULTS. SERIES I.

*Color of Skin.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Green.	Intermediate.	Yellow.	Percentages.		
						Green.	Intermediate.	Yellow.
No. 70	15	Yellow	3	0	12	20	0	80

TABLE XXXII. CROSSES AND RESULTS. SERIES II.

*Netting.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Not netted.	Intermediate.	Netted.	Percentages.		
						Not netted.	Intermediate.	Netted.
No. 70	15	Netted	0	3	12	0	20	80

TABLE XXXIII. CROSSES AND RESULTS. SERIES III.

*Form of Fruits.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Form of Fruits.			Percentages.	
			Obtuse elliptical.	Intermediate.	Round.	Obtuse elliptical.	Round.
No. 70	15	Intermediate	0	15	0	0	100 0

TABLE XXXIV. CROSSES AND RESULTS. SERIES IV.

*Ribbing.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Ribbing.			Percentages.	
			Ribbed.	Intermediate.	Not ribbed.	Ribbed.	Intermediate. Not ribbed.
No. 70	15	Intermediate	0	15	0	0	100 0

TABLE XXXV. CROSSES AND RESULTS. SERIES V.

*Size of Seeds.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
No. 70	15	Intermediate	0	15	0	0	100	0

TABLE XXXVI. CROSSES AND RESULTS. SERIES VI.

*Size of Fruit.*F₃ Generation.

Hybrid selfed.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
No. 70	15	Intermediate	0	15	0	0	100	0



HYBRID, No. 13.



HYBRID, No. 13.

TABLE XXXVII. CROSSES AND RESULTS. SERIES I.

Color of Skin.

F ₃ Generation.	No. plants.	Character.	Green.	Intermediate.	Yellow.	Percentages.		
						Green.	Intermediate.	Yellow.
Hybrid selfed.								
No. 13.	15	Yellow	7	1	7	46	6	46

TABLE XXXVIII. CROSSES AND RESULTS. SERIES II.

Netting.

F ₃ Generation.	No. plants.	Character.	Netted.	Intermediate.	Not netted.	Percentages.		
						Netted.	Intermediate.	Not netted.
Hybrid selfed.								
No. 13.	15	Netted	15	0	0	100	0	0

TABLE XXXIX. CROSSES AND RESULTS. SERIES III.

Form of Fruit.

F ₃ Generation.	No. plants.	Character.	Form of Fruit.			Percentages.		
			Obtuse elliptical.	Intermediate.	Round.	Obtuse elliptical.	Intermediate.	Round.
Hybrid selfed.								
No. 13	15	Intermediate	0	15	0	0	100	0

TABLE XL. CROSSES AND RESULTS. SERIES IV.

Ribbing.

F ₃ Generation.	No. plants.	Character.	Ribbing.			Percentages.		
			Ribbed.	Intermediate.	Not ribbed.	Ribbed.	Intermediate.	Not ribbed.
Hybrid selfed.								
No. 13	15	Intermediate	0	15	0	0	100	0

TABLE XLI. CROSSES AND RESULTS. SERIES V.

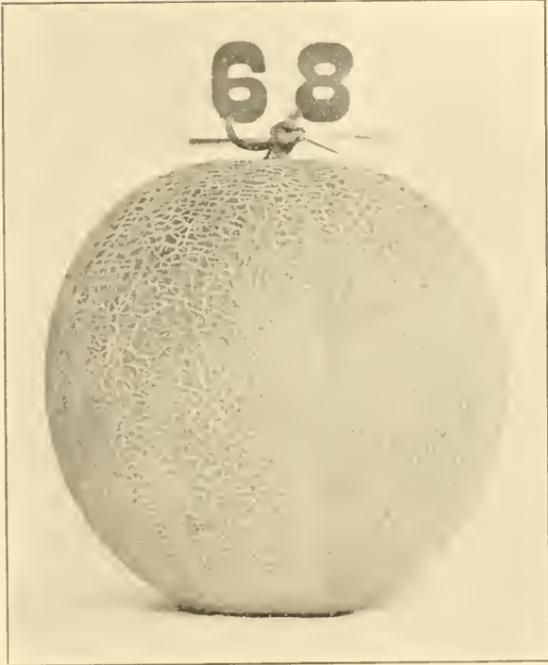
Size of Seeds.

F ₃ Generation.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
Hybrid selfed.								
No. 13 . . .	15	Intermediate	0	15	0	100	0	0

TABLE XLII. CROSSES AND RESULTS. SERIES VI.

Size of Fruits.

F ₃ Generation.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
Hybrid selfed.								
No. 13.	15	Large	15	0	0	100	0	0



HYBRID, No. 68.

TABLE XLIII. CROSSES AND RESULTS. SERIES I.

Color of Skin.

F ₃ Generation.		Character.			Percentages.		
Hybrid selfed.	No. plants.	Green.	Intermediate.	Yellow.	Green.	Intermediate.	Yellow.
No. 68	15	0	3	12	0	20	80

TABLE XLIV. CROSSES AND RESULTS. SERIES II.

Netting.

F ₃ Generation.		Character.			Percentages.		
Hybrid selfed.	No. plants.	Netted.	Intermediate.	Not netted.	Netted.	Intermediate.	Not netted.
No. 68	15	0	15	0	0	100	0

TABLE XLVII. CROSSES AND RESULTS. SERIES V.

F ₃ Generation.		<i>Size of Seeds.</i>							
		No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
Hybrid selfed.				Large.	Intermediate.	Small.	Large.	Intermediate.	Small.
No. 68	15	Intermediate	0	15	0	0	100	0	0

TABLE XLVIII. CROSSES AND RESULTS. SERIES VI.

F ₃ Generation.		<i>Size of Fruit.</i>							
		No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
Hybrid selfed.				Large.	Intermediate.	Small.	Large.	Intermediate.	Small.
No. 68	15	Large	10	5	0	66 +	33 +	0	0



HYBRID, No. 26.



HYBRID, No. 26.

TABLE LI. CROSSES AND RESULTS. SERIES III.

Form of Fruit.

F ₃ Generation.		Percentages.						
Hybrid selfed.	No. plants.	Character.	Obtuse elliptical.	Intermediate.	Round.	Obtuse elliptical.	Intermediate.	Round.
No. 26	15	Obtuse elliptical.	10	5	0	66	33	0

TABLE LII. CROSSES AND RESULTS. SERIES IV.

Ribbing.

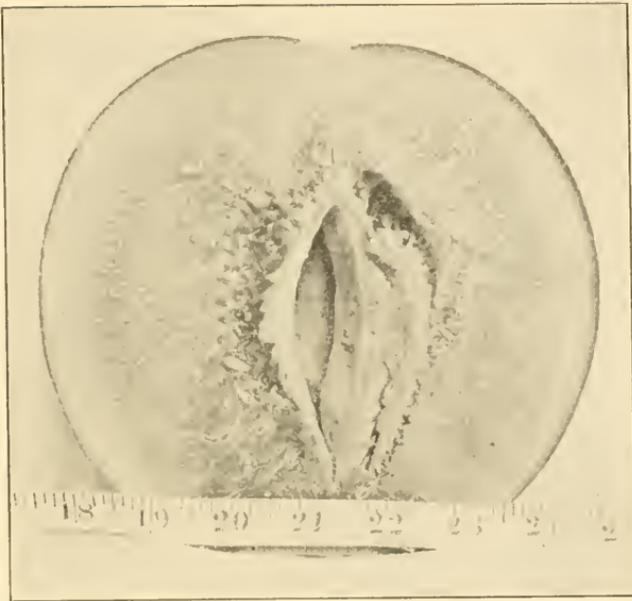
F ₃ Generation.		Percentages.						
Hybrid selfed.	No. plants.	Character.	Ribbed.	Intermediate.	Not ribbed.	Ribbed.	Intermediate.	Not ribbed.
No. 26	15	Intermediate	5	10	0	33	66	0

TABLE LIII. CROSSES AND RESULTS. SERIES V.

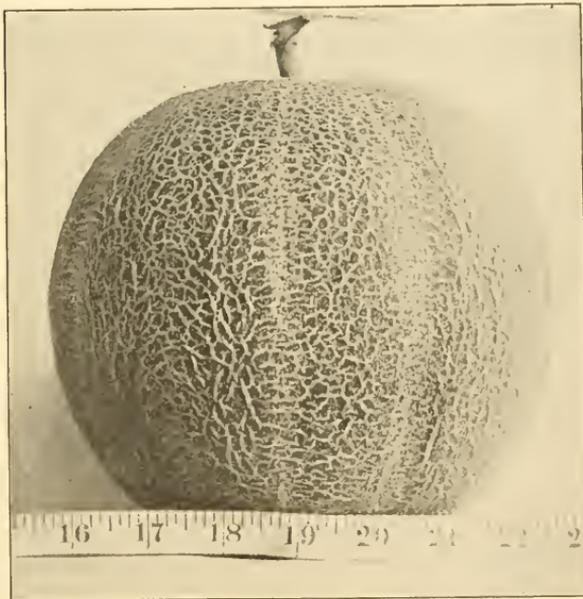
F ₃ Generation.		<i>Size of Seed.</i>					Percentages.		
		No. plants.	Character.	Large.	Intermediate.	Small.	Large.	Intermediate.	Small.
Hybrid selfed.									
No. 26	15	Intermediate.	0	15	0	0	100	0	

TABLE LIV. CROSSES AND RESULTS. SERIES VI.

F ₃ Generation.		<i>Size of Fruit.</i>					Percentages.		
		No. plants.	Character.	Large.	Intermediate.	Small.	Large.	Intermediate.	Small.
Hybrid selfed.									
No. 26	15	Large.	4	11	0	26	73	0	



HYBRID, No. 17.



HYBRID, No. 17.

TABLE LV. CROSSES AND RESULTS. SERIES I.

Color of Skin.

F ₃ Generation.					Percentages.			
No. 17	No. plants.	Character.	Green.	Intermediate.	Yellow.	Green.	Intermediate.	Yellow.
Hybrid selfed.	15	Yellow.	3	3	9	20	20	60

TABLE LVI. CROSSES AND RESULTS. SERIES II.

Netting.

F ₃ Generation.					Percentages.			
No. 17	No. plants.	Character.	Not netted.	Intermediate.	Netted.	Not netted.	Intermediate.	Netted.
Hybrid selfed.	15	Netted.	0	0	15	0	0	100

TABLE LX. CROSSES AND RESULTS. SERIES V.

Size of Seeds.

F ₃ Generation.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
Hybrid selfed.								
No. 17.	15	Intermediate.	0	15	0	0	100	0

TABLE LX. CROSSES AND RESULTS. SERIES VI.

Size of Fruits.

F ₃ Generation.	No. plants.	Character.	Large.	Intermediate.	Small.	Percentages.		
						Large.	Intermediate.	Small.
Hybrid selfed.								
No. 17.	15	Large.	7	8	0	46	53	0

Season 1912. Seeds of hybrid melons, No. 27 and No. 34, were selected for the purpose of ascertaining whether a pure hybrid type had been fixed in these hybrids, Melon No. 27 having a green skin and Melon No. 34 a yellow skin; both these hybrid melons were close pollinated.

Season 1913. Seeds of Melons No. 27 and No. 34, which were close pollinated season 1912, were tested out to confirm work in fixation of type, and resulted in a duplication of F_4 generation, thereby proving fixation of type in these hybrids.

The work indicates that, when such pairs of characters as are here considered have been crossed, they show a blend in the F_1 generation rather than dominance of either character. In the F_2 generation the segregation of dominant and recessive characters occurs.

Six pairs of characters have been studied in the melon, and show dominance and recessiveness as follows:

DOMINANT.	RECESSIVE.
Yellow color of skin.	Green color of skin.
Round form of fruit.	Obtuse-elliptical form of fruit.
Large size of seeds.	Small size of seeds.
Ribbing.	Non ribbing.
Netting.	Smoothness.
Large size of fruits.	Small size of fruits.

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