Cucurbit Genetics Cooperative

Report No. 4

July 1981

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Cucurbit Genetics Cooperative Report 4:ii-iv (introduction) 1981

Introduction

Resolution

Resolution and notes of organization meeting, October 28, 1976, Denver Hilton, Denver, Colorado, U.S.A.

The following resolution was adopted by research workers interested in organizing the Cucurbit Genetics Cooperative:

- The Cucurbit Genetics Cooperative is organized to develop and advance the genetics of economically important cucurbits.
- Membership to this Cooperative is voluntary and open to workers who have an interest in Cucurbit Genetics (an invitation to participate is extended to all Horticulturists, Entomologists, Plant Pathologists, Geneticists, and others with an interest in Cucurbits).
- Reports of the Cooperative will be issued on an annual basis. The reports will include articles submitted by members and for the use of the members of the Cucurbit Genetics Cooperative. None of the information in the annual report may be used in publications without the consent of the respective authors for a period of five years. After five years, the information may be used in publications without the consent of the authors.

Dues

Further, dues for the Cucurbit Genetics Cooperative (CGC) will be $2.50 per year and will be used to defray costs of preparation and mailing of the annual report. Members from outside the U.S.A. are encouraged to pay dues in at least two-year increments because of bank charges incurred for clearing checks. Only postal money orders or checks drawn on U.S. banks are acceptable. The annual report will include four sections: Research Notes, Stocks and Germplasm desired or for Exchange, Membership Directory, and Financial Statement. Other sections will be added in future reports as desired, i.e. gene lists, linkage groups, etc.

In accordance with the above resolution, we requested that an invitation to join the CGC be published in the following:

- Agronomy News
- Euphytica
- HortScience
- Journal of Economic Entomology
- Journal of Heredity
- Phytopath News

We are most pleased to acknowledge the assistance of the editors of these publications.

Report of Fourth Annual Meeting

by R.L. Lower

The fourth annual meeting of the Cucurbit Genetics Cooperative was held in conjunction with the American Society for Horticultural Science on July 30, 1980 at Ft. Collins, CO. There were 15 in attendance. The meeting was chaired by R.L. Lower. He reported on publication of CGC No. 3 and the financial status of CGC. The cost for publication and mailing of CGC Report No. 3 was $413.80 and left a balance of $425.99. The active membership now stands at 118. There was no further new or old business and the meeting was adjourned.

Comments from the Coordinating Committee

by Richard L. Lower

The **1981 Annual Meeting** of the CGC will be held at Atlanta, GA USA during the American Society for Horticultural Science meetings. The meeting will be held in the Marriott Hotel, Lee Suite, at 5:30 p.m. on August 13, 1981.

The call for papers for the 1982 report will go out in November, 1981, and they should be submitted to the Coordinating Committee by January 31, 1982. Hopefully, the fifth report will be published by June, 1982.

We are eager to hear from the membership regarding the future direction of the CGC. It is a pleasure to acknowledge the assistance of Grace Ebert who was responsible for the typing, proofing, and duplicating of this report. We express our sincere appreciation.

- **Coordinating Committee**
- W. P. Bemis (*Cucurbita* spp.)
- W. R. Henderson (watermelon)
- J. D. Norton (muskmelon)
- M. L. Robbins (cucumber)
- R. W. Robinson (other genera and species)
- R. L. Lower, Chairman

The chairman thanks Dr. Todd Wehner for the preparation of the enclosed addendum which serves as an index for CGC Report No. 1. Also, the Coordinating Committee acknowledges the service of the Nominating Committee chaired by Colen Wyatt.* The committee nominated Dr. J.D. McCreight as the replacement for Dr. J.D. Norton on the Coordinating Committee. The chairman thanks all of the Coordinating Committee for their assistance and especially Dr. Norton who will rotate off the committee effective July 1, 1981.

*Nominating committee includes: Colen Wyatt, Howard Adams, and Ron Robbins.

Errata

CGC Report No. 3, page 34, line 8 should read "at 26°C day and 14°C at night" rather than "at 78°C day and 58°C at night."

CGC Report No. 3, pages 55-59. In the table accompanying the paper, references were made to the relevant taxonomic literature for the original description of the species. This was done by a number in the right-most column of the table, referring to a list of eight numbered references. This system of references was mistakenly altered in editing. Below are printed the eight original citations, followed by the references to the text of the paper.

Literature pertaining to Table 1. The numbers refer to the numbers in the right-most column of the table.

1. Meeuse, A.D.J. In: Codd, L.E. 1965-1966. Bothalia 8:59-82.
2. Cogniaux, A. In: Engler, A. 1916. Das Pflanzenreich IV.275.I:143-146, 148-150.
3. Gabaev, S.G. 1929-1930. Ogurtsy Azii (Cucumbers from Asia). Trud. Priklad. Bot. Gen. Sel. 23(3):443-473.
4. Gabaew, S. 1933. Systematische Untersuchungen an Gurkenarten und Varietaten. Angewande Boanik 15:290-307.
5. Harvey, W.H. and O.W. Sonder. 1861-1862. Flora Capensis 2:496.
6. Jeffrey, C. 1965. Further notes on Cucurbitaceae. Kew Bull. 19(2):215-233.
7. Jeffrey, C. In: Milne Redhead, E. and R.M. Polhill. 1967. Flora of Tropical East Africa. (Cucurbitaceae):94-108.
8. Naudin, M. Ch. 1859. Ann. Sci. Nat. 4, Ser. XI:20-23.

Literature cited in the paper.

1. Clarke, C.B. In Hooker, Sir J.D. 1879. Flora of British India II:619.
2. Cogniaux, A. In Enger, A. 1916. Das Pflanzenreich IV.275.I:129-130.
3. Filov, A. 1964. Dikij rodich ogurtsa (The wild parent of the cucumber). In Bjull. Glav. Bo. Sad. 52:105-106.
4. Meeuse, A.D.J. In Codd, L.E. 1965-1966. Bothalia 8:74-76.
5. Naudin, M. Ch. 1859. Ann. Sci. Nat. 4, Ser. XI:1-86.
6. Rottler, J.P. 1803. Neue Schriften Gesellschaft Naturforschender Freunde zu Berlin 4:209-210.

Cucurbit Genetics Cooperative Report 4:2-4 (article 1) 1981

Investigations into the Characteristics of Seeds From Compact Cucumber Plants

M.D. Edwards and R. L. Lower

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Seeds from compact (*cp cp*) cucumber plants often germinate poorly when compared to those from normal vining-type (*Cp Cp*) plants, particularly in adverse environments."Compact" seeds also appear somewhat unlike "vining" cucumber seeds. The average seed weight is about 35% that of normal seeds. Also, seeds are often more cylindrical than the flat, ellipsoidal shape characteristic of cucumber seeds.

This study was conducted to gain insight into the variability present for a number of seed characteristics in a heterogeneous population of compact genotypes and to determine if visually apparent seed characteristics were associated with poor germinability. Initially, a random sample of 62 open-pollinated, mature fruit was selected from a population of compact genotypes at Hancock Experimental Farm in September 1979. Fruit length and diameter were measured, then seed were extracted and fermented at room temperature for three days to facilitate cleaning. Washed seed were air-dried for thee days, then evaluated for total seed number and percentage of "flat" seeds prior to packaging. Seeds of three fruit were discarded at this time due to failure of seed development.

Three months later two samples each of 10 "flat" and 10 "cylindrical" seeds were taken from each of the remaining 59 seed lots and evaluated for sample weight. There samples were then planted 1.5 cm deep in vermiculite in wooden flats on a greenhouse bench and overhead irrigated until germination occurred. Experimental design was a randomized complete block with two replications. Emergence percentage and rate (mean number of days to emergence) were recorded for each sample. In addition, visual ratings were recorded for severity of cotyledonary abnormalities and vigor at the time the second true leaf was beginning to expand.

A wide range of variability was observed for fruit and seed characteristics among 59 randomly-sampled fruit as indicated in Table 1. Partitioning of the observed variability for emergence percentage is shown in Table 2. Most of the variability was observed between fruit samples, but highly significant components were also attributable to replicates and "seed types" within each fruit. Phenotypic correlations between seed and fruit characteristics are presented in Table 3. Emergence percentage is significantly and positively correlated with percentage flat seeds, total seed number, and seed weight.

Several multiple regression models were fitted in an attempt to predict emergence percentage from seed characteristics. Although a number of seed characteristics are correlated with emergence percentage, these characteristics are significantly intercorrelated and as a result account for some of the same variability in emergence percentage. The best model accounted for only 24% of the variability observed for emergence percentage in this sample of fruit. Presumably, factors other than visually apparent seed characteristics are important in determining seed quality in compact cucumbers.

Table 1. Distribution of fruit and seed characteristics for 59 randomly-sampled fruit.

Characteristic	Mean	S. D.	Minimum	Maximum
Fruit length (cm)	14.5	2.9	9.0	22.0
Fruit width (cm)	6.7	0.62	5.5	8.0
Seed number	162.0	65.0	28.0	313.0
Percent flat seeds	58.0	22.0	0.0	97.0
Seed weight (g/seed)	0.011	0.002	0.007	0.016
- Flat seeds	0.011			
- Cylindrical seeds	0.011			

Emergence percentage	42.0	30.0	0.0	98.0
- Flat seeds	48.0			
- Cylindrical seeds	35.0			
Days to emergence	7.6	1.6	5.8	12.3
- Flat seeds	7.6			
- Cylindrical seeds	7.6			

Table 2. Analysis of variance for emergence percentage among 59 random fruit.

Source	**df**	**Mean squares for emergence**
Fruit	25	0.354**
Replication	1	0.183**
Error 1	59	0.015
Seed type within fruit	59	0.043**
Error 2	59	0.009
		$R^2 = 0.94$

** significant at the 0.01 level.

Table 3. Phenotypic correlations between fruit and seed characteristics among 59 random fruit.

Trait	**Fruit diameter**	**% flat seeds**	**Seed number**	**Seed weight**	**Emergence %**	**Days to emergence**
Fruit length	0.21	0.16	0.50**	0.32**	0.01	-0.19
Fruit diameter		-0.04	0.06	0.49**	-0.16	0.14
% flat seeds			0.40**	0.27**	0.45**	-0.45**
Total seed number				0.06	0.34**	-0.47**
Mean seed weight					0.31*	-0.13
Emergence %						-0.60**

*,** significant at the 0.05 and 0.01 levels, respectively.

Cucurbit Genetics Cooperative Report 4:4-5 (article 2) 1981

Variability for Seed Quality Among Fruit from Individual Compact Cucumber Plants

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Considerable variability has been observed for emergence percentage and other seed characteristics within a heterogeneous population of compact cucumber genotypes, as reported in a previous study (CGC #4, pp. 2-4). The present study was designed to investigate the extent to which different fruit on the same plant vary for seed quality characteristics.

The same heterogeneous, open-pollinated population of compact plants served as the source of fruit for this and the previous study. Twenty-five plants were selected which had at least five fruit positioned sequentially along the mainstem or along a sequence of mainstem and lateral branches. Although the time frame in which these fruit had been set could not be exactly established, the crown fruit was clearly set first in the season and the apical-most set much later in the season, on each plant. The 125 single-fruit samples obtained were handled as described in CGC #4, pp. 2-4. Seeds were evaluated for emergence in steam sterilized sand in wooden flats. Replication 1 was germinated in a 25°C growth chamber with 12 hrs. of fluorescent illumination daily and replication 2 was germinated on a greenhouse bench under fluctuating but considerably lower temperatures (15 to 27°C).

Partitioning of variability for emergence percentage among the 25 families of five sequentially-positioned fruit is presented in Table 1. The greatest mean square was observed for replication effects. This was not unexpected since replication was conducted across quite different environmental conditions. Interestingly, parent plant x replication interaction contributed very little to observed variability for emergence percentage. Parent plants, fruit within plants, and seed type within fruit x plants were all highly significant sources of variation as tested by their appropriate error terms. Parent plant differences were also highly significant as tested by fruit within plants as an error term. Therefore, the variability between fruit within the same plants for emergence percentage.

Correlation between plant mean seed characteristics are presented in Table 2. Observed associations are as reported in the previous study, but values for specific correlations are of considerably greater magnitude among plant means than among individual fruit.

Means for seed characteristics for each fruit position are depicted in Figure 1. Total seed number tended to increase over the season while mean seed weight and emergence percentage tended to decrease and percent flat seeds remained essentially unchanged.

Although there is clearly variation for seed quality among fruit from individual plants, the factors contributing to these differences could not be determined from this study. Such variation could conceivably arise from a number of influences including: 1) influence of paternal genetic complement, 2) changes in climatic factors associated with seed development and filling, and 3) variable maternal influence attributable to fruit position on the plant or changes in competition for available substrates over the season.

Table 1. ANOVA for emergence percentage among five fruit from each of 25 plants.

Source	df	Mean squares for emergence
Plant	24	0.56**
Replication	1	5.80**
Error A	24	0.7
Fruit within plants	100	0.22**
Error B	100	0.05

Seed type within fruit x plants	125	0.05**
Error C	125	0.03

** significant at the .01 level.

Table 2. Correlations between plant mean seed characteristics (n = 25).

Trait	**% flat seeds**	**1000 seed wt.**	**Emergence %**
Seed number per fruit	0.59**	0.41*	0.61**
% "flat" seeds		0.70**	0.78**
1000 seed weight			0.62**

*,** significant at the .05 and 0.1 levels, respectively.

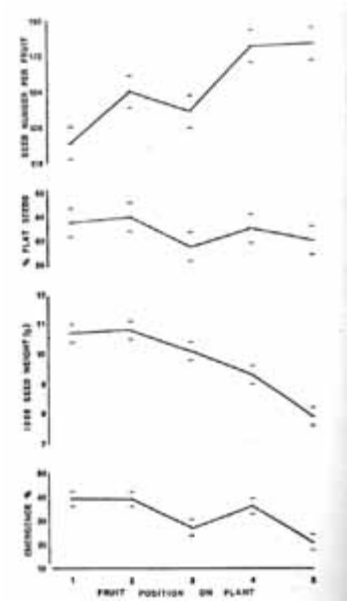
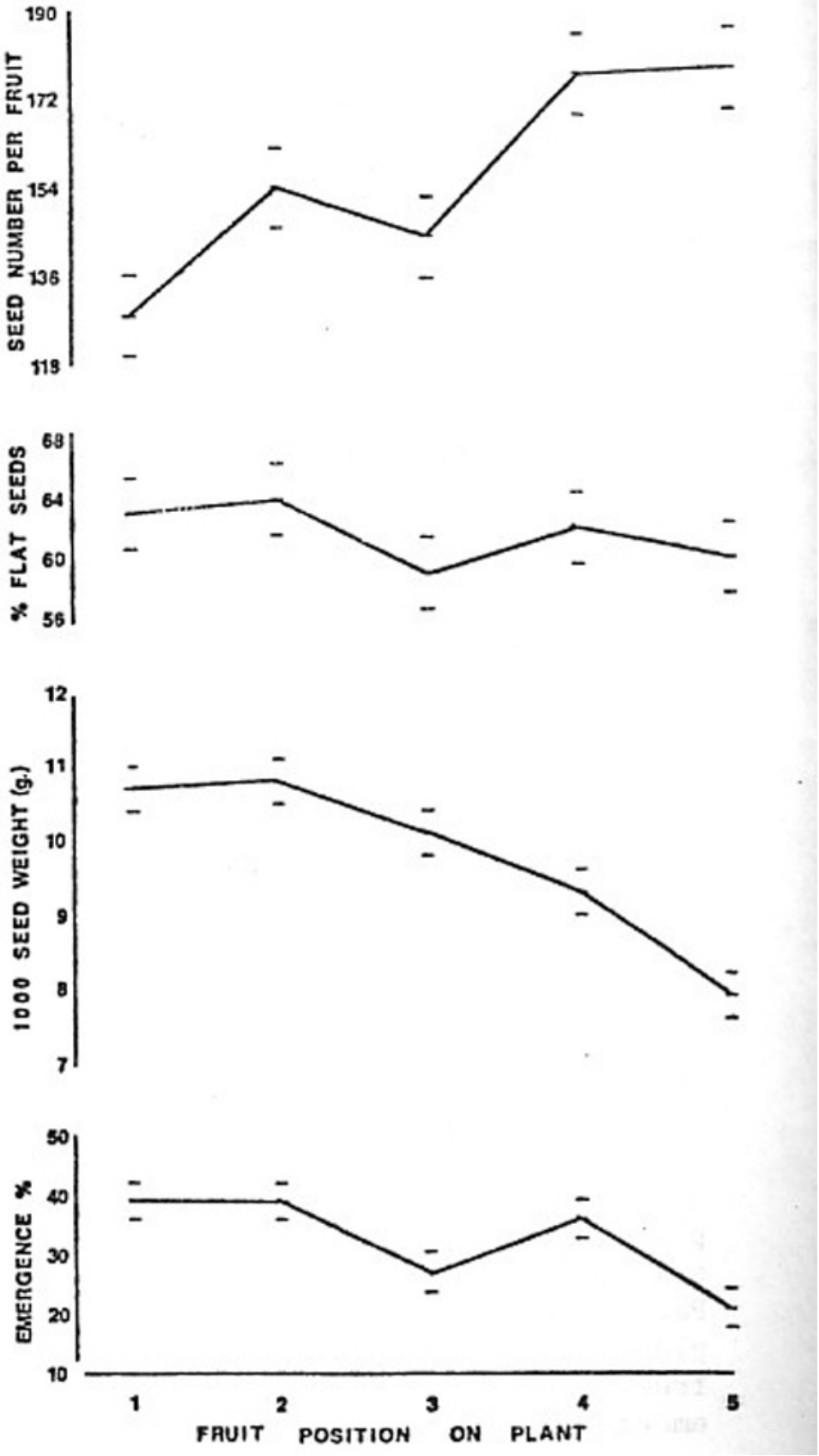


Figure 1. Means and standard errors for seed characteristics across fruit position.


SEED NUMBER PER FRUIT
190
172
154
136
118
% FLAT SEEDS
68
64
60
56
1000 SEED WEIGHT (g.)
12
11
10
9
8
7
EMERGENCE %
50
40
30
20
10
1
2
3
4
5
FRUIT POSITION ON PLANT

Cucurbit Genetics Cooperative Report 4:6-8 (article 3) 1981

In Vitro and Sporulation of *Didymella bryoniae* and a Glasshouse Method for Screening for Resistance of Cucumber

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At the Institute for Horticultural Plant Breeding (IVT) a breeding project for resistance against *Didymella bryoniae* (Auersw.) Rehm, syn. *Mycosphaerella citrullina* (C.O.Sm.) Gross. (common names: gummy stem blight, fruit and stem rot) has been in progress since 1969 in cooperation with the Research Institute for Plant Protection (IPO). This program has resulted so far in several partially resistant lines (1). Although the testing method was briefly described in the above paper, requests for additional information have convinced us that a more detailed description of the procedure would be worthwhile.

Preparing the Inoculum. Isolations of the fungus are made by preference from top internodes of infected plants. Stem pieces are disinfected in mercuric chloride 0.1% or sodium hypochlorite 1% during 30-60 sec, rinsed in sterile water and cut in segments of about 0.5 cm length. These are transferred to 9 cm petri dishes with malt extract agar (Oxoid). when we suspect heavy bacterial contamination of the plant material, we use prune agar (Difco) with 50 ppm oxytetracycline. The cultures are incubated at 22°C under exposure to blacklight (Philips or Sylvania F20t12-BLB; 12 hrs light/12 hrs dark). After several days we transfer agar discs from the edge of the developing colonies to fresh plates or slants with malt extract agar. After incubation for 10-12 days the plates are fully covered with sporulating fungus.

Cultures should be stored at a temperature of 14-15°C. Under these conditions they last for 2-3 months. To prepare the inoculum we flood fresh plates with distilled water and rub with he forefinger to bring the spores into suspension. The number of spores per ml is counted with a hemacytometer and the suspension is diluted to 10^7 spores/ml. We add one drop of Tween 80/100 ml suspension to ensure good contact with the plant.

Effects of the Environment on Spore Production. To get an insight into the effect of the type of culture medium and alternating blacklight during the incubation on the spore production, five isolates were transferred to two different culture media: malt extract agar and V-8 juice agar. The incubation took place under alternating blacklight or in the dark. From the full-grown plates a spore-suspension was made with a known quantity of water. The mean number of spores per plate could be obtained from the spore countings. From the figures in Table 1, it is clear that growing *D. bryoniae* on malt extract agar under alternating blacklight is by far the best way of obtaining large amounts of inoculation material. We have obtained comparable results with other *Didymella* species (*D. lycopersici* and *D. chrysanthemi*).

We generally observe much more fluffy mycelium growing on the plates in the absence of blacklight exposure. This type of mycelium does not contain pycnidia, and it has, therefore, little value as inoculum. Some isolates tend to form this fluffy mycelium more than others, even under blacklight. Usually sectors with sporulating pycnidia occur, and we always take material from these sectors for maintaining the isolate.

Inoculation. Plants are transplanted into 12 cm pots for 4-5 days after sowing. They are put under a transparent plastic tent when the first true leaf has a diameter of about 5 cm. After 24 hrs the spore suspension is sprayed over the plants with a propane gas operated knapsack sprayer as a pressure of 4 atm (60 psi). The optimal temperature for incubation is 26°C at a relative humidity of over 95%. For 36 hrs after the inoculation, the plants are kept in the dark by covering the tent with a sheet of black plastic. The transparent plastic is removed 4-5 days after inoculation. The first symptoms are then apparent. After 1-2 weeks the plants are assessed individually according to the following scale

0 - no visible symptoms
1 - slight infection, light brown lesions usually along the edge of the first true leaf
2 - moderate infection, mostly brown lesions on the leaves

3 - heavy infection, usually severely damaging the growing point; plants can recover from axillary buds

We exclude the cotyledons from the assessment because of earlier unreliable results. Individual plants without (severe) symptoms are selfed and intercrossed and the resulting progenies again tested. This way progress has been made in increasing the resistance level of young potted plants (1). We must, however, take into account the possibility of plants escaping effective inoculation, and we, therefore, compare lines as well. We also note differences in the overall severity of symptoms between tests, so we compare the reactions of breeding lines with that of check cultivars.

Table 1. Effect of culture medium and blacklight on sporulation of isolates of *didymella bryoniae.*[z]

Culture medium	Blacklight sporulation (+ or -)	Number of plates	Mean number of spores/plate x 10^6
Malt extract agar	+	62	3017.8
"	-	35	254.4
V-8 juice agar	+	35	6.6
"	-	33	8.9

[z] Combined data of several experiment with five different isolates; cultured in incubator at 22°C for 10 days.

Literature Cited

1. Meer, Q. P. van der, J. L. van Bennekom and A. C. van der Giessen. 1978. Gummy stem blight resistance of Cucumbers (*Cucumis sativus* L.). Euphytica 27:861-864.

Cucurbit Genetics Cooperative Report 4:8-10 (article 4) 1981

Effects of Ethylene on Hermaphroditic Cucumbers

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Ethrel, an ethylene releasing compound, has been demonstrated to alter the growth and flowering habit of monoecious cucumbers. Several of the most striking alterations include a decrease in internode length and a reduction of staminate flowers with an increased number of pistillate flowers produced at earlier nodes along the man stem. Very little work has been reported on the effects of Ethrel on bisexual lines. Robinson (1) notes that Ethrel application to the andromonoecious cultivar Lemon induced the development of pistillate flowers. The resulting pistillate flowers had elongated fruit as opposed to the round fruit from perfect flowers.

Fruit setting and seed production has traditionally been difficult on bisexual lines. The ovaries of bisexual flowers are short, thick, rounded, and capable of producing fruit with only bout 25% as many seeds as those from pistillate flowers. The first objective of this experiment was to determine if Ethrel could be used to increase ovary length, fruit length, and seed yield.

It is difficult to predict certain fruit characters of the hybrid between a hermaphroditic and gynoecious line because the short rough fruit of the perfect flowered lines hide the genetic potential that these lines possess for many size and quality characteristics. Usually it is necessary to testcross with gynoecious lines to determine combining ability of the hermaphroditic genotype. The second objective of this experiment was to learn if Ethrel treatment of hermaphroditic lines will reveal their genetic potential for several fruit and quality characteristics.

The four hermaphroditic lines tested were 1913, 3010, 2091, and 2113. Lines 2091 and 2113 were chosen because they produced dissimilar phenotypes in crosses with a pickling-type gynoecious line, 1606. The 1606 x 2091 hybrid had pickling-type fruits with rough warty light green skin and a length:diameter ratio (L/D) of about 3:1. The 1606 x 2113 hybrid had distinctly longer fruit with smooth dark green skin.

An untreated control plus four Ethrel treatments were used: 150 ppm applied once (1x), 150 ppm applied twice (2x), 250 ppm (1x) and 250 ppm (2x). The first treatment was applied at the third true leaf stage and when appropriate, a second application was applied one week later. Each line-treatment combination was replicated four times. Data was taken on plant height 20 days after the first Ethrel application, ovary length, presence or absence of anthers, fruit length, fruit width, skin color and texture, and the number of seeds per fruit. Pollinations were mae with line 1568 which was producing an abundance of staminate flowers at the time.

Anthers did not develop in plants treated with Ethrel at 150 ppm (2x) and 250 ppm (2x), but occasionally occurred in plants treated with 250 ppm (1x). All Ethrel treatments reduced plant height by reducing internode length (Table 1). The 250 ppm (2x) treatment is not recommended because of severe stunting. Ovary length was consistently increased by all treatments of Ethrel for lines 2091, 3010, and 2113. Line 1913 which had the longest ovary when untreated, did not respond to any of the Ethrel treatments. About five weeks after Ethrel application, ovary lengths decreased to near normal and anther development resumed.

Fruit lengths were increased over the untreated control for lines 2091, 3010, and 2113. The longest fruit which developed on an Ethrel treated 2113 plant was 8.06 cm above the untreated mean for that line; whereas, the longest fruit from a treated 2091 line was 6.25 cm above its untreated mean. Line 1913 which had the longest fruit when untreated, failed to respond with longer fruits. No significant changes in fruit width resulted and the overall fruit size response was an increase in the L/D ratio.

With two out of the four hermaphroditic lines, Ethrel caused a striking change in skin texture and color. Fruits from 3010 and 2113 normally had many spines and warts on a blotchy yellow background. All Ethrel treatments reduced the number of spines and warts on these fruits and caused a shift to a dark green skin color. Ethrel treatment on lines 1913 and 2091 did not produce changes in color and texture and all fruits developed warts and a yellowish skin.

Seed yield of all the lines was significantly increased by the three highest Ethrel treatments [150 ppm (2x), 250 ppm (1x), 250 ppm (2x)]. In many cases, pollination was facilitated because there were no anthers, and any injury to the stigma which might have occurred during the emasculation procedure was eliminated. Also, the long epigynous ovary of the treated plants initiated more ovules along the lengthened placental region increasing the potential for seed set. Unfortunately, many of the fruit from the

250 ppm (1x) and 250 ppm (2x) plants were pear-shaped because of inadequate pollination. A similar experiment is planned for the field where bee activity should insure complete pollination.

The response of the two inbreds 2091 and 2113 to Ethrel mimicked the phenotype of their hybrid with the pickling type gynoecious inbred 1606. The hybrid 1606 x 2091 had the characteristic short pickle shape with yellow-green skin while 1606 x 2113 resembled a long slicer type with smooth dark green skin. Line 2113 also had a greater increase in fruit length with Ethrel treatment than did 2091.

Ethrel application to these four hermaphroditic lines resulted in many simultaneous phenotypic changes suggesting that anther development, fruit shape, and skin color and texture, may be affected by the same endogenous hormone. It is possible that the Ethrel treatments is supplying the hormone which is somehow produced or controlled by the *M* gene. The association of the *M* locus with the ethylene hormone may help explain the seemingly pleiotropic effects of sex expression and fruit shape. In the F_1, the *M* locus would be heterozygous and could provide the enzyme contributing to anther suppression and ovary shape. By spraying the hermaphroditic lines with Ethrel it may be possible to supply the substance produced or controlled by the *M* locus and reveal the genetic potential that a hermaphroditic line might contribute to the hybrid phenotype.

Table 1. Effects of Ethrel on plant height, ovary length, fruit length, and number of seeds per fruit of 4 hermaphroditic cucumber lines.

	Plant Height (cm) [y]				**Ovary Length (mm) [x]**				**Fruit Length (cm) [y]**				**No. of seeds per fruit [y]**			
Ethrel treatment [z]	**2113**	**1913**	**2091**	**3010**	**2113**	**1913**	**2091**	**3010**	**2113**	**1913**	**2091**	**3010**	**2113**	**1913**	**2091**	**3010**
0	46.2	85.2	66.0	59.8	14.2	19.9	10.4	12.4	8.9	11.4	6.8	6.0	81.0	78.2	52.2	68.5
150 ppm (1x)	36.0	67.5	52.8	32.8	25.1	21.2	12.9	17.0	12.8	11.4	9.3	8.5	71.0	75.8	60.2	82.2
150 ppm (2x)	28.8	27.8	34.2	36.0	25.0	19.6	18.6	20.2	13.0	11.0	11.8	10.5	100.5	205.8	153.0	131.2
250 ppm (1x)	34.8	50.0	43.2	38.2	30.8	19.9	15.4	21.6	15.5	12.1	10.8	10.0	92.0	150.8	165.0	113.5
250 ppm (2x)	26.7	36.5	30.0	29.5	28.4	21.3	19.0	22.0	13.7	11.0	12.4	11.1	90.5	147.8	137.8	99.5
LSD (0.05)	6.35				1.29				0.89				17.3			

[z] Single treatments were made at the third true leaf stage. Additional treatments were made 7 days later.

[y] Mean of 4 reps per treatment.

[x] Mean of 3 ovary lengths per plants of 4 reps per treatment.

Literature Cited

1. Robinson, R. W. 1978. Association of fruit shape and sex expression in the cucumber. Cucurbit Genetics Coop. Rpt. 1:10.

Cucurbit Genetics Cooperative Report 4:11 (article 5) 1981

A Second Source of Non-bitterness in Cucumber

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The non-bitter character is commercially of vital importance in The Netherlands, bitter cucumbers being unwanted and thus unsalable.

In the 1950s, a continuous search went on at the IVT for non-bitter plants. In the gene bank then available, among 15,000 individuals one plant of the United States variety Improved Long Green (ILG) was found which was completely non-bitter in all vegetative and generative parts. Probably it was a spontaneous mutant. According to Andeweg and De Bruyn, the non-bitter character depends on one recessive gene (1). In the 1960s, this character was incorporated into the Dutch varieties with the result that at present almost all varieties are completely plant non-bitter.

In 1969, the IVT received from a missionary the pickling cucumber variety Jiwika, originating from the village of Jiwika in the Balliem valley in the central highlands of New Guinea. It was said to be plant-bitterfree.

Crosses were made both with the non-bitter ILG mutant and a bitter line. All 48 F_1 plants from the cross between Jiwika and the non-bitter ILG mutant were found to be completely free from bitter principles. Of the F_2 progeny from the cross of Jiwika and the bitter line, 192 plants were tested for the presence of bitter principles. Of those, 47 plants were found to be completely non-bitter. From this it may be concluded that in Jiwika too, the non-bitterness is governed by one recessive gene and that this gene is identical with the ILG gene, designated *bi.*

Recently, it was found that the gene *Bi* is not inherited in dominant fashion but intermediary (2). This could be demonstrated via the development of a method for the quantitative determination of cucurbitacin.

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Cucurbit Genetics Cooperative Report 4:12-13 (article 6) 1981

An Estimate of the Heritability of Low Temperature Seed Germination in Cucumber

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Reduced germination in low temperature spring soils often results in erratic stands and reduced yield potential in many agronomic and horticultural crops. For this reason, numerous breeding programs and genetic studies have been initiated with the objective of developing cultivars with improved germination, emergence and seedling vigor under adverse conditions of low soil temperatures (3,4). Low temperature tolerance in cucumbers and other vegetable crops is necessary, as uniform and rapid emergence is essential for successful mechanization of the crop. In addition, the establishment of vigorous plants under low temperature conditions would allow the extension of processing and marketing seasons (2).

The objective of this initial study was to estimate the heritability of low temperature germination, and to develop a selection procedure for population improvement.

Seeds of 210 half-sib families derived from a random mating heterogenous population of adapted cucumber lines were evaluated for percent germination at 13°C under controlled environment conditions at the University of Wisconsin Biotron. We chose a family structure (half-sibs) for evaluation of low temperature germination for several reason.

1. selection among family means would be more effective with traits of low heritability.
2. a family structure provides a continuous distribution of family means, as opposed to a discrete distribution among individuals.
3. a family structure allows evaluation of performance at optimal as well as suboptimal temperatures. Performance of a family at optimal temperatures can be used as a check of seed viability, as well as a method to adjust family performance at suboptimal temperatures for non-genetic effects such as poorly filled or damaged seed.

Two replicated of 20 seeds from each family were placed on moist filter paper in petri dishes and evaluated for percent germination at both 13 and 25°C. Germination was defined as radicle emergence of 5 mm or longer. Narrow sense heritability among half-sib family means for germination at 13°C was estimated as 0.17 ± 0.06 (Table 1).

A recurrent selection procedure adapted from Lonnquist's (2) modified ear-to-row selection was also initiated. The first 10 germinated seeds from each of 20 selected families (selection intensity 10%) were transplanted to the greenhouse and grown to maturity. Individuals within each family were random mated by using four randomly selected staminate flowers to pollinated each pistillate flower. This provided approximately 150 new families for evaluation in the next cycle of selection. Using this method, two cycles of recurrent selection can be completed per year. Seed from the first three cycles of recurrent selection are currently being increased under uniform environmental conditions to minimize the confounding effects of processing and storage time on progress from selection. We hope to evaluate progress from selection, as well as look at correlated responses to selection, in the fall of 1981.

Table 1. Analysis of variance for percent germination of cucumber at 13°C 10 days after seeding (arcsin transformed data).

Source	df	Mean squares	Expected mean squares	Abbreviation
Replication	1	-	-	-
Family	209	0.0187	$s^2_e + 2s^2_f$	m1
Error	209	0.0155	s^2_e	m2

$s^2_f = 1/4\ s^2_A = (m1 - m2)/2$

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Cucurbit Genetics Cooperative Report 4:13-16 (article 7) 1981

The Effects of Fermentation and Storage Time on Germination of Cucumber Seeds at Optimal and Suboptimal Temperatures

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One technique commonly used to clean cucumber seeds is to scrape the placental tissue and seed from the seed cavity and allow natural fermentation to occur for a given length of time. At temperatures between 15 and 21°C sufficient fermentation will usually occur within 3 to 6 days (1). However, the effect of the duration of fermentation on the germinability of cucumber seeds is not well documented. In tomatoes, Lower and Cadregari (4) found differences in varietal response to the duration of fermentation. After 12 days of fermentation the percent germination in one variety decreased from 95 to 20%, whereas in another variety germination remained in excess of 90%.

An additional potential problem in seed germination is that some or all seeds of several crop species are dormant at harvest (3). In adapted *Cucumis sativus* cultivars fresh seed dormancy, though seldom a serious problem, can be overcome by removal of the seed coat, infusion of any of several growth regulators, or dissipated during storage (2, 5, 6, 7).

The objective of this study was to observe the effects of the duration of fermentation and storage time on the rate and percent germination of cucumber seed at optimal (25°C) and suboptimal (15°C) temperatures.

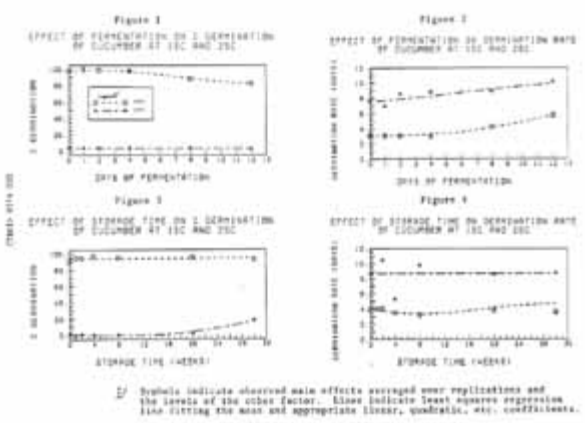
Materials and Methods

Mature fruit were harvested from a random mated heterogenous population of adapted cucumber lines which were field grown at the Hancock Experiment Station, Hancock, WI. Seeds and pulp were scraped from the seed cavity of more than 200 fruit and bulk fermented at 25°C. The fermenting material was stirred daily and bulks of seed were sampled over a 12-day period. The seed samples were washed to float off debris, dried on a screen overnight, and then placed in storage. The storage room conditions were variable, and the temperature ranged from 15 to 25°C; this simulated normal storage conditions of seed used in our breeding program. Germination was tested by removing samples of seed from storage at specified intervals of time and placing 50 seeds on filter paper in 90 mm petri dishes with 10 ml of water. The treatment combination represented a 6x7x2 factorial set, i.e. 6 fermentation times (0, 1, 2, 4, 8, and 12 days), 7 storage times (0, 1, 2, 4, 8, 20, and 30 weeks), and 2 germination temperatures (15 and 25°C). The experimental design was randomized complete block with two replications (petri dishes) per treatment. Germination readings were taken at 3, 6, 9, and 12 days after planting. The percent germination after 12 days and the germination rate (mean number of days to germinate of those seed which germinated) were calculated. Germination was defined as radicle emergence of 5 mm or longer. For the analysis of variance arcsine transformation was performed on percentage data. Significant main effects were subjected to further analysis to fit the appropriate regression model.

Results

Main effects of fermentation. The pH of the fermenting material increased from 4.0 at day 0 to 4.5 after eight days of fermentation. The effect of fermentation duration on the percent germination gave contrasting results at 15 and 25°C. The percent germination at 25°C remained above 97% over the first four days of fermentation and then decreased to 83% after 12 days of fermentation (Fig. 1). The percent germination at 15°C varied about a mean of 3% regardless of the duration of fermentation time (Fig. 1). The effect of fermentation duration on the germination rate at 15 and 25°C was similar. The rate of germination at 25°C was stable at three days over the first four days of fermentation and then slowed to six days after 12 days of fermentation (Fig. 2). The rate of germination at 15°C slowed linearly from 7.5 days initially to 10 days after 12 days of fermentation (Fig. 2).

Main effects of storage time. The seed was stored from September 1980 to May 1981; during that time seed moisture was reduced from 7.3 to 5.0%. The effect of the duration of storage time on the percent and rate of germination gave contrasting results at 15 and 25°C. The percent germination at 25°C remained above 915 regardless of storage time (Fig. 3). The percent germination at 15°C increased from 1 to 18% after 30 weeks of storage (Fig. 3). The rate of germination of 25°C accelerated from 4.1 days initially to 3.2 days after eight weeks of storage, and then slowed to 3.9 days after 30 weeks of storage (Fig. 4). The germination rate at 15°C varied about mean of 8.9 days regardless of storage time (Fig. 4).



Discussion

Fermentation for up to four days at 25°C adequately separated seeds from pulp for cleaning, without adversely affecting the viability of cucumber seeds from this population. However, excess fermentation beyond four days resulted in reduced germination and a slower rate of germination at an optimal temperature (25°C).

The initial accelerated rate of germination at 25°C and the increased percent germination at 15°C with storage time indicate continued physiological changes in cucumber seeds during storage. Whether these changes simply reflect a response to decreased seed moisture prior to imbibition or dissipation of low temperature germination inhibitors with age or some other phenomena remains to be tested.

The results of this study provide information useful in understanding occasional erratic germination of cucumber seeds which have been subjected to different processing methods. In addition, the results focus attention on how the effects of processing, handling, and storage of cucumber seeds can alter their ability to germinate at both optimal and suboptimal temperatures. These effects will warrant increased attention in the planning and interpretation of future seed germination experiments.

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Figure 1

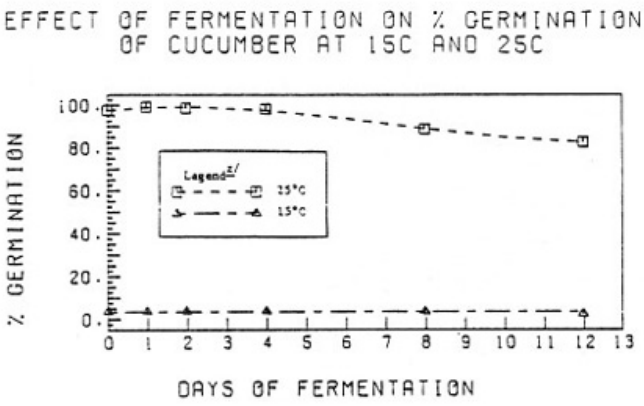


Figure 2

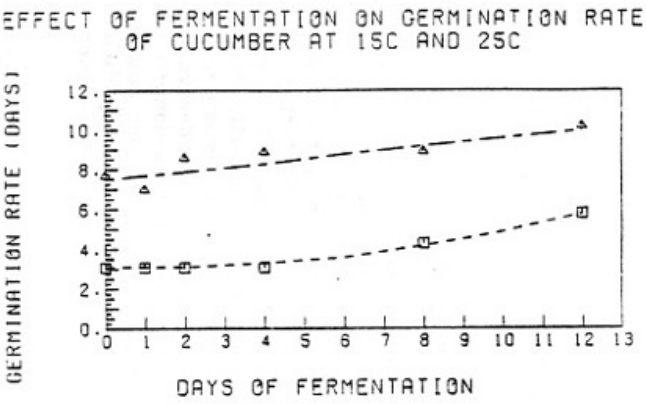


Figure 3

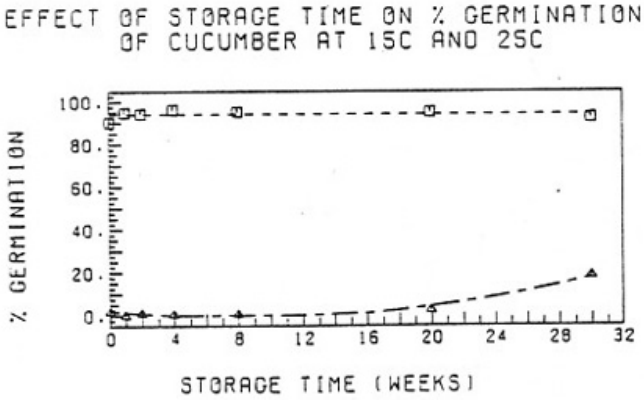
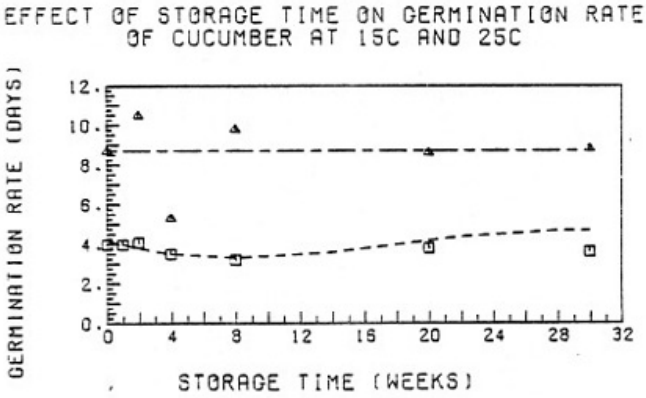


Figure 4



Z/ Symbols indicate observed main effects averaged over replications and the levels of the other factor. Lines indicate least squares regression line fitting the mean and appropriate linear, quadratic, etc. coefficients.

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Pathogenicity of Isolates of *Didymella bryoniae* and Reisolation of the Fungus Out of Symptomless Plants

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Five different isolates of *Didymella bryoniae* (Auersw.) Rehm, causal fungus of fruit and stem rot, were separately used to inoculate three cucumber genotypes with different levels of resistance, to detect possible differences in pathogenicity. Three tests were carried out, the first in 1978 and the last two in 1980. The isolates had been collected from 1974 to 1977 by Van Steekelenburg (Research Institute for Plant Protection) and were subcultured manifold on malt extract agar (1). The plant material consisted of two IVT breeding lines with different levels of resistance against fruit and stem rot and were derived from cv. Rheinische Vorgebirge (2). Susceptible check was cv. Levo. The experimental design was a split block with eight replications of two plants per treatment randomly arranged in two plastic tents. The plants were inoculated in the potted plant stage, as described earlier (1). We inoculated the plants with each isolate separately, while shielding the remainder of the plants and taking care to keep the treatments apart.

Average visual disease ratings according to the scale in (1) of all 16 plants per treatment are in Table 1. These are the results of one test only, inoculated October 10, 1980 and evaluated October 20, 1980. The data from the other two tests are similar. The ratings in the water-control treatment may reflect damage from water-logging due to the extremely high relative humidity under the tents. ANOVA of all the data revealed that the apparent resistance level of the three genotypes differed significantly over all isolates ($F_{2/14}$ = 23.97**). The isolates were also significantly different ($F_{3/35}$ = 29.02**). Separate analyses per host genotype established that on line A, isolate M77-3 was more pathogenic than all others with M74-3 as second most pathogenic, both significantly differing from the water-control. On line B both isolates were equally pathogenic and both differed significantly from the others. On 'Levo' their pathogenicity was similar, and all isolates induced significantly more symptoms than the water-control. Yet there was no significant interaction between isolates and host genotypes ($F_{10/70}$ = 1.94), so from this test we cannot conclude that physiological races of *D. bryoniae* exists, although differences in overall pathogenicity were clear. The results of the other two experiments pointed in the same direction. There was a noteworthy large difference in the coefficient of variation of the two lines (67%) in comparison with that of cv. Levo (26%). The lines appear to be segregating. There was almost complete concordance of the ranking of all five isolates on susceptible cv. Levo in all three tests. Apparently no relative change in pathogenicity has occurred in these isolates for over two years, despite frequent subculturing under blacklight and the fortuitous selection for *in vitro* sporulation (1).

The value of the resistance found in the potted plant stage depends on how well it holds out in plants during the cropping period. Initial results of correlation studies with related breeding lines were not reassuring (3). We have investigated whether symptomless plants in our tests were indeed free of the fungus following 4-5 weeks of recovery after the test. Therefore, we attempted to reisolate the fungus from pieces (length 0.5-1 cm) of disinfected internodes cultured according to (1). We also applied the same technique to plants with mild, moderate and severe symptoms in the potted plant stage, but at the time of dissection, all plants were without symptoms. The plants had been inoculated with very pathogenic isolate M77-3 or with M74-4. Fungal growth was assessed following five days of incubation of the stem pieces.

From almost all of 67 dissected plants the fungus was reisolated from the hypocotyl. From less that half of the plants we also obtained fungal colonies from higher internodes, often from the first one or from the top of the plant (9th to 15th internode). Only one to three internodes per plant yielded positive reisolation results. A summary is in Table 2. The most resistant line contained most plants from which the fungus was reisolated. From plants that were severely diseased in the potted plant test we obtained less often fungal growth than from moderately or slightly attacked plants. From one-third of the plants that did not show symptoms in the potted plant test, we were able to reisolate *Didymella*, so these plants apparently carried it without visible damage. The results of both isolates differed slightly.

These preliminary data caution against overreliance on the potted plant test. Other reisolation attempts out of inoculated plants of up to four months of age indicate that the fungus may be present in the plants for a long time unnoticed, and

possibly break out in disease when the environment and condition of the plants are right.

Table 1. Average disease rating of five isolates of *Didymella bryoniae* on two lines and cv. Levo in a potted plant test.

Isolate	Line A	Line B	Levo	Mean
M74-2	0.61[z]	0.60	1.76	0.99
M74-3	1.60	1.30	2.30	1.73
M74-4	1.08	0.43	2.05	1.19
M75-3	1.20	0.59	1.51	1.10
M77-3	2.29	1.28	2.33	1.97
Mean	1.36	0.84	1.99	1.40
Water	0.16	0.06	0.39	0.20

[z] Average of 8 plots of 2 plants.

Table 2. Number of plants from which *Didymella bryoniae* was reisolated, as a fraction of the number of plants tested (plants were inoculated in a potted plant test 6 weeks before dissection).[z]

Line	Isolate	0	1	2	3	Mean
A	M77-3	-	3/3	-	1/8	4/11
	M74-4	2/6	-	1/1	0/2	3/9
B	M77-3	1/2	3/5	8/8	-	12/15
	M74-4	2/8	0/1	0/1	-	2/10
Levo	M77-3	-	0/1	3/5	0/5	3/11
	M74-4	-	1/2	1/5	1/4	3/11
	Mean	5/16	7/12	13/20	2/9	27/67

[z] Only internodes above hypocotyl considered.

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Cucurbit Genetics Cooperative Report 4:19-20 (article 9) 1981

A Cucumber Mutant with Increased Hypocotyl and Internode Length

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A cucumber plant with a three-fold increase in hypocotyl length was found in the F_2 generation after treatment of seed of 'Lemon' with thermal neutron radiation. Discrete segregation occurred in the F_2 generation of crosses with the mutant. On the basis of F_2 ratio of 33+:11 long hypocotyl, from a cross with 'MSU 713-5', and other data, it is concluded that a single recessive gene is involved. The symbol *lh*, for long hypocotyl, is proposed.

Length of the internodes as well as the hypocotyl is increased by *lh* (Table 1). Despite its marked effect on internode elongation, it had no apparent effect on other phytohormone-mediated development. The mutants were normal in sex expression, fruit length, leaf shape, and other characteristics.

Previously genes have been reported to reduce internode length of the cucumber, but this is the first cucumber gene reported to increase length of internode and hypocotyl. Its unique nature, ease and reliability of classification in the seedling stage, good viability and fertility, and freedom from interference with classification for other genes makes it a useful seedling marker for the cucumber.

Table 1. Length of hypocotyl and first two internodes of F_2 segregants.

Length (cm)						
	Hypocotyl		Internode 1		Internode 2	
Class	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Range**
Lh	5.8	2.0-9.0	5.4	2.0-8.5	7.6	3.3-10.0
lh	16.3	14.5-20.0	16.3	10.0-22.0	12.9	10.0-20.0

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Tissue Culture Propagation of Field-Grown Cucumber Selections

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One potential application of tissue culture techniques to cucumber breeding is in the propagation of selections made in the field. This would replace vegetative propagation by rooted cuttings (4). Callus has been induced to form from all vegetative and reproductive parts of the cucumber plant: root, stem, leaf blade, petiole, tendril, flower parts, and seedling hypocotyls and cotyledons (1). Callus has also been produced from leaf protoplasts (2).

One method of propagation would involve producing callus from the selected plants, multiplying the callus, and then regenerating plants from the callus. The best source of tissue for use in propagating selections is leaf tissue, since it is available throughout the life of the plant, is available in large quantities, and, if taken near the growing point, represents younger and more rapidly growing tissue than most other plant parts. The major problem in vegetatively propagating cucumber selections from the field is eliminating external and internal contamination without killing the tissue. Our objective was to evaluate a tissue culture approach to propagation of genetically diverse cucumbers grown in the field under normal summer disease load. In addition, we evaluated sodium hypochlorite (chlorine bleach) for use in sterilizing tissues to be cultured *in vitro*.

Thirty diverse *Cucumis* plant introduction (PI) lines were planted at Raleigh, NC on June 27. All but two of the PI lines used were *Cucumis sativus* accessions (Table 1). The exceptions are PI 299570 which is *C. africanus*, and PI 292190 which is *C. metuliferus*. After 41 days, the youngest fully-opened leaf was collected from 3 plants of each PI line. Leaves were then sterilized in a 17% solution of laundry bleach (1 bleach:5 water) for 15 to 42 min (depending upon the sterilizing treatment), and then 3 mm square pieces of blade or petiole tissue were cut and placed on the tissue culture medium with 5 tissue pieces per petri plate. The medium contained Murashige-Skoog (3) salts and vitamins with 0.1 mg/l naphthalene acetic acid, 1 mg/l N6-benzylamino purine, and 3% sucrose. A completely random experimental design was used with 30 lines, 2 tissues (leaf blade and leaf petiole), and 2 replications (petri plates). The plates were evaluated for contamination and callus production after 34 days in culture.

Tissue from leaf blades produced callus with a higher rate of success than that from leaf petioles (Table 2). Uncontaminated callus was obtained from 25 of the 30 lines used, with the loss of callus being due to either internal contamination of the tissue or to killing of the tissue for callus during sterilization. Tissue from leaf petioles is not an efficient source of tissue for callus production because of its high rate of internal contamination (Table 3), and its low rate of clean callus production (Table 2). Leaf blades should be sterilized in 17% laundry bleach for about 20 min to eliminate as much contamination as possible without killing the tissue (Table 3). Better than 60% of the petiole and blade pieces of the *C. africanus* and *C. metuliferus* PI lines produced clean callus.

It appears that, with further refinements, the system outlined here could be used to reliably establish callus cultures of selections made from field-grown cucumber plants.

Table 1. Plant introduction (PI) lines, and their origins, used in this study.

PI	Origin	PI	Origin	PI	Origin
92806	China	222099	Afghanistan	299570z	South Africa
165499	India	223841	Philippines	342950	Denmark
167050	Turkey	224668	Korea	344442	Iran

177363	Syria	228808	Canada	355052	Israel
181756	Lebanon	249561	Thailand	356809	U. S. S. R.
183224	Egypt	257286	Spain	357837	Yugoslavia
205995	Sweden	264226	France	358813	Malaysia
206043	Puerto Rico	267745	Brazil	360939	Netherlands
212059	Greece	283899	Czechoslovakia	369717	Poland
212233	Japan	288990	Hungary	292190y	Transvaal

[z] *Cucumis africanus*

[y] *Cucumis metuliferus*

Table 2. Callus production from leaf tissue collected from 30 field-grown Cucumis lines.[z]

Tissue source	Clean callus (%)	Contaminated callus (%)	Dead tissue (%)
Petiole	38	32	30
Blade	58	7	35

[z] Youngest fully-opened leaf harvested from 41-day-old plants growing at Raleigh, NC.

Table 3. Percent loss of leaf tissue pieces to contamination or to killing by sterilization.

	Tissue source [z]			
	Leaf petiole		Leaf blade	
Time in sodium hypochlorite (min.)	Dead	Contaminated	Dead	Contaminated
15	0	77	13	33
18	10	33	7	7
21	47	20	0	7
24	30	67	33	0
27	43	10	47	0
30	47	17	40	0
33	30	17	13	0
36	43	23	73	7
39	23	17	53	7
42	33	37	60	13

[z] Youngest fully-opened leaf harvested from 41-day-old plants growing at Raleigh, NC.

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Leaf Miner Resistant Muskmelon Breeding Lines

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A severe infestation of leaf miners at the Horticulture Farm, E.V. Smith Research Center led to the discovery of high levels of resistance to leaf miners in certain muskmelon breeding lines during the 1978 growing season. The severe infestation of leaf miners was attributed to the use of Methomyl in the weekly spray program.

Breeding lines which were selected for resistance to leaf miners in 1978 exhibited high levels of resistance during the 1979 and 1980 growing seasons.

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Multiple Disease Resistant Casaba

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Multiple disease resistant casaba breeding lines were developed from crosses of casaba cultivars and multiple disease resistant cantaloupe breeding lines. Fruit quality was excellent with total soluble solids of 15.3%. After storage at 21°C for 90 to 120 days, the fruit were still in excellent condition for market.

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A New Plant Type in *Cucumis melo* L.

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Two plant types have been widely described in melon. The vine type is by far the more common, with all but a few cultivars being of this type. The short-internode type (2, 5) permits high plant populations per unit area, but is not yet important commercially. Both these types have a prostrate growth habit.

A third, less widely known, plant type exhibits upright, bushy growth until shortly after fruit set. Given the unfortunate use of the term "bush" in reference to the short-internode type, this new type is perhaps better referred to as "birdsnest" (3), in reference to the position of the fruits in the center of the plant. The "short-runnered" form described by Dyutin (4) may be similar material.

Plants of the birdsnest type are distinguished by three main features: compact growth, placement of fruits near the base of the plant, and uniform development and maturation of fruits. Five introductions reportedly fitting this description were made available to us: 'Persia 201' (P201), 'Persia 202' (P202), 'Persia 203' (P203), 'Persia 221' (P221), and 'Russia 5062' (R5062). P201, P202, and P203 were collected from Teheran, Iran, and P221 from Isfahan, Iran, in 1966 (7), and upon screening were described as having short internodes, fruits concentrated near the center of the plant and ripening uniformly, of poor eating quality, and highly susceptible to diseases (8). R5062 was kindly provided by Dr. D.W. Denna, who described it is a "birdsnest" type obtained from "a Russian plant breeder" (3).

These introductions were observed for several years in field trials at Newe Ya'ar (Yizre'el Valley, Northern Israel) followed by evaluation in a replicated field trial during the summer of 1979. Particular attention was paid to compactness of growth and closeness of fruits to the base of the plant. Data for concentration of fruit maturity were incomplete, due to disease infestations, which killed most of the plants before fruit maturity, P203 exhibited a spreading, prostrate growth and distant placement of fruits, and thus could not be considered as being of the birdsnest type. R5062 was not so compact as the remaining three introductions and its fruits were significantly farther from the center of the plant, though there was a significant difference in regard to the latter character between inbreds obtained from the original material. P201, P202, and P221 were equally desirable with regard to fruit position. However, P201 appeared to be somewhat less compact than P202 and P221. Observations of P201, P202 and P221 plants surviving to maturity supported the contention that fruits of individual plants ripen nearly simultaneously.

P201, P202, and P221 are vigorous, with large light green leaves, large seeds, and are andromonoecious. All three are highly susceptible to diseases. Fruits of P201 and P202 are round and have a heavy, coarse netting. Fruits of P221 are usually flat in shape, have fine netting, and a rind that turns bright yellow-orange when ripe. Flesh of P201 and P221 is orange and that of P202 segregates for orange and green. In all three accessions, fruit weight averages slightly over 1 kg, the seed cavity is large, flesh is this and low in sugar (3-4% soluble solids by refractometer), and the fruits decay quickly.

The short-internode type is reported to differ genetically from the vine type by a major recessive gene plus at least two modifiers (1, 2, 6). Dyutin (4) reported that his short-runnered form had a complex inheritance. Results of crossing P202 with vine type cultivars are also suggestive of a complex genetic control, but the relationship between P202 and Dyutin's material is not known. Crossing results indicate that it is possible to improve horticultural characteristics and lower disease susceptibility while maintaining birdsnest expression to a large degree. Development of cultivars combining birdsnest type with susceptible fruit characteristics may permit profitable once-over mechanized harvest.

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Association of Sex Form with Fruit Shape in Muskmelon (*Cucumis melo* L.)

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An attempt was made to verify the observations of Rosa (2), Kubicki (1), and Wall (3) regarding the extent of association between monoecious sex expression and oblong fruit shape and of andromonoecious sex expression with round fruit shape. Further, it was possible to study the existence of linkage, if any, of hermaphroditic sex expression and the extent of association of flat fruit shape with any of these sex forms. In these studies, the fruit shape was characterized as flat, round and oblong on the basic of shape index (polar diameter/equatorial diameter) of < 1.0, around 1.0 and > 1.0 respectively.

In F_2 populations derived from monoecious x andromonoecious crosses involving plants with oblong and round fruit, linkage was detected and estimated in monoecious-1 x andromonoecious-2 in coupling phase and monoecious-4 x andromonoecious-1 in repulsion phase. The recombination fraction for the former was 0.310 ± 0.072 in straight combination and 0.247 ± 0.068 in reciprocal combination, whereas in monoecious-4 x andromonoecious-1, it was 0.699 ± 0.084 indicating absence of linkage in the reciprocal combination. In andromonoecious-2 x monoecious-3 in coupling phase, no linkage was detected.

In the cross monoecious flat x andromonoecious round, linkage was detected in the reciprocal cross with a recombination fraction of 0.643 ± 0.080, while no linkage was detected in monoecious flat x andromonoecious oblong. The recombination obtained in both coupling and repulsion phase was quite high, 24 to 31% and 63 to 69%, respectively, indicating thereby very loose or no linkage between sex of the plant and fruit shape. The p-value obtained was more than 0.50 viz. 0.699 ± 0.084 and 0.643 ± 0.080 and they were within the range of 5% standard error. This is indicative that there was no linkage.

These observation indicate only loose linkage of oblong and round shapes with monoecious and andromonoecious sex types. Two possibilities are indicated. The genes for monoecious and andromonoecious sex forms appear to be located on different chromosomes or a second possibility is that genes for fruit shape are located in the same chromosome where genes for sex are present. The spatial distance between these two loci could not be estimated. Data clearly indicate that the chances of recombinations through crossover are comparatively high and linkage in coupling phase can at best be termed as a loose one. However, the flat fruit shape did not seem to have any particular kind of association with any of the two sex forms as did those of oblong and round fruit shapes.

No linkage was detected in the round x oblong crosses involving andromonoecious (Ga) and hermaphrodite (ga) parents differing at the *G* locus.

In a monoecious (GA) x hermaphrodite (ga) cross, the segregation of sex is assumed to be mainly on two major genes (*A* and *G)* and fruit shape on one gene basis. In a hermaphorodite-2 and monoecious-3 cross representing parents in coupling phase, linkage with *A* gene was detected with a recombination fraction of 0.358 ± 0.057 and no linkage was detected between *G* gene and fruit shape. In the repulsion phase, the recombination fraction was 0.649 ± 0.067 for *A* gene and no linkage was detected with *G* gene in a cross between monoecious-4 x hermaphrodite-1. Similarly, no linkage was noticed in monoecious-2 x hermaphrodite-1 involving parents with flat x oblong fruit shape, either with the *A* or *G* loci.

On the basis of these results obtained in three different sets of crosses, it can be concluded that there appears to be very loose linkage between *A* gene with oblong fruit shape and recessive *a* gene with round fruit shape. However, there is no linkage with *G* gene as has been noted from the nonsignificant X^2 values for linkage in monoecious x hermaphrodite and andromonoecious x hermaphrodite crosses. Flat fruit shape was also not found to be associated with any of the sex forms.

Wall's observation (3) that muskmelon fruit shape was determined by single gene with incomplete dominance and it was linked in coupling phase with genes for sex forms were not corroborated by these results. High recombinant fraction obtained

in the present studies clearly ruled out the possibility of pleiotropy suggested by Rosa (2). Results of Kubicki (1) and Wall (3) were related to the cultivated varieties of New World Origin and hence an impression was gained of the possibility of sex linked inheritance. The present studies gave credit to some kind of loose, and probably chance, association of fruit shape in monoecious and andromonoecious sex forms and it might have been due to unconscious selection during domestication and evolution of present day cultivars. There is clear evidence against the hypothesis of sex linked inheritance with fruit shape.

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Cucurbit Genetics Cooperative Report 4:30-32 (article 15) 1981

A New Watermelon Disease In Tunisia

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A very serious, new bacterial disease, not yet identified, has been reported on watermelon in 1978, on both early planting (January) and later plantings (March) in the Sahel and the Cap Bon in Tunisia.

The disease appears as large, black spots on the leaves at the middle of the plant, near the principal stem followed by a withering of the entire plant. As a result, the fruits ripen prematurely. In 1979, an early planting of several cultivars of watermelon revealed a very small difference in sensitivity among these cultivars (Table 1). Only *Citrullus colocynthis*, which is a wild species, has shown a very good behavior and complete resistance to this disease in the field. In 1980, the results from two watermelon planting confirmed the previous observations (Table 1).

Based on these results, *C. colocynthis* has been selected as a source of resistance to this disease. The F_1 hybrid between the common watermelon *C. lanatus* and *C. colocynthis* and BC_1 has been made, which will be used in studying the inheritance of resistance to this disease. The ultimate objective is to obtain a *C. lanatus* type with resistance to this new bacterial disease and free from the bitterness of *C. colocynthis* (1-4).

Table 1. Reaction of watermelon cultivars and *Citrullus colocynthis* to a new bacterial disease.

	1979 [z]			1980	
Cultivars	**6 June**	**15 June**	**28 June**	**15 June [y]**	**15 August [x]**
Algerian Red Seed	-	-	-	5 [w]	-
Ali	3	4	4	5	-
Arizona	-	-	-	-	4
Betima	-	-	-	3.5	-
Blue Belle	2.5	4.5	4	-	5
Blue Ribbon	-	-	-	-	4
Charleston Gray	-	-	-	-	5
Chilean Black	-	-	-	-	5
Congo	-	-	-	5	5
Crimson Sweet	3.5	4	4	5	-
Early Canada	1.5	3.5	4	-	-
Fairfax	-	-	-	-	5
Garrisonian	-	-	-	-	5
Giza	1	2.5	4	-	4
Giza 1	-	-	-	3.5	-
Giza 2	-	-	-	4	-
Hramorni	2.5	3.5	4	3	-
Klondike RS 57	-	-	-	-	3.5
Klondike X	-	-	-	-	4

Klondike VII	-	-	-	-	5
Marzowsky	-	-	-	-	4
Panonia	-	-	-	5	5
Peacock Striped	2	3.5	4	4	-
Pobeditel	4	4	4	5	-
Red New Dragon	3	5	4	-	-
Royal Charleston	-	-	-	-	5
Royal Flesh	1.5	3.5	4	-	-
Ruby T.S.	2	4.5	4	-	-
Sugar Baby	-	-	-	5	-
Sugar Bell 126	1	5	4	-	-
Sugar Delikata	1.5	4.5	4	-	-
Sugar Sweet	-	-	-	-	5
Sweet Favorita	-	-	-	-	4
Tasty	-	-	-	5	5
Tatum	2	3.5	4	-	-
Wide Ranger 118	4	4	4	-	-
XP 241	2	3.5	5	-	-
XP 772	2	3	3	-	-
XP 1023	2	3.5	4	-	-
XP 1203	-	-	-	-	4
XP 2008	1	4	4	-	4
You Sweet Thing	-	-	-	-	5
117	4	4.5	5	-	-
3527	1	2.5	4	-	-
3807	1	3	4	-	5
7486 M	1	2.5	4	-	-
37486 N	3	2.5	4	-	-
Citrullus colocynthis (1)	-	-	-	1	1
Citrullus colocynthis (2)	-	-	-	0.5	0.5

[z] Planted on 13/2/79.

[y] Planted on 17/1/80.

[x] Planted on 15/3/80.

[w] 5 = Susceptible, 0 = Resistant.

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Hypersensitivity to Anthracnose Infection in *Citrullus lanatus*

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Van der Plank (3) discussed the hypersensitivity reaction in plants as first defined by Muller. It includes the morphological and histological change that when produced by an infectious agent, elicit the premature dying of the infected tissue as well as the inactivation and localization of the infectious agent.

Two very different types of hypersensitive reactions to *Colletotrichum lagenarium*, isolate CIBR (2), have been noted in *Citrullus lanatus*. The most common type is rapid wilting and death of the infected leaf. The other type is not as common and does not elicit rapid wilting and death of the leaf. Instead, yellowing occurs around the lesion and may extend over the entire leaf. In some plants the pale area of the leaf is well defined; in others, the entire plant may be notably paler than normal.

In a line derived from PI 189225, initial lesions on plants showing leaf yellowing were smaller than lesions on plants hypersensitive to the pathogen. Plants in this line segregated into 38 non-hypersensitive, 16 hypersensitive. Another line derived from a single plant of PI 299778, which did not demonstrate the yellowing response to inoculation, did not exhibit the traits among eight progeny. F_2 progeny from a cross of 'Dixielee' with a plant of PI 299778, which did exhibit the trait, segregated 31: 5 for non-hypersensitivity: hypersensitivity.

Extracts from four young lesion-free leaves were taken from a single hypersensitive plant and a single non-hypersensitive plant of the PI 189225 progeny. Slab gel electrophoresis with SDS (1) revealed an additional protein in the extract from the hypersensitive plant.

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Cucurbit Genetics Cooperative Report 4:35 (article 17) 1981

Segregation for Resistance to Trifluralin Toxicity in Progeny from Crosses of Susceptible *Cucurbita moschata* Parents

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Several herbicides are reported to be selective in cucurbits when soil-incorporated (1, 2). Among these are the dinitroanilines, for example, trifluralin (treflan). A recent finding by us on the response of progeny derived from crosses of susceptible cultivars of *Cucurbita moschata* to trifluralin indicated physiological variation in response to this herbicide.

The three susceptible parental cultivars used in the study were two butternut squash types, 'Ponca' and 'Waltham' and a calabash type, 'La Primera'. The parents, F_1 and F_2 generations of each cross, 'Ponca' x 'La Primera' and 'Waltham' x 'La Primera', were grown in separate replicated (randomized complete block) experiments in the field, Lincoln, Nebraska (1980). Trifluralin was incorporated into the soil at the rate of 1 lb. a.i./acre (1.12 kilos a.i./ha) a day prior to transplanting the squash seedlings.

'Ponca' and 'Waltham' showed high susceptibility to trifluralin injury while 'La Primera' was slightly less susceptible than these. The F_1s of both crosses were highly susceptible. The F_2 segregation for both crosses suggested that the cultivars possessed different genes for susceptibility to trifluralin toxicity since a number of transgressive segregates for high tolerance to trifluralin injury were observed.

We observed that injured plants had restricted root development and a subsequent poor vegetative growth. Most of these eventually died while a few that recovered did not fruit before frost.

The occurrence of resistant transgressive segregates indicated that there is potential in these squashes to breed for resistance to a family of herbicides, such as the dinitroanilines, and this could possibly permit the use of these herbicides for weed control to overcome some of our present control problems.

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Non-Destructive Fatty Acid Analysis of Cucurbit Seed

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In breeding for higher linoleic acid content in the seed oil of the buffalo gourd, *Cucurbita foetidissima,* we have found that this character varies greatly within seeds from the same cross, due to heterozygosity of the parental stocks.

We have developed a technique for half-seed analysis of fatty acid composition so that the phenotypes of individual embryos may be established non-destructively.

Seeds are imbibed in water overnight, then dipped in 10% bleach solution. The seed coat is incised around the edge with a scalpel and removed, and the nucellar membrane is stripped off with forceps. The embryo is then cut in half. The anterior portion is supported on glass wool in a vial containing an inorganic nutrient solution. Vials are incubated at 30°C.

The posterior half of the cotyledons is used for fatty acid analysis. It is ground on a small piece of 400 grit sandpaper with a spatula, then scraped off into a small reaction vial and agitated in 1 ml of hexane. The hexane is evaporated under a stream of nitrogen. 0.2 ml toluene and 0.5 ml of 5% H_2SO_4 in methanol are added and the tube is tightly covered with a teflon lined screw cap. The mixture is heated for 3 hrs at 100°C, cooled, and transferred to a 10x17 mm test tube. 0.5 ml hexane and 1.0 ml distilled water are added and the tubes are centrifuged 15 min at 2000 rpm. Using a dropping pipet the top layer is transferred to another tube and the solvents are evaporated under nitrogen. The remaining fatty acid methyl esters are redissolved in 0.1-0.2 ml hexane.

This method provides more than enough fatty acid methyl esters for gas chromatographic analysis from about 10-20 mg of seed material. Germination is not significantly reduced from that of whole seeds. After a week of growth in the vials, selected seedlings are potted in a soil medium and transferred to the greenhouse, then transplanted to the field after 3-6 weeks.

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Seed Increase of Mexican *Cucurbita* Collection

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During 1981 we will take field notes, evaluate for breeding purposes and have seed increase of the *Cucurbita* collected in Mexico during 1979 by Drs. Knight and Whitaker (161 accessions) (1).

In some other crops like peppers, tomatoes, beans, etc., and according with the International Board of Plant Genetic Resources, our field notes are based on the "List of Descriptors" that have been suggested by the IBPGR. A common computer program is already available.

We are planning to do the same for *Cucurbita*, but the proper "descriptors" are still lacking. If someone is already working on it, please let me know because if this is not the case, I feel we are in a proper time for starting it. Meanwhile, I will appreciate suggestions about the field notes that you are taking in evaluating your introductions. Besides the regular ones on breeding (e.g. disease and insect resistance), please include some others pertinent to taxonomy and botany that could be referred later on to studies related with evolution.

If anyone interested in taking a look at this collection, or sharing some of the seeds, contact me in early June to let you know the best time for a field visit. The collection will be planted at our Agricultural Experiment Station at Bajio, near Celaya, Guanajuato, Mexico.

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Cucurbit Genetics Cooperative Report 4:37-38 (article 20) 1981

Monitoring and Controlling Corn Rootworm Beetles with Baits of Dried Bitter *Cucurbita* Hybrids

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Recently we reported (1) that fruits of two hybrid species of *Cucurbita, C. texana* x *C. pepo* and *C. andreana* x *C. maxima* combined the genetic production of bitter cucurbitacin terpenoids (Cucs) of the wild parents with the high yields of squash fruit characteristic of the domestic cultivars. The fruit of the former hybrid contained about 0.48 mg Cucs E, I and E glycosides per g fresh weight and that of the latter about 1.25 mg per g of Cucs B and D. These Cucs act as arrestants and feeding stimulants for the corn rootworm beetles *Diabrotica virgifera*, *D. longicornis* and *D. undecimpunctata* in amounts as small as 1 ng (2).

During the 1979 season we investigated the use of cut fruits of these bitter *Cucurbita* hybrids, poisoned with methomyl or trichlorfon at 0.01 to 0.1% of fruit weight, for monitoring and control of the adult corn rootworms. These fresh baits remained attractive to the adult beetles for at least 2 weeks and individual cut fruits killed several thousand beetles (1, 3).

During the 1980 season we explored the use of dried and ground fruits of these bitter *Cucurbita* hybrids, poisoned with 0.1% methomyl or 0.01% fenvalerate or decamethrin as broadcast, granular baits for the control of the corn rootworm beetles. To our surprise these baits were highly effective in killing the beetles when broadcast in sweetcorn at dosages of 10, 30, and 100 kg per ha, containing 10 to 100 g methomyl or 1 to 10 g fenvalerate or decamethrin. The *C. texana* x *C. pepo* fruits produced a somewhat more effective bait than the *C. andreana* x *C. maxima* bait, perhaps due to better physical properties of the fibrous "zucchini' type fruit (1). The *C. texana* x *C. pepo* bait at 30 kg ha (30 g methomyl) killed an estimated 150000 beetles per ha within 20 hrs after application or approximately 85% of the pretreatment population. At a dosage of 10 kg ha (10 g methomyl), the reduction was about 62% of the pretreatment count. Bitter *Cucurbita* baits containing decamethrin killed large numbers of corn rootworm beetles at dosage of insecticide ranging from about 1 to 3 g/ha. The dried baits remained effective in killing beetles for 2 weeks or longer.

These successful experiments suggest that the dried bitter hybrid *Cucurbita* fruits may have practical value in IPM programs for corn rootworms. Poisoned dried fruit sections may be incorporated into simple traps for monitoring beetle populations. Dried bitter fruits may be formed into poisoned baits as indicated above or formulated into granular or pelleted insecticides for control of adult beetles above ground or corn rootworm larvae in the soil. We plan to investigate higher yielding hybrids of bitter *Cucurbita*, refined methods of bait formulation, and better methods of distribution, during subsequent seasons.

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Sources of Resistance to Viruses in *Lagenaria siceraria*

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In 1977, we reported (2) that an accession of *Lagenaria siceraria*, PI 391602 from China, was resistant to squash mosaic virus (SqMV), watermelon mosaic virus 1 (WMV-1), watermelon mosaic virus 2 (WMV-2). and that an occasional plant was resistant to cucumber mosaic virus (CMV). In 1978, Greber (1) also reported resistance to WMV-1 and MWV-2 in an accession of the same species from Queensland, Australia. Since it is known that some of these viruses are frequently destructive where *L. siceraria* is cultivated, additional germplasm of this species was evaluated with CMV, SqMV, WMV-1, WMV-2, tobacco ringspot virus (TRSV), and tomato ringspot virus (TmSV). These last two viruses are transmitted by nematodes and are found with a certain frequency in New York State (3).

Plants of 18 lines representing 12 countries were screened for resistance under greenhouse and field conditions. All plants received from one to three inoculations and those which, upon assay, were found free of systemic infection, were transferred to the field for further evaluation. Plants were rated resistant if, at maturity, they were still free of systemic infection.

From the results given in Table 1, it is evident that resistance was found in one or more lines to five of the six viruses used. Resistance to CMV was confined to PI 269506, PI 271353, and a few plants of PI 391602. In these lines, virus infection was confined to the inoculated leaves. However, further testing using a large number of CMV isolates revealed the existence of two strains able to infect systemically these resistant lines. All lines were resistant to SqMV and the plants responded with a few, small and often inconspicuous necrotic local lesions. This hypersensitive reaction greatly localized viral infection. Resistance to TmRSV was found in PI 188809 and PI 271353, in which plants reacted only with localized infection. Resistance to WMV-1 was more common and was detected in plants of PI 188809, PI 271353, PI 280631, PI 288499, PI 391602 and the Hawaiian cultivar Hyotan. Resistance to WMV-2 was found in plants of PI 271353, PI 391602, 'Hyotan', ad G-24386. All plants resistant to WMV-1 and/or WMV-2 were free of local and systemic symptoms, but virus infection occurred in inoculated leaves of some plants.

Three lines, PI 271353, PI 391602, and 'Hyotan', were resistant to both WMV-1 and susceptible to WMV-2, or vice versa, suggesting that resistance to these viruses in conferred by different genetic factors. As a source of multi-resistance, PI 271353, from India, appears to be the most valuable for a breeding program. However, no information appears to be available on the mode of resistance to these or any other virus affecting *L. siceraria*.

Viral resistance in *L. siceraria* can be also useful in separating viruses which may occur simultaneously in naturally infecting cucurbit plants. We have used this host to free CMV, WMV-1, or WMV-2 when found in association with SqMV, or to separate WMV-1 from WMV-2 or vice versa. Although most of the lines, when inoculated with SqMV, reacted with a few and sparse necrotic local lesions, an occasional plant responded with numerous lesions which remained small and rather distinct for a long time. Thus, using selected plants, it may be possible to use *L. siceraria* as a local lesion host for qualitative and quantitative assay of SqMV. In this respect, *Lagenaria* is potentially more valuable than *Cucumis metuliferus* (4).

Table 1. Reaction to cucumber mosaic virus (CMV), squash mosaic virus (SqMV), tobacco ringspot virus (TRSV) tomato ringspot virus (TmRSV), watermelon mosaic virus 1 (WMV-1), and watermelon mosaic virus 2 (WMV-2) of accessions of *Lagenaria siceraria.*

Accession	Origin	CMV	SqMV	TRSV	TmRSV	WMV-1	WMV-2
PI 181913	Syria	S	R	S	S	S	S
PI 188809	Philippines	S	R	S	R	R	S
PI 197437	Ethiopia	S	R	S	S	S	S

PI 269506	Pakistan	R*	R	S	S	S	S
PI 270456	Mexico	S	R	S	S	S	S
PI 271353	India	R*	R	S	R	R	R
PI 273663	Ethiopia	S	R	S	S	S	S
PI 287533	Italy	S	R	S	S	S	S
PI 287534	Italy	S	R	S	S	S	S
PI 280631	S. Africa	S	R	S	S	R	S
PI 280636	S. Africa	S	R	S	S	S	S
PI 288499	India	S	R	S	S	R	S
PI 349591	New Guinea	S	R	S	S	S	S
PI 391602	China	S/R*	R	S	S	R	R
PI 414369	India	S	R	S	S	S	S
Paphos	Cyprus	S	R	S	S	S	S
Hyotan	Hawaii	S	R	S	S	R	R
G-24386	California	S	R	S	S	S	R

R = Resistant (no systemic infection).
S = susceptible (systemic symptoms).
* = some strains may cause systemic infection

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Virus Studies with *Cucurbita foetidissima*

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Two isometric viruses have been isolated from field-grown buffalo gourd (bg), *Cucurbita foetidissima.* Host range studies, electron microscopy, and serology have been used to identify these viruses as squash mosaic virus (SqMV) and a cucumber mosaic-like (CMV-like) virus. These viruses have then been reinoculated to buffalo gourd as well as reisolated and characterized.

Host Range. After SqMV was transferred from buffalo gourd to *Cucurbita pepo* var. 'sugar Pumpkin', the viruses range was determined by inoculating cultivated species. Squash mosaic virus-buffalo gourd did not infect *Chenopodium amaranticolor* or *Nicotiana tabacum* var. 'Xanthi', which is identical to known SqMV but unlike other isometric cucurbit viruses.

The CMV-like virus has host range identical to known CMV (ATCC PV-242, PV-59): local lesions (no systemic reaction on *C. amaranticolor*, systemic mosaic on *N. tabacum* var. 'Xanthi', local lesions (no systemic necrosis) on cowpea, *Vigna sinensis*, thereby eliminating tobacco ringspot virus (TRSV), tomato ringspot virus (TmRSV), and SqMV. Its isometric shape eliminates the possibility of watermelon mosaic virus (WMV).

Electron-Microscopy and Serology (Transmission Electron Microscopic Serology). The SqMV-bg aggregates when combined with SqMV antisera and viewed in the electron microscope. These findings correspond to that of Ochterlony agar gel diffusion tests.

The CMV-like virus disintegrated when stained with phosphotungstic acid but is stable in uranyl acetate, as does known CMV. The Derrick technique (1) has been employed to avoid the aggregations present in the control when the previous technique was used. Three different strains of ATCC CMV antisera (PVAS 30, 242, 260) have provided no conclusive results, though two known strains of CMV (ATCC PV-59, PV-242) react moderately to very well with the antisera. Tomato ringspot virus, TRSV, alfalfa mosaic virus (AMV) and SqMV antisera were also tried unsuccessfully, Agar gel tests have proved inconsistent.

Therefore, there are several possible identities of the CMV-like virus: it is a known strain of CMV, which we do not have antiserum to as yet, it is a unique strain of CMV, it is not CMV but another virus, known or unknown.

Reinoculation to Buffalo Gourd and Subsequent Reisolation*.* When SqMV-bg was reinoculated to seedlings of buffalo gourd in the greenhouse, a mild systemic mosaic appeared. However, about 1-2 weeks later, the new leaves appear normal. Squash mosaic virus was recovered from these buffalo gourd plant. Known SMV II (Cantaloupe; Mesa, AZ) produced identical symptoms.

Similar symptom patterns appeared when the CMV-like virus was reinoculated to buffalo gourd except that the mosaic was very severe, leaves recurved. However, new leaves appeared normal in three weeks. The virus was recovered from the inoculated buffalo gourd. However, buffalo gourd is resistant to known CMV (ATCC PV-59, PV-242). Provvidenti also reported buffalo gourd as resistant to CMV in New York (2).

Watermelon mosaic virus (cantaloupe; Yuma, AZ) and TRSV (ATCC PV-157) have been inoculated to seedling buffalo gourds in the greenhouse. The plants were mechanically inoculated three times over a 10-day period, allowed to express symptoms for one month, viewed in the electron microscope, and then inoculated to appropriate host plants. Buffalo gourd has proved resistant to both WMV and to RSV, which has concurred with observations of Provvidenti (2).

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Plant Disease Reporter 62:326-329.

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Do *Cucurbita* Plants with Silvery Leaves Escape Virus Infection? Origin and Characteristics of NJ260

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NJ260 is a new *B/B* inbred of *Cucurbita pepo* L. This inbred was developed from a cross between 'Caserta', *B+/B+*, and 'Precocious Early Prolific', *B/B* (7), in an attempt to synthesize a predominantly female line (6). The leaves of 'Caserta' become moderately mottled sometime after the seedling stage. The leaves of 'Precocious Early Prolific' are non-mottled.

Under comparable field conditions in our area, NJ260 is an extra dwarf whose relatively small leaves are intensely mottled from the seedling stage and on, becoming uniformly silvery with the passage of time. It is a highly pistillate line bearing curved fruits with a constricted neck. It is also a low seed producer, perhaps due to poor pollen tube growth in a morphologically abnormal style. But the most extraordinary feature of NJ260 during the past five years has been its complete freedom from virus infection under field conditions in which non-silvery plants exhibit close to 100% infection at the end of the growing season.

The "mottled-leaf" character was described previously as "silver gray areas in axils of leaf veins", and genetic data, based on a limited number of crosses, demonstrated that this character is conditioned by a dominant gene, *M*, in *maxima, moschata,* and *pepo* (2, after 3 and 5). Scott and Riner (5) pointed out that the mottled effect "is visible only on the upper surface of the leaves and is a result of light-colored gray-green tissue being surrounded by the darker green tissue". Furthermore, results of their starch test have led them to state that "apparently the mottling is not due to chlorophyll deficiency in the light-colored tissues". Scarchuk and Lent (4) reported that the palisade cells in green areas are in close contact with the epidermis, as well as with each other. By contrast, the palisade cells in silvery areas are not in close contact with either the epidermis or with each other, thus resulting in air spaces. And "these air spaces are responsible for the silvery-gray color".

According to my observations, the expression of the silvery trait (silvery pattern or "mottled-leaf") varies greatly depending on (i) the *time* during plant development which it is first manifested, (ii) the *extent* of its distribution over the leaf, (iii) its *intensity* , and (iv) the *environment*. Limited breeding data and selection of different lines from crosses between silvery NJ260 and non-silvery inbreds suggest that several genes play a role in the varied expression of the silvery trait and that this trait is not linked completely with any of the abnormalities of NJ260. Among the environmental influences, light is an important factor. High light energy enhances the expressivity of the silvery trait.

If NJ260 is indeed endowed with an ability to escape natural virus infection, this ability could be due to its silvery foliage. Such a foliage may repel insect vectors in a way analogous to that of aluminum mulch (1). Alternatively, silvery foliage may prevent effective penetration or multiplication of virus particles following contacts with these vectors. However, NJ260 does not appear to resist virus infection following artificial inoculation.

NJ260 is being reproduced this winter in Costa Rica and in Israel. I hope that sufficient seed will be available in the near future for more critical investigations of the silvery trait and its breeding potential with respect to freedom from natural virus infection and plant adaptation.

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On Coadaptation of Gene *B* in *Cucurbita*

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Gene *B* conditions precocious fruit pigmentation in *Cucurbita pepo* and *C. maxima.* But this gene can also affect plant growth, sexuality, and fruit quality. Some of these effects are beneficial and others, detrimental. According to my present hypothesis, the beneficial effects can be enhanced and the detrimental effects can be suppressed by gene substitutions at other loci (1). From this point of view, the coadaptation of *B* depends on its harmonious interactions with other genes.

Gene *B* brings about precocious pigmentation by blocking chlorophyll synthesis or by causing chlorophyll depletion early in fruit development. The substitution of *B* for *B*+ in different cultivars of *maxima* and *pepo* revealed the fact that *B* can block chlorophyll synthesis in other potentially green organs or tissues such as leaf blade, petiole, stem, tendril, and the calyx of staminate flowers. It appears that the genetic background can determine (i) the expression or suppression of *B* in any one of these organs or in all of them, (ii) the timing of *B* expression, and (iii) the sensitivity of *B* yo environmental stimuli.

One of my objectives is to identify some of the genetic elements which regulate the expression of *B* in different vegetative tissues, particularly in leaves and stems. Some data on the inheritance of resistance (inactive *B*) and susceptibility (active *B*) to leaf yellowing in a cross between two *BB* inbreds are presented in Table 1. From these data I cannot identify the number of segregated genes which affect the expression of *B* in leaves. Furthermore, I find it difficult to duplicate these data for some unknown reasons. Nevertheless, two facts are consistent in repeated inheritance studies of this cross. First, the frequency of the parental phenotypes in the F_2 is relatively high. Second, selection in subsequent filial generations can lead to the development of a line that is more resistant than the resistant parent under field conditions. The evidence suggests that the expression of *B* in leaves is conditioned by relatively few genes and is greatly affected by non-genetic variations. Many observations support the conclusion that the gene pools of *C. maxima* and *C. pepo* consist of elements which can suppress or inactivate *B* in all organs other than the fruit and that these hypothetical elements will play a major role in the coadaptation of *B* in the cultivated *Cucurbita.*

Table 1. Inheritance of resistance and susceptibility to leaf yellowing in the cross between 'Precocious Fordhook Zucchini' (PEZ), *B/B*, resistant, and 'Jersey Golden Acorn' (JGA), *B/B*, susceptible for plants grown together in a controlled environment in 1978.[z]

	Grading scale for classification of variations in extent of yellowing in the first and second true leaves																					
Generation	**1-1[y]**	**1-2**	**1-3**	**1-4 1-5**	**2-1**	**2-2**	**2-3 2-4 2-5**	**3-1**	**3-2**	**3-3**	**3-4**	**3-5**	**4-1**	**4-2**	**4-3**	**4-4**	**4-5 5-1**	**5-2**	**5-3**	**5-4**	**5-5**	**Total plants**
P_1, PFZ	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
P_2, JGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	5	10
F_1	0	0	0	0	0	0	0	0	0	0	0	0	4	2	1	0	0	2	1	0	0	10
F_2	11	0	1	0	5	1	0	10	5	9	7	1	5	2	6	10	0	0	0	8	9	90

[z] 12 hr photoperiod, light from G.E. F96T12CW 1500 fluorescent tubes which generate 1.1 to 1.5 millieinsteins at the shoot apices, 22°C during day and 20°C at night, plants grown in mix in 10 cm clay pots. Although PFZ is resistant in this environment it is only moderately so under field conditions. Susceptibility in JGA is confined to the first 5-6 leaves as plants gradually turn green thereafter. Low temperatures and low light intensity are conductive to leaf yellowing in *BB* plants.

[y] The grades ranged from 1 to 5: grade 1 for a green leaf with less than 5 yellow spots and grade 5 for uniformly yellow leaf. Grade 1-1 means that the first and second true leaves were of grade 1. Grade 4-2 means that the first true leaf was of grade 4 and the second of grade 2.

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The Derivatives of 'Fordhook Zucchini' and Their Breeding Value

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A cultivar by the name Fordhook Zucchini (*Cucurbita pepo* L.) was introduced by W. Atlee Burpee Co. in 1942. According to available information, this cultivar was obtained from M. Herb of Naples, Italy. As a former plant breeder for Burpee, I became familiar with this cultivar from the first year of its introduction. It was unique in its long, glossy, dark green fruits but highly variable in growth habit, foliage characteristics, and fruit size and shape.

As a result of painstaking work of selection and inbreeding, I isolated from this cultivar a uniform line that possessed a number of useful characteristics including open habit of growth, spineless foliage, and attractive, cylindrical fruits. This line was introduced by Burpee in 1947 as 'Fordhook Zucchini Improved'. However, sometime later the word "Improved" was deleted from the name of the new cultivar and thus the name of the old cultivar was restored, although the latter became extinct in 1947.

In 1964, I completed the substitution of *B* for *B*+ in the background of 'Fordhook Zucchini Improved' (1, 2) and the resulting breeding line (*B/B*) is known as 'Precocious Fordhook Zucchini'.

'Fordhook Zucchini Improved' and 'Precocious Fordhook Zucchini' have become prime sources of breeding material for at least two reasons. First, they have an exceptionally high combining ability in the production of F_1 hybrids of the Zucchini group. For example, one of the most important F_1 hybrids of the *standard* Zucchini group is the cross between 'Caserta', developed by Dr. L. C. Curtis, and 'Fordhook Zucchini Improved'. Furthermore, 'Precocious Fordhook Zucchini' is being used for the production of *precocious* hybrids such as 'Gold Rush'. Second, 'Fordhook Zucchini Improved' and 'Precocious Fordhook Zucchini' are being utilized by plant breeders in different parts of the world as sources of genes for spineless foliage, a highly desirable characteristic in summer squash.

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Heart Shape Stage Embryos of *Cucumis* Species More Successful in Embryo Culture than Advanced Stage Embryos

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Experience with general prerequisites of the artificial culture of vital embryos from self pollinated plants of *Cucumis* species is likely to be helpful to the culture of abortive embryos from interspecific crosses in this genus. Our attempts to get such experience by using embryos from various selfed cultivars of *Cucumis sativus* were hampered by difficulties in isolating the very young embryos from their ovules. Last year the ovules of the cross *C. metuliferus* [Gene bank no. (Gbn) 1734] x *C. africanus* (Gbn 0181) proved more amenable to excision of embryos, likely because the tissues at the ovule tip were less hardened. As the embryos of this cross grew almost normally *in situ* (1, 2), we selected them to study the effect of embryo size on development in tissue culture.

The embryos were isolated at various times after pollination and incubated on MS medium with the addition of casein hydrolysate 1 g/l, sucrose 35 or 50 g/l, Difco Bacto agar 7.5 g/l, kinetin 0, 0.1, 1, or 10 mg/l, and IAA 0.02 mg/l. The cultures were kept under 16 hr TL 34 light (1,000 lux) at 25°C and 8 hr darkness at 23°C per day.

The size of the embryos proved decisive for the success of *in vitro* culture. Approximately 15% of the late globular stage embryos 0.07-0.10 mm in diameter [13-17 days after pollination (d.a.p.)] developed into plants on the basal medium with kinetin 0.1 mg/l + sucrose 35 g/l. In about three weeks they reached a developmental stage suitable for transplanting to soil. The other combinations of the variables were unsuccessful. The low rate of success is possibly due to damage of the embryos by the isolation. The heart shape stage embryos 0.1-0.8 mm in length (17-22 d.a.p.) appeared rather successful in culture. The early heart shape stage embryos 0.1-0.3 mm in length produced plants on kinetin 0.1 mg/l + sucrose 35 g/l, but they needed 1 mg/l when the medium contained sucrose 50 g/l. The late heart shape embryos 0.3-0.8 mm in length developed well into plants on kinetin 1 mg/l + sucrose 35 g/l, but the less on sucrose 50 mg/l. The other combinations of the variables were unsuccessful. The three suitable combinations for the heart shape embryos resulted in a success of 32%. The period of culture till transplanting to soil was as long as for globular embryos. Further cotyledon extension growth *in situ* (22-33 d.a.p.) diminished the results of the embryo culture. Embryos 0.8-2.0 mm in length did start growing, greening and occasionally rooting, but a growing point never appeared regardless of the combination of kinetin and sucrose. Embryos 2-4 in length remained completely white and did not grow at all on kinetin 0 and 0.1 mg/l, irrespective of the sucrose concentration. Increasing the kinetin concentration sometimes resulted in partially increasing or entire greening of the cotyledons, but a growing point did not develop. Embryos 4-5 mm in length reacted similarly, but later a few did form a growing point on kinetin 10 mg/l + sucrose 35 g/l. Maturation of the embryos (33-50 d.a.p.) improved their suitability for tissue culture. Almost all embryos 5-6 mm in length rapidly developed into complete plants on all the kinetin concentration studied + sucrose 35 g/l, whereas sucrose 50 g/l retarded this development.

Small batches of embryos obtained from selfed plants of *C. africanus*, *C. metuliferus* and *C. sativus* were also tried on the above media. Their age and size affected the success of *in vitro* culture similarly as found with the hybrid embryos. Thus, the results obtained with the hybrid embryos may be representative of embryos from selfing.

On the whole, the results indicate the occurrence of a temporary germination inhibitor complex in the cotyledons. We could not overcome this inhibitor complex by adding kinetin. GA3, which was tried later on, appeared also not capable of overcoming it. This postulated inhibitor complex was found only during the stage of cotyledon extension. It is, therefore, not similar to the germination inhibitor factor, which normally occurs in the seed coats of mature seeds. We conclude, that in the case of embryo abortion during advance embryonic stages, it is best to start the artificial culture from the early heart stage embryos rather than to wait until just before degeneration.

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Cucurbit Genetics Cooperative Report 4:50-53 (article 27) 1981

Reciprocal Crosses Between *Cucumis africanus* L.f. and *C. metuliferus* Naud. III. Effects of Pollination Aids, Physiological Condition and Genetic Constitution of the Maternal Parent on Crossability

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The positive effect of mentor pollen and amino-ethoxy-vinyl-glycine (AVG) on the success of reciprocal crosses between *Cucumis africanus* L.f. and *C. metuliferus* Naud. was recently reported (2). Because of the preliminary nature of those results, we have repeated the crosses in a series of experiments especially designed to evaluate the efficacy of the different pollination aids. We reports here on the results of these experiments.

Four experiments were carried out spread over the summer season. In all of them only one accession of *C. africanus* [Gene bank no. (Gbn) 0181] and one accession of *C. metuliferus* (GBn 1734) were used. The first two experiments each comprised 20 plants per species, grown from seed. They were cultivated in a glasshouse (minimum temperature 22°C D/20°C N) in 10 l. plastic containers with Trio peat soil, standing on dishes. This constraint on the root volume limits vegetative growth and promotes female flowering. It also saves glasshouse space, since the plants can be rearranged after the pollinations have ended. The treatments are listed in Table 1. On every plant up to eight flowers were pollinated: one without any pollination aid (control), one with lanolin paste applied at pollination time, four with AVG in lanolin paste, one with mentor pollen and one with both mentor pollen and AVG. Preparation and application of the mentor pollen and the AVG were as described earlier (2, 3). The larger number of AVG treatments derives from the low fruit set in last year's crosses (2). All pollinations were made during four weeks starting with the opening of the first pistillate flower. The last two experiments were similar to the above except for the following: half of the plants of *C. metuliferus* were planted in full soil and only control and AVG pollinations were made. In the last experiment the *C. africanus* group consisted of six clones of five plants each, which derived from two exceptionally successful and four mediocre individual plants out of the first experiment.

Results of the first two experiments are in Table 1. *Cucumis metuliferus* x *C. africanus* yielded more fruits than the reciprocal cross, the mentor pollen treatments excepted. Fruit set in both crosses responded similarly to the pollination aids; it was generally higher in the control than in the AVG treatment. Lanolin itself proved detrimental. The two treatments with mentor pollen gave a high fruit set. All fruits in the control, the lanolin and the AVG treatment contained embryos. The number of these embryos per fruit was generally high. By contrast, in the two treatments with mentor pollen only part of the fruits contained embryos (especially in the cross *C. africanus* x *C. metuliferus*), and the number of embryos in those fruits was low or very low.

The percentage fruit set in both reciprocal crosses in the control and AVG treatment are summarized for all four experiments in Table 2. Only data from seed grown plants cultivated in containers are included. It is evident that these percentages depend not only on the direction of the cross but also quite heavily on the pollination period. In the last two experiments, *C. metuliferus* plants that were grown in containers set fruit (results in Table 2), but those in full soil did not.

So the constraint on the root volume promotes not only flowering but also fruit set. The two *C. africanus* clones in the fourth experiment, which were derived from the successful plants of the first experiments, yielded 10 and 47% fruit set in the control and o and 50% respectively in the AVG treatment. The four other clones set no fruits, so there appears to be variation for crossability.

The embryo growth was slowed down by cultivation of the maternal plants in containers. Mature seeds of *C. metuliferus* x *C. africanus* germinated in soil. The embryos of *C. africanus* x *C. metuliferus* remained smaller than last year (1), and embryo culture of them was unsuccessful.

The results of the experiments on pollination aids were very different from the preliminary ones in 1979 (2). We did not discern a positive effect of AVG on crossability, probably because of the high fruit set in the control and the negative effect of the carrier of AVG, lanolin paste. An explanation for this high fruit set in the control may be the cultivation of the plants in the restricted amount of soil, as illustrated by the results of the last two experiments. There was, however, also no positive effect of AVG on fruit set in full soil grown plants. The fruit set in the control was very different in the four experiments (Table 2). The main variable factor among these experiments was the weather, which changed from cloudy and relatively cool during the pollination period of the first experiment to bright and warm during that of the third one (temperature over 30°C in the glasshouse). Temperature and light intensity were again lower during the fourth experiment. The genetic variation for crossability as was found in the fourth experiment seems worthy of exploitation in our future crossing program.

Table 1. Effects of pollination aids on the results of reciprocal crosses between *Cucumis africanus* and *C. metuliferus.*

	Cucumis africanus x C. metuliferus					***C. metuliferus x C. africanus***				
Treatment	**No. of pollinated flowers**	**Fruit set %**	**No. of analyzed fruits**	**No. of fruits with embryos**	**% ovules with embryos**	**No. of pollinated flowers**	**Fruits set %**	**No. of analyzed fruit**	**No. of fruits with embryos**	**% ovules with embryos***
Exp.1 Control	17	12	2	2	96	20	70	10	10	87
Lanolin	16	0	-	-	-	19	21	4	4	87
AVG	68	7	4	4	97	77	45	24	24	91
Mentor pollen	17	100	9	3	6	20	80	16	14	29
Mentor pollen plus AVG	16	100	10	2	5	14	79	10	6	33
Exp. 2 Control	20	5	1	1	100	20	65	5	5	91
Lanolin	19	5	1	1	3	15	7	1	1	94
AVG	80	8	4	4	98	73	26	10	10	90
Mentor pollen	17	94	7	1	2	11	100	10	10	15
Mentor pollen plus AVG	12	92	8	1	12	9	100	9	9	29

*Only fruit with embryos; percentage calculated on the basis of the total number of enlarged ovules, ranging from 25 to 125 per fruit.

Table 2. Percent fruit set in the reciprocal crosses between *Cucumis africanus* and *C. metuliferus* in the control and AVG treatment during four pollination periods.

		C. africanus x C. metuliferus		***C. metuliferus x C. africanus***	
Experiment	**Pollination period**	**Control**	**AVG**	**Control**	**AVG**
Exp. 1	June 6 - July 4	12%[z]	7%	70%	45%
Exp. 2	June 30 - July 25	5	8	65	26
Exp. 3	August 11 - September 5	0	0	18	13
Exp. 4	September 22 - October 17	-[y]	-	41	10

[z] Numbers of pollinated flowers, on which the percentages are based; for the first experiments see Table 1; *C. africanus* x *C. metuliferus* in experiment 3: 65 pollinations in the control and 54 in the AVG treatment; *C. metuliferus* x *C. africanus* in experiment 3: 11 and 8 pollinations respectively; in experiment 4: 17 and 10 respectively.

[y] For cloned maternal plants, see text.

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Cucurbit Genetics Cooperative Report 4:53-55 (article 28) 1981

Response of Some *Cucurbita* and *Cucumis* Accessions to Three *Meloidogyne* Species

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We have developed an interspecific hybridization program to introduce into squash (*Cucurbita pepo*) and muskmelon (*Cucumis melo*) disease resistance found in wild *Cucurbita* and *Cucumis* species. We have realized the interspecific hybridization between *C. pepo* and *C. martinezii* (3) [= *C. okeechobeensis* according to Robinson and Puchalski (6)] and *C. pepo* x *C. ecuadorensis* (4). The wild species involved in this program were inoculated with different populations of three *Meloidogyne* species: *Meloidogyne incognita*, *M. arenaria*, and *M. javanica*. The most important of these species in France on Cucurbitaceae is *M. arenaria*, but the others can also cause damage (1, 2).

All the inoculated *Cucurbita* species were susceptible to *M. arenaria* and *M. javanica* (Table 1). However, we noticed differences among the cultivars of *C. pepo* with the different populations of *M. incognita*; 'Diamant' seemed more tolerant than 'Black Beauty' with each of the three *M. incognita* populations. The most important conclusion is that the accessions of wild *Cucurbita* species inoculated are as susceptible to *M. arenaria* and *M javanica* as *C. pepo* and they are more susceptible to *M. incognita*. We have to be careful when introducing powdery mildew and virus resistance to not bring greater susceptibility to root-knot nematodes into *C. pepo*.

The two accessions of *Cucumis metuliferus* were resistant to two populations of *M. arenaria* but susceptible to a third population. An accession of *C. metuliferus* from Fassuliotis seemed a little less susceptible to *M. javanica* and *M. incognita* than the one from the Vavilov Institute. *Cucumis ficifolius*, PI 193967, was more resistant to the three populations of *M. arenaria* than *C. metuliferus* but was susceptible to two of the three populations of *M. incognita.* These two *Cucumis* species are very interesting for their high level of tolerance to root-knot nematodes and justify attempts to realize interspecific hybridization with cultivated *Cucumis* (5). Since *M. arenaria* is the most common species of *Meloidogyne* in France, *C. ficifolius* would be more interesting than *C. metuliferus.*

Table 1. Egg production index of *Cucurbita* and *Cucumis* species inoculated with different source populations of three *Meloidogyne* species (sources given).

	Meloidogyne arenaria			***Meloidogyne javanica***	***Meloidogyne incognita***		
Species	**Monteux, France**	**Grau du roi, France**	**Ain Taoujdate, Morocco**	**Abou, Dabi**	**West Indies**	**Ivory Coast**	**Calissane, France**
Cucurbita							
C. pepo cv Black Beauty	3	3	3	3	3	2	2
C. pepo cv Diamant	3	3	3	3	0-1	0-1	0-1
C. martinezii	3	3	3	3	3	3	-
C. lundelliana	3	3	3	3	3	3	3
C. ecuadorensis	3	3	3	3	3	3	3
Cucumis							
C. metuliferus (1)	1	3	0	2	0-1	2	1

C. metuliferus (2)	1	2	0	1	1	1	1
C. ficifolius PI 193967	0	1	1	1	1	2	2

0=non infection; 1=very light infection; 2=reduced infection; 3=maximum infection, high multiplication rate.
(1) Received from Vavilov Institute.
(2) Received from G. Fassuliotis.

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Cucurbit Genetics Cooperative Report 4:56-57 (article 29) 1981

Species Crosses Under Controlled Temperature Conditions

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Pollen tube behavior and fertilization in selected crosses between species of *Cucumis* were studied at different temperatures in glasshouses of the I. V. T. phytotron in the summer season of 1980. This investigation follows the large scale crossability program reported earlier (1). Plants were grown in plastic containers, as this improved flowering. The following cross pollinations were carried out at 20, 23, and 26°C constant: *Cucumis sativus* (Gbn 1811) x respectively *C. melo* cv. Gulfstream, *C. ficifolius* (Gbn 1729) and two accessions of *C. metuliferus* (Gbn 0164 an Gbn 1802); and *C. metuliferus* (Gbn 0164 and Gbn 1802) x respectively *C. melo* cv. Gulfstream and *C. sativus* (Gbn 1811). For the crosses *C. ficifolius* (Gbn 1729) x respectively *C. sativus* (Gbn 1811) and *C. melo* cv. Gulfstream, pollinations were also made at 17°C constant. Pollen tube growth was examined *in vivo* by UV microscopy three days after pollination. Fruits were dissected and checked for possible ovule and embryo development, using a binocular microscope.

In general, the pollinations under controlled temperature conditions in the phytotron did not give better results that earlier work in the glasshouse as far as pollen tube growth is concerned. However, to some extent a temperature effect could be noted for three parental combinations which are listed in Table 1. 26°C proved beneficial for pollination and fertilization in *C. metuliferus* x *C. melo*. Four fruits were obtained, containing seeds of different size. Globular and heart shape embryos were found in one fruit only. Placed on an agar medium, some embryos developed cotyledons but no growing point. The same cross involving a different accession of *C. metuliferus* did not reveal any temperature dependence. It may, therefore, be rewarding to test many accessions of *C. metuliferus* for their crossability in crosses with *C. melo*.

A temperature effect also appeared to exist for the pollinations on *C. ficifolius* (Table 1). One fruit was obtained at 20°C following pollination with *C. sativus* and five and three fruits respectively at 20 and 23°C when *C. melo* cv. Gulfstream used as pollen parent. The fruits, harvested about five weeks after pollination, only contained seeds without an embryo. The structure of the tissues found in the embryo sacs could often not be determined. Perhaps these seeds were too old, as fruits harvested two weeks after pollination in the cross *C. ficifolius* x *C. melo* contained seeds with a small embryo (0.05 mm). These embryos did not develop further when put on an agar medium; larger scale experiments are necessary to decide whether such embryos may or may not be cultured on plantlets.

Table 1. Temperature effect on pollen tube growth and fertilization of 4 different species crosses in *Cucumis* L.

Cross combination	Temp (°C)	Number pollinations	No. fruit used for UV tests	Pollen tubes in	Remarks
C. metuliferus (Gbn 0164) x *C. melo* cv Gulfstream	20	16	4	style	no fruit set
	23	19	6	style	no fruit set
	26	21	5	ovary	fruits with small globular embryos
C. metuliferus (Gbn 1802) x *C. melo* cv Gulfstream	20	31	10	style	no fruit set
	23	29	9	style	no fruit set
	26	28	12	style	no fruit set
C. ficifolius (Gbn 1729) x C. sativus (Gbn 1811)	17	15	10	ovary	no fruit set
	20	57	19	ovary	one fruit; not determinable tissues in seeds

				(micropyle)*	
	23	49	19	ovary	no fruit set
	26	29	18	style (ovary)	no fruit set
C. ficifolius (Gbn 1729) x C. melo cv Gulfstream	17	17	10	stigma (style)	no fruit set
	20	58	16	style (ovary)	fruits with determinable tissues in seeds; small embryos in seeds of 14 days old fruits
	23	40	17	micropyle	fruits with determinable tissues in seeds; small embryos in seeds of 14 days old fruits
	26	22	12	ovary	no fruit set

*(...) a few pollen tubes.

Literature Cited

1. Kho, Y. O., A. P. M. den Nijs and J. Franken. 1980. Interspecific hybridization in *Cucumis* L. II. The crossability of species, an investigation of *in vivo* pollen tube growth and seed set. Euphytica 29:661-672.

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Seedling Death in Interspecific Crosses with *Cucumis africanus* L.f.

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Three interspecific crosses with *Cucumis africanus* L.f. out of our crossability analysis of African *Cucumis* species (4) set seed, most of which germinated. The seedlings, however, died from desiccation of the base of the stem after about four weeks of growth. This seedling death, as a special case of F1-hybrid breakdown, is described here in some detail as well as several attempts to overcome the barrier by making cuttings, grafting and *in vitro* culture.

Results of reciprocal crosses of *C. africanus*, *C. myriocarpus* Naud. and *C. anguria* L. are summarized in Table 1. seedling death was observed in 12 combinations of different accessions in three crosses with *C. africanus*. Individual progenies of two crosses with seedling death are listed in Table 2. The first cross, *C. africanus* x *C. anguria*, appeared to succeed in three out of eight combinations of accessions. One of the resulting progenies has thus far been positively identified as a hybrid, which was functionally male sterile and sparingly cross fertile. The reciprocal cross (5 combinations) never yielded fruit, despite good pollen tube penetration into the ovules (4). The second cross in Table 2 appeared less promising: six out of 14 different seed samples of *C. africanus* x *C. myriocarpus* did not germinate. The others germinated in part, and all seedlings died early.

We were unsuccessful in overcoming seedling death by rooting healthy tops of young plants as cuttings. Also, over 100 plantlets of *C. africanus* x *C. anguria* and *C. myriocarpus* x *C. africanus* grafted onto *C. africanus* died about two weeks later than non-grafted plants. In vitro culture of seeds and excised embryos was attempted to overcome seedling death. Surface-sterilized mature seeds of *C. africanus* x *C. anguria* (two samples, 61 seeds) and of *C. africanus* x *C. myriocarpus* (three samples, 80 seeds) were incubated on MS medium, and embryos were isolated from half of them. Most seeds discharged a slight to dense cloud of some gray-white substance into the medium, especially those of *C. africanus* x *C. myriocarpus*. Most embryos developed a film of gray material around their radicle.

Only seeds and embryos without these symptoms of deterioration germinated and developed into plantlets. In the two progenies of *C. africanus* x *C. anguria* the germination percentages were 38 and 47% (Gbn 0162 x 0198 and 0162 x 0310), in those of *C. africanus* x *C. myriocarpus* 13.0 and 0% (Gbn 0162 x1763, 0162 x 0182, and 0181 x 0165). After approximately four weeks of aseptic culture (25 ± 1°C, 16 hrs. light, 1000 Lux), the base of the hypocotyl of the plantlets turned brown, narrowed and desiccated, toppling the 3 to 4 leaved shoot, while this and the roots still appeared healthy. Eventually all plantlets died. Kinetin added to the basal medium (0.1, 1, and 10 mg/l) did not stop the deterioration process. *In vitro* grafting onto plantlets of *C. africanus* succeeded, but soon the hybrid tissue just above the graft-union turned brown and the grafts died after about two weeks. There was no difference in the behavior of the hybrids of the two crosses tested.

We speculate that some vital compound (e.g. necessary in the primary metabolism) may be missing in the lethal seedling, with a gradual accumulation of a certain deleterious metabolite as a possible result. This might express itself first in the 'oldest' part of the plants, which enlarge first during seedling development.

A few combinations of *C. africanus* x *C. anguria* yielded vigorous F_1 hybrids, so there appears to be variability for crossability. This was not found for *C. africanus* x *C. myriocarpus*, but more accessions can be tested. A comparison of the present results with earlier relevant reports is puzzling. Both Deakin *et al.* (2) and Dane *et al*. (1) considered *C. africanus* closely related to both *C. myriocarpus* and *C. anguria*, since they obtained (at least sparingly) fertile F_1 plants in almost all possible combinations. Independent evidence from isozyme electrophoretic patterns (3, 5) links the three species closely together phylogenetically. Because different accessions of all three species were used by different authors, conclusions from any comparison remain tentative. We plan to extend the analysis to accessions also used in the earlier reports.

Table 1. Summary of crosses with three *Cucumis* species showing occurrence of seedling death.

	Male parent		
Female parent	***Cucumis myriocarpus***	***C. africanus***	***C. anguria***
Cucumis myriocarpus	+	D(1)	-(4)
C. africanus	D(6), S(4)	+	+(3), D(5)
C. anguria	+(6)	-(5)	+

+ = vigorous offspring; - = occasional fruits but no seeds; D = seedling death, S = non-germinating seeds; numbers in parentheses refer to the number of combinations of different accessions.

Table 2. Behavior of individual progenies in two crosses with *Cucumis africanus* with seedling death. Legends as in Table 1.

***Cucumis africanus* x *C. anguria*; *C. africanus* accession used as female parent, *C. anguria* accession used as male parent.**						
Gbn	**0198**	**0307**	**0310**	**1736**	**1758**	
0162	D, D, D	+	D, D	+	D	
0181	D	-	-	-	-	
0330	-	D	-	-	-	
1457	+	-	-	-	-	
***C. africanus* x *C. myriocarpus*; *C. africanus* accession used as female parent, *C. myriocarpus* accession used as male parent.**						
Gbn	**0165**	**0182**	**0202**	**0203**	**1737**	**1763**
0162	-	D, S	-	S	D, S	D
0181	S	D, D	S	S	D	-
1773	-	D, D	-	-	-	-

Gbn (Gene bank no.); 0307 = PI 196477, 0310 = PI 233646, and 1457 = PI 299570.

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Cucurbit Genetics Cooperative Report 4:62-65 (by laws) 1981

Covenant and By-Laws of the Cucurbit Genetics Cooperative

Article I. Organization and Purposes

The Cucurbit Genetics Cooperative is an informal, unincorporated scientific society (hereinafter designated "CGC") organized without capital stock and intended not for business or profit but for the advancement of science and education in the field of genetics of cucurbits (Family: Cucurbitaceae). Its purposes include the following: to serve as a clearing house for scientists of the world interested in the genetics and breeding of cucurbits, to serve as a medium of exchange for information and materials of mutual interest, to assist in the publication of studies in the aforementioned field, and to accept and administer funds for the purposes indicated.

Article II. Membership and Dues

The membership of the CGC shall consist solely of active members; an active member is defined as any person who is actively interested in genetics and breeding of cucurbits and who pays biennial dues. Memberships are arranged by correspondence with the Chairman of the Coordination Committee.

The amount of biennial dues shall be proposed by the Coordinating Committee and fixed, subject to approval at the Annual Meeting of the CGC. The amount of biennial dues shall remain constant until such time that the Coordinating Committee estimates that a change is necessary in order to compensate for a fund balance deemed excessive or inadequate to meet costs of the CGC.

Members ho fail to pay their current biennial dues within the first six months of the biennium are dropped from active membership. Such members ma be reinstated upon payment of the respective dues.

Article III. Committees

1. The Coordinating committee shall govern policies and activities of the CGC. It shall consist of six members elected in order to represent areas of interest and importance in the field. The Coordinating Committee shall select its Chairman, who shall serve as spokesman of the CGC, as well as its Secretary and Treasurer.

Approvals: W. Bemis; J.D. Norton; R.W. Robinson; W.R. Henderson; M.L. Robbins; R.L. Lower

2.The Gene List Committee, consisting of five members, shall be responsible for formulating rules regulating the naming and symbolizing of genes, chromosomal alterations, or other hereditary modifications of the cucurbits. It shall record all newly reported mutations and periodically report lists of them in the Report of the CGC. It shall keep a record of all information pertaining to cucurbit linkages and periodically issue revised linkage maps in the Report of the CGC. Each committee member shall be responsible for genes and linkages of one of the following groups: cucumber, *Cucurbita* sp., muskmelon, watermelon, and other genera and species.

3. Other committees may be selected by the Coordinating Committee as the need or fulfilling other functions arises.

Article IV. Election and Appointment of Committees

1. The Chairman will serve an indefinite term while other members of the Coordinating Committee shall be elected for ten-year terms, replacement of a single retiring member taking place every other year. Election of a new member shall take place as follows: A Nominating Committee of three members shall be appointed by the Coordinating Committee. The

aforesaid Nominating Committee shall nominate candidates for an anticipated opening on the Coordinating Committee, the number of nominees being at their discretion. The nominations shall be announced and election held by open ballot at the Annual Meeting of the CGC. The nominee receiving the highest number of votes shall be declared elected. The newly elected member shall take office immediately.

In the event of death or retirement of a member of the Coordinating Committee before the expiration of his/her term, he/she shall be replaced by an appointee of the Coordinating Committee.

Members of other committees shall be appointed by the Coordinating Committee.

Article V. Publications

1. One of the primary functions of the CGC shall be to issue an Annual Report each year. The Annual Report shall contain sections in which research results and information concerning the exchange of stocks can be published. It shall also contain the annual financial statement. Revised membership lists and other useful information shall be issued periodically. The Editor shall be appointed by the Coordinating Committee and shall retain office for as many years as the Coordinating Committee deems appropriate.

Approvals: W. Bemis; J.D. Norton; R.W. Robinson; W.R. Henderson; M.L. Robbins; R.L. Lower

2. Payment of biennial dues shall entitle each member to a copy of the Annual Report, newsletters, and any other duplicated information intended for distribution to the membership. The aforementioned publications shall not be sent to members who are in arrears in the payment of dues. Back numbers of the Annual Report, available indefinitely, shall be sold to active members at a rate determined by the Coordinating Committee.

Article VI. Meetings

An Annual Meeting shall be held at such a time and place as determined by the Coordinating Committee. Members shall be notified of time and place of meetings by notices in the Annual Report or by notices mailed not less than one month prior to the meeting. A financial report and information on enrollment of members shall be presented t he Annual Meeting. Other business of the Annual Meeting may include topics may include topics of agenda selected by the Coordinating Committee or any items that members may wish to present.

Article VII. Fiscal Year

The fiscal year of the CGC shall end on December 31.

Article VIII. Amendments

These By-Laws may be amended by simple majority of members voting by mail ballot, provided a copy of the proposed amendments has been mailed to all the active members of the CGC at least one month previous to the balloting deadline.

Article IX. General Prohibitions

Notwithstanding any provision of the By-Laws or any other document that might be susceptible to a contrary interpretation:

1. The CGC shall be organized and operated exclusively for scientific and educational purpose.
2. No part of the net earnings of the CGC shall or may under any circumstances inure to the benefit of any individual.
3. No part of the activities of the CGC shall consist of carrying on propaganda or otherwise attempting to influence legislation of any political unit.
4. The CGC shall not participate in, or intervene in (including the publishing or distribution of statements), any political campaign on behalf of a candidate for public office.

5. The CGC shall not be organized or operated for profit.
6. The CGC shall not:

- lend any part of its income or corpus without the receipt of adequate security and a reasonable rate of interest to;
- pay any compensation in excess of a reasonable allowance for salaries or other compensation for personal services rendered to;
- make any part of its services available on a preferential basis to;
- make any purchase of securities or any other property, for more than adequate consideration in money's worth; or
- engage in any other transactions which result in a substantial diversion of income or corpus to any officer, member of the Coordinating Committee, or substantial contributor to the CGC.

The prohibitions contained in this subsection (6) do not mean to imply that the CGC may make such loans, payments, sales, or purchases to anyone else, unless authority be given or implied by other provisions of the By-Laws.

Article X. Distribution on Dissolution

Upon dissolution of the CGC, the Coordinating Committee shall distribute the assets and accrued income to one or more scientific organizations as determined by the Committee, but which organization or organizations shall meet the limitations prescribed in sections 1-6 of Article IX.

Cucurbit Genetics Cooperative Report 4:66 (germplasm) 1981

STOCKS AND GERMPLASM DESIRED OR FOR EXCHANGE

Stocks Desired

C. E. Thomas, U.S. Department of Agriculture, Subtopical Fruit and Vegetable Research Station, P.O. Box 267, Weslaco, TX 78596

Cucumis melo lines with resistance to downy mildew, powdery mildew and/or *Alternaria* leaf-blight, especially bush types.

Cucurbit Genetics Cooperative Report 4:67-74 (membership) 1981

Membership List - Cucurbit Genetics Cooperative

1. Adams, Howard. Northrup, King and Company, Post Office Box 1406, Woodland, CA 95695. Breeding commercial cultivars.
2. Adeniji, Adeoye A. University of Nebraska, Department of Horticulture, 377 Plant Science Building, Lincoln, NE 68583.
3. Ahsan, A. Shoaib. Serial Section, Indian Agricultural Research Institute, Library, New Delhi 110012, India.
4. Alexandrova, Maria. Institute for Vegetable Crops, "Maritza" 32, Bresovsko Shosse Plovdiv, Bulgaria.
5. Angell, Fred. A. L. Castle, Inc., Post Office Box 279, Hollister, CA 95023.
6. Arellano, J. A. Librarian, Unidad de Biblioteca y Documentacion, CIAPY, Apartado Postal 1485-B, Merida, Yuc., Mexico.
7. Asgrow Seed Co., P. O. Box P, Delray, Beach, FL 33444.
8. *Azhar, Mohammad. Associate Plant Breeder, 1850 Hanover Drive #120, Davis, CA 95616. Muskmelon breeding.
9. Baggett, J. R. Department of Horticulture, Oregon State University, Corvallis, OR 97331.
10. Baker, L. R. Director, Vegetable Research, Asgrow Seed Company, 7171 Portage Avenue, Kalamazoo, MI 49001.
11. Balgooyen, B. Northrup, King and Company, Post Office Box 959, Minneapolis, MN 55440.
12. Bemis, W. P. Department of Plant Science, University of Arizona, Tucson, AZ 85721.
13. Bhattarai, M. R. c/o Overseas Unit, Faculty of Education, The Polytechnic Wolverhampton, Castle View, Dudley DY1 3HR, West Midlands, England.
14. Bohn, G. W. Imperial Valley Conservation Research Center, 4151 Highway 86, Brawley, CA 92227.
15. Bowman, R. Vlasic Foods, Inc., West Bloomfield, MI 48033.
16. Brewer, J. G. Head, Vegetable Research, Sluis en Groot, P. O. Box 13, Enkhuizen, The Netherlands.
17. Burkett, Al. PetoSeed Company, Inc., Rt. 4, Box 1255, Woodland, CA 95695.
18. Castellani, M. (Madame). Brentano's S.A., 37, Avenue de l'Opera, 75002 Paris, France.
19. Central Library of Agricultural Science, ATTN: A. Ratzabi, Periodicals Dept., Post Office Box 12, Rehovot, 76 100, Israel.
20. Chambliss, O. L. Dept. of Horticulture, Auburn University, Auburn, AL 36830.
21. Chermat, M. C. Vilmorin, Documentation Center, La Menitre 49250 Beaufort en Vallee, France.
22. Chung, Paul. PetoSeed Company, Inc., Rt. 4, Box 1255, Woodland, CA 95695.
23. Clayberg, C. D. Department of Horticulture and Forestry, Kansas State University, Manhattan, KS 66506.
24. Coyne, Dermot. Department of Horticulture, University of Nebraska, Lincoln, NE 68583.
25. Crall, J. C. Agricultural Research Center, University of Florida, Post Office Box 388, Leesburg, FL 32748. Watermelons.
26. Custers, J. B. M. Institute for Horticultural Plant Breeding, Post Office Box 16, Wageningen, The Netherlands.
27. da Costa, Cyro Paulino. Departamento de Genetica - ESALQ, Caixa Postal 83, 13.400-Piracicaba-SP Brazil.
28. de Kroon, R. J. Enza-Zaden, Postbox 7, Enkhuizen, Holland.
29. de Macedo, Alvaro Aurelio. Sementes Agroceres, S.A., Caixa Postal 58, 32.500-Betim-MG, Brasil
30. de Ponti, O. M. B. Institute for Horticultural Plant Breeding, P.O. Box 16, Wageningen, The Netherlands.
31. de Ruiter, Ir. A. C. Deruiterzonen Seed Company, Postbus 4, Bleiswijk, The Netherlands.
32. Del Monte Corporation, ATTN: Ms. Dorothy Arthur, Librarian, Post Office Box 36, San Leandro, CA 94557.
33. Dumas de Vaulx, Roger. Centre de Recherches Agronomiques, Station d'Amelioration des Plantes Maraicheres, Domaine St. Maurice-84140, Montfavet, France.
34. Dumlao, Rosa. Joseph Harris Company, Moreton Farm, Rochester, NY 14624.
35. Eason, Gwen. 2401B Wesvill Court, Raleigh, NC 27607.
36. Eenhuizen, P. Rijk Zwaan, Zaudteelt En Zaadhandel B.V., Postbus 40, De Lier, Holland.
37. Eigsti, Ori. 17305, SR4, RR1, Goshen, IN 46526.
38. Elmstrom, Gary W. Agricultural Research Center, University of Florida, P. O. Box 388, Leesburg, FL 32748.
39. Eyberg, Dorothy A. Assistant Plant Breeder, Asgrow Seed Co., P. O. Box L, San Juan Bautista, CA 95045.
40. Franchi, Gianni. Franchi S.P.A., via S. Bernardino 120, 24100 Bergamo, Italy.
41. Gabelman, W. H. Department of Horticulture, Rm. 18, University of Wisconsin, Madison, WI 53706.
42. Gabert, Augie. Dessert Seed Company, Inc., Box 9008 Brooks, OR 97305.
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44. George, B. F. Heinz, U.S.A., Post Office Box 57, Tracy, CA 95376.

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46. Gonon, Yves. Marsem-Agri., Mas de Rouzel, Route de Generac, 30000 Nimes, France.
47. Graham, John D. Webster Brook-Apt. 4, R.D. 2, Delhi, NY 13753.
48. Graines Caillard, ATTN: Pour le Directeur General et P. O., la Secretaire, BP 30, Chem de Pouille, 49130 Les Ponts de Ce, France.
49. Granqvist, B. J. E. Ohlsens Enke A/S, Nymunkegaard, DK-2630 Taastrup, Denmark.
50. Groff, David. Asgrow Seed Company, R.D. #1, Bridgeton, NJ 08302.
51. Hagan, W. L. Del Monte Corporation, Agricultural Research Center, Post Office Box 36, San Leandro, CA 94577.
52. Haley, Alleah B. 112 Whitecliff Drive, Vallejo, CA 94590. Disease resistance in cucumber, *Cucumis sativus*.
53. Hallard, Jacques et Ch. Les acacias - Rue du roi Rene 8, La Menitre, 49250 Beaufort-en-Vallee, France.
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58. Hollar, Larry A. Hollar and Company, Inc., Post Office Box 106, Rocky Ford, CO 81067.
59. Holle, Miguel (Horticulturist). Annual Crops Program, Catie, Turrialba, Costa Rica.
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70. Kosaka, Yashiro. Nihon Horticultural Production Institute, 207 Kamishiki, Matsudoshi, Chiba-ken, Japan.
71. Kust, Tony. Asgrow Seed Co., Division of Upjohn, 7000 Portage Rd., Kalamazoo, MI 49001.
72. Laborde, Jose Antonio. Unidad De Evaluacion y Planeacion, Apartado Postal No. 112, Celaya GTO Mexico.
73. Laterrot, Mme. Bibliothecaire, Station d'Amelioration des Plantes Maraicheres, Domaine Saint - Maurice, 84140 Montfavet, France.
74. Lee, A. Neuman Seed Company, Post Office Box 1530, El Centro, CA 92243.
75. Lefebvre, Veronica. USDA Technical Information System Selection and Order Section, Room 112, National Agricultural Library Building, Beltsville, MD 20705.
76. Lower, R. L. Department of Horticulture; 208C, University of Wisconsin, Madison, WI 53706.
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79. McCreight, J. D. USDA/SEA/AR, P. O. Box 5098, Salinas, CA 93915.
80. Meysing, Wilbert D. Sluis & Groot Seed Co., Pannevis Breeding Station, Noordlierweg 14, 2678 LV De Lier, Holland.
81. Morelock, T. E. Department of Horticulture and Forestry, University of Arkansas, Plant Science Building 313, Fayetteville, AR 72701.
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83. Mundi-Prensa Libros, S.A. Subscription Dept., Castello, 37 Apartado 1.223, Madrid-1, Spain.
84. Munger, H. M. Cornell University, 410 Bradfield Hall, Ithaca, NY 14853.
85. Mutschler, Martha A. Dept. of Plant Breeding & Biometry, 252 Emerson Hall, Cornell University, Ithaca, NY 14853.
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87. New York State Experiment Station Library, Jordan Hall, Geneva, NY 14456.
88. Newstrom, Linda. Dept. of Botany, Life Science Building, University of California-Berkeley, Berkeley, CA 94720.
89. Ng, Timothy J. Department of Horticulture, University of Maryland, College Park, MD 20742. Muskmelon genetics and breeding.
90. Niego, Shlomo. Plant Genetics, The Weizmann Institute of Science, Rehovot, Israel.
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93. O'Sullivan, John. Ministry of Agriculture and Food, Box 587, Simcoe, Ontario N3Y 4N5, Canada.
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104. Reed, Sandra M. Campbell Institute for Research and Technology, 2611 Branch Pike, Cinnaminson, NY 08077.
105. Rhodes, A. M. Vegetable Crops Building, University of Illinois, Urbana, IL 61801. Genus *Cucurbita*.
106. Rhodes, William B. Edisto Experiment Station, Post Office Box 247, Blackville, SC 29817.
107. Richens, R. H. Director, Commonwealth Bureau of Plant Breeding and Genetics, Department of Applied Biology, Pembroke Street, Cambridge, CB2 3DX, England.
108. Risser, Georgette. (Mademoiselle). Maitre de Recherches, Station d'Amelioration des Plantes Maraicheres, INRA, Domaine St. Maurice 84140, Montfavet-Avignon, France.
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114. Ruttercutter, Glen. Nestle Enterprises, Inc., Agricultural Research Center, 701 W. Main Street, Leipsic, OH 45856.
115. Schaffer, Arthur. Dept. of Horticulture & Forestry, Blake Hall, Rutgers State University-Cook College, P. O. Box 231, New Brunswick, NJ 08903.
116. Schroeder, R. H. FMC Corporation, Agricultural Chemical Division, P. O. Box 2508, El Macero, CA 95618.
117. Scott, John W. Department of Horticultural Science, 2001 Fyffe Court, Ohio State University, Columbus, OH 43210.
118. Seshadri, V. S. Division of Vegetable Crops and Floriculture, Indian Agricultural Research Institute, New Delhi-110012, India.
119. Shattuck, Vernon. 825 N. Tucson Avenue, Tucson, AZ 85716.
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121. Staub, Jack E. Dept. of Horticulture, Rm. 118B, University of Wisconsin, Madison, WI 53706.
122. Stern, Joseph. Goldsmith Seeds, Inc., P. O. Box 1349, Gilroy, CA 95020.
123. Takahashi, Osamu. Plant Breeder, Takii Plant Breeding and Experimental Station, Kosei, Koga, Shiga 520-32, Japan.
124. Tatlioglu, T. Institut fur Angewandte Genetik, der Universitat Hannover, Herrenhauser Str. 2, 3000 Hannover 21, West Germany.
125. Taylor, A. D. Director of Research, Robson Seed Farms, One Seneca Circle, Hall, NY 14463.
126. Tepedino, Vincent J. USDA/SEA/AR, UMC 53, Utah State University, Logan, UT 84322.
127. Thomas, Claude E. USDA/SEA/AR, P. O. Box 267, Weslaco, TX 78596.
128. Tolla, Greg. Campbell Institute of Agricultural Research, Napoleon, OH 43545.
129. Torrey, T. C. W. Atlee Burpee Company, 335 S. Briggs Road, Santa Paula, CA 93060.
130. Valentine, T. M. Keystone Seed Company, P. O. box 1438, Hollister, CA 95023. Cucumber, summer and winter squash breeding efforts.
131. van Blokland, G. D. Royal Sluis, Postbox 22, 1600 AA Enkhuizen, Holland.
132. van den Berg, Pieter. Technical Manager, Nickerson International Plant Breeders S.A., P. O. Box 1787, Gilroy, CA 95020.
133. van der Arend, Wim. Nunhems Zaden b.n., Voort 6, Haelen, Holland.
134. van der Ploeg, D. ATTN: Henri van Isselmuden, Elite Zaden N.V. - NL 3220, Barendrecht, Holland.
135. Ventura, Yaacov. Hazera Seeds Ltd. P. O. Box 1565, Haifa, Israel.
136. Verhoff, Ruud. Plant Breeder, Bruinsma Seed Company, P. O. Box 24, 2670 AA Naaldwijk, Holland.
137. Watterson, Jon. PetoSeed Company, Inc., Rt. 4, Box 1225, Woodland, CA 95695.
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139. Whitaker, T. W. USDA/ARS, P. O. Box 150, La Jolla, CA 92038.
140. White, J. W. 1330 Virginia Street, Berkeley, CA 94702.
141. Williams, Tom V. Project Leader, Northrup, King & Co., P. O. Box 1389, Homestead, FL 33030.
142. Wyatt, Colen. PetoSeed Company, Inc., Rt. 4, Box 1255, Woodland, CA 95695.
143. Yorty, Paul. Musser Seed Co., Box 1406, Twin Falls, ID 83301.
144. Yu, Albert. PetoSeed Company, Inc., Rt. 4, Box 1255, Woodland, CA 95695.
145. Yukura, Yasuo. 46-7, 3-Chome, Miyasaka, Setagaya-Ku, Tokyo, Japan. Genetics of sex-expression in cucumber and melon.
146. Zuta, Zeev. Hazera Seed Company, Oe Yehuda Post, Israel

*If you know where these people can be reached, please inform us of an address; they are still on our lost list.

One last addition:

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Cucurbit Genetics Cooperative Report 4:75 (financial) 1981

FINANCIAL STATEMENT June, 1981

(Prior to publication of Report No. 4)

Item		Amount	Amount
Balance - June, 1980			$839.79
Receipts - June 1980 to June 1981*			
	Dues	$212.50	
	Back issues	234.50	
	Interest	60.47	
	TOTAL	$507.47	507.47
			$1,347.26
Expenditures			
	Cost of publication and mailing of CGC #3		
			413.80
Balance of $933.46			$933.46**

*One complimentary membership to Plant Breeding Abstracts.
** Also, one check ($7.00) in bank processing.